



Chapter 5

An Intelligent Healthcare Monitoring System for Coma Patients

Janney J. Bethanney  T. Sudhakar, Sindu Divakaran, H. Chandana, Chriselda L. Caroline

Book Editor(s): R.J. Hemalatha, D. Akila, D. Balaganesh, Anand Paul

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An Empirical Review on Brain Tumor Classification Approaches

Mutkule Prasad Raghunath[✉] & B. Anikayarkanni

Conference paper | First Online: 29 November 2022

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Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 521)

Abstract

Cancer or malignant growth is the significant medical issue that shatters the world due to higher mortality rate. Cancer is regarded as the second most deadliest disease after cardiovascular disease as it kills one sixth of people in the world. There are different sorts of cancers such as colon cancer, lung cancer, breast cancer, blood cancer and brain tumor. The Brain tumor prevails as the most destructive cancer due to its low survival rate, assorted characteristics and combative nature. The brain is the crucial part of the human body as it controls the whole activity such as breathing, muscle movement and inducing the senses with the help of tissues and neural cells. Each and every cell has their own abilities; a few cells develop with their own usefulness, and some lose their ability, oppose, and develop distortions. These mass assortments of unusual cells from the tissue are called cancer. Harmful brain tumors are uncontrolled and unnatural development of synapses (brain cells). It is quite possibly the most dangerous and deadly malignant growth, which forces the requirement for programmed recognition techniques. There are so many methods existing in the literature to facilitate effective brain tumor classification methods. Hence, in this survey, we analyze 30 literature works concentrating on classification problems associated with the brain tumor using MRI, bringing into light the various shortcomings of the existing methodologies for classification problems. Here, the analysis of various methods will be facilitated based on several factors, such as performance metrics, datasets used etc. On the other hand, the

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Analysis and Survey of Soil Moisture Prediction Techniques for Agricultural Applications

[Seema J. Patil](#)  & [B. Ankayarkanni](#)

Conference paper | [First Online: 29 November 2022](#)

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Abstract

Soil Moisture (SM) is an important factor disturbing the growth of crop. Thus, sophisticated understanding or precise prediction of future SM states are important in scheduling of irrigation, improving utilization of agricultural water, and forecasting of yield. Hence, the detection and prediction of SM are of major concern in the present era. This review article provides the detailed review of latest research papers presenting the SM prediction approaches for the prediction of SM. The papers are classified as conventional methods of SM prediction, Remote sensing based SM prediction approaches, Machine learning based SM prediction methods, and the deep learning based SM prediction approaches. In addition to this, various research gaps and the challenges associated with the existing works of SM prediction are discussed. The reviewed works are analyzed in the basis of performance metrics, performance attained using various methods, and the datasets employed for analysis. In addition, this review presents the future scope for the researchers with the analysis of issues associated with the existing literary works.

Keywords

[Soil moisture](#) [Prediction](#) [Agriculture](#) [Irrigation scheduling](#) [Yield forecast](#)

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Author's Profile



Dr. S. Raviraja, working as a Professor and Dean, Faculty of Computer Studies, University of Garden City, Sudan and Founder of Royal Research Foundation, India. Former employee of University of Malaya (UM), Malaysia. He has received his Bachelors in Computer Science & Masters in Computer Applications from University of Mysore, India and a PhD from University of Honolulu, US, built a multilingual script recognition OCR for African Languages and later as Post Doctoral Fellow in UM. Authored Textbooks on IT. He has published more than 30 research papers in refereed international journals proceedings of various international conferences. He has met the necessity of addressing many of the theoretical, practical and methodological issues surrounding research on AI. His research interests include Medical Image Analysis, Vision & Intelligence, Robotics and in Software Engineering Methodologies. Ongoing research works on Cognitive Neuroscience, Cognitive Intelligence and Quantum Computing.



Dr. S. Raja shree working as an Assistant Professor in the Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology. She has about 10 years of teaching experience. She received his B.E degree in Computer Science and Engineering with first class and M.E. degree in Computer Science and Engineering with distinction from Anna University, Trichy. She has published 4 research papers in refereed international journals and 2 research papers in the proceedings of various international conferences. Her areas of research include Artificial Intelligence, Deep Learning, Cyber Security. She is an active member of MISTE and ACM.



Mr. Nayani Sateesh working as a Senior Assistant Professor in the Department of IT at CVR College of Engineering, Hyderabad. He graduated from Osmania University, Hyderabad, India. He secured Master of Technology in Web Technologies (CSE) From JNTUH Hyderabad, Telangana, India. He is Pursuing Ph.D. in CSE at JNTUK Kakinada, Andhra Pradesh, India. He is in the field of Data Science at CVR College of Engineering, Hyderabad, Telangana, India. He is in the teaching profession for more than 11 years besides 5 years of Software Industry experience. He has presented around 10 papers in National and International Journals, Conferences, and Symposiums. His main area of interest includes Data Mining and Knowledge Discovery, Machine Learning, Deep Learning and Data Science.



Dr. Nanda Ashwin working as a Professor in the Department of Information and Engineering East Point College of Engineering has about 26 years of teaching experience. She received his B.E degree in Computer Science and Engineering MS in System Software and M. Tech degree in Software Engineering with distinction from VTU, Belagavi. She has published 16 research papers in refereed international journals and 10 research papers in the proceedings of various international conferences. She has received several best paper awards for his research papers at various international conferences. Her areas of research include Wireless Communication, Cloud Computing, Big Data Analytics and Data Science.



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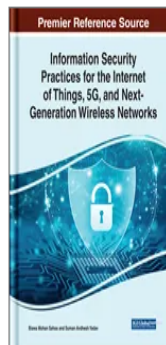
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Edge Computing Enabled by 5G for Computing Offloading in the Industrial Internet of Things

Vinodhini Mani, Kavitha C., Baby Shamini P., S. R. Srividhya

Source Title: *Information Security Practices for the Internet of Things, 5G, and Next-Generation Wireless Networks*

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Abstract

Game theory and 5G data transferring structures are used to enhance data offloading of computational data. All such solutions not only reduce the load on the cloud by processing edge data and information but also play an important role in privacy and security by ensuring which data communication is locally translated into a network that directly connects the user equipment and then sends the local server to the network core of the organization. With a combination of 5G structure and game theory, we can comfortably handle data transmission, data security, and also system efficiency. The game theory approach with the dynamic computation offloading algorithm (DCOA) allows IIoT (industry internet of things) devices to make decisions spontaneously and reduce computational offloading while transferring data to the local server. The small range of 5G makes it possible to use a small cell network run by a central hub. As a result of its higher frequency, 5G follows a different wireless spectrum structure (N-RAM) and is enhanced by slicing the network.

Chapter Preview

Repercussion of Expressions in Facial Age Estimation

Publisher: IEEE

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A. Deepa ; T Sasipraba ; All Authors

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II. Related Work

III. Proposed Method

IV. Results of Testing

V. Conclusion

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Abstract:

This digital Aeon has a remarkable growth in soft computing and technical innovation. In digitization, the role of the images and interpretation through image data is inevitable. There are several innovations carried on in the field of image processing like recognition, verification, interpretation and analysis which are imposed in the form of images and visual presentations which are obligatory in many situations. The era attunes attention to recognition and extraction of features from a face. The digital world seeks heed in the area of bio-recognition, age estimation and gender identification. The proposed system concentrates on processing the facial image, extracting the features from the input image to classify the age group of the input image. Extraction of features and establishment of classifiers are the major considerations in the process of facial image processing and estimation includes features availed from texture, geometric measures, fiducial value and matching the results with the database reading. With the features extracted from the face image, the classification of age is done after processing the image and subjecting to deep neural classification. The result of accuracy is tested in images which encompass expressions. The accuracy of estimation is achieved better with the analysis of muscle movements and the impact of expressions in the variation in texture of the face.

Published in: 2022 International Conference on Inventive Computation Technologies (ICICT)

Date of Conference: 20-22 July 2022

INSPEC Accession Number: 21972072

Date Added to IEEE Xplore: 16 August 2022

DOI: 10.1109/ICICT54344.2022.9850870

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Abstract:

Injection attack is one of the best 10 security dangers declared by OWASP. SQL infusion is one of the main types of attack. In light of their assorted and quick nature, SQL injection can detrimentally affect the line, prompting broken and public data on the site. Therefore, this article presents a profound woodland-based technique for recognizing complex SQL attacks. Research shows that the methodology we use resolves the issue of expanding and debasing the first condition of the woodland. We are currently presenting the AdaBoost profound timberland-based calculation, which utilizes a blunder level to refresh the heaviness of everything in the classification. At the end of the day, various loads are given during the studio as per the effect of the outcomes on various things. Our model can change the size of the tree quickly and take care of numerous issues to stay away from issues. The aftereffects of the review show that the proposed technique performs better compared to the old machine preparing strategy and progressed preparing technique.

Published in: 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT)

Date of Conference: 10-11 March 2022

INSPEC Accession Number: 21728580

Date Added to IEEE Xplore: 12 May 2022

DOI: 10.1109/IC3IoT53935.2022.9787878

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Abstract	Abstract: Firstly, Parkinson delineates Parkinson's sickness as a neurologic syndrome, it affects the central system, as a result, the patients face difficulty talking, strolling, tremor throughout the motion. Parkinson's sickness patient generally encompasses a low-volume noise with a monotone quality, this method explores the classification of audio signals feature dataset to diagnose Parkinson's sickness (PD), the classifiers we tend to use during this system area unit from Machine Learning. Our model tends to utilize provision regression and XGboost classifiers, and therefore the audio feature dataset from the UCI dataset repository. The system has achieved a much better end up in predicting the palladium patient is healthy or not, XGBoost provided the height accuracy of 96% and therefore the Matthews parametric statistic (MCC) of 89%.	
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Figures	Date Added to IEEE Xplore: 12 May 2022	DOI: 10.1109/IC3IoT53935.2022.9768002
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Abstract	Abstract: Human beings from all over the world prefer and consume rice more than any other food. Rice is at its peak of demand when its quality is good. Currently, the kind and quality of rice is determined through a naked-eye visual assessment approach. This method, however, is arduous, time-consuming, requires human skill, and is dependent on the inspector's physical health. To address these issues, this work introduces an automated system that uses digital image processing techniques to identify and classify rice grains. The image processing approach is the most appropriate since it is a non-contact technique that captures the picture of the rice grains. MATLAB is used to pre-process, segment, and extract features from the captured images. Using Neural Networks (NN) and Support Vector Machines (SVM) algorithmic classifications, the quality of rice is assessed based on the extracted features. The results indicate that SVM-based classification performs better than its counterpart based on our comparison study.	
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II. Related Works	Date Added to IEEE Xplore: 12 May 2022	DOI: 10.1109/IC3IoT53935.2022.9767925
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Abstract:

The e-healthcare management system could be enhanced extremely by connecting to current trend technology. This paper suggested a model of grouping adaptable e-healthcare services administration framework dependent on Cloud Computing. Along these lines, this paper prescribed a model of planning adaptable e-healthcare services administration framework dependent on distributed computing. The recommended framework has been enhanced and incorporates different divisions to create healthcare services framework. Health Data Management System based on the client side, simple healthcare cloud and application side creates a readily attainable network. Biometric based confirmation system is appropriate in this condition since it defeats the constraints of nominal crime and forget passwords in the regular nominal id secret key instrument utilized for giving security. It additionally has high correctness rate for secure information access and recovery. At long last, the framework proposed enhances cost administration, time, cost, putting away patient profile.

Published in: 2019 Amity International Conference on Artificial Intelligence (AICAI)

Date of Conference: 04-06 February 2019

INSPEC Accession Number: 18620767

Date Added to IEEE Xplore: 29 April 2019

DOI: 10.1109/AICAI.2019.8701387

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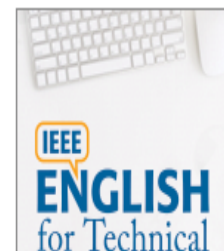
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Conference paper | [First Online: 30 August 2022](#)

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Abstract

Coronavirus disease 2019 (COVID-19) is caused by a new virus called SARS-CoV-2. Its impact on public health creates adverse effects. Because it is a brand-new virus, scientists are getting to know more every day. Although the majority who've COVID-19 have slight symptoms, COVID-19 can also cause intense infection or even demise. a few corporations, together with older adults and those who've certain underlying scientific conditions, are at accelerated risk of extreme contamination So monitoring and Visualization of COVID-19 cases and simply representing the information for a higher understanding of the COVID-19 instances around the world helps humans recognize the present-day state of affairs and to try this a cellular application is a fine way. In this paper, We summarize and illustrate with examples the way to amass and Visualize the statistics of the COVID-19 cases in a cellular application using Flutter.

Keywords

COVID-19 CNN Tracking Visualization Data gathering Data manipulation
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Neoplastic—Nuclei Cell Labelling Using Mask R-CNN

R. I. Minu[✉], G. Nagarajan, Ankit Prabh & Jenendar Bishnoi

Conference paper | First Online: 24 July 2022

292 Accesses

Part of the [Lecture Notes in Computational Vision and Biomechanics](#) book series (LNCVB, volume 37)

Abstract

Neoplastic cells are tumorous cells that damage the cells around them and are the prologue for cancer development in organs. However, identifying these cells poses a bottle-neck in the research of cancer cure as it is an extremely tedious job to manually isolate these from the rest of the cells in the tissue. Hence, the automation of this process using deep learning (DL)-based object detection and segmentation techniques such as Mask R-CNN will allow researchers and pathologists to save valuable time otherwise consumed in manually identifying these nuclei. The main objective of this research paper is to provide an instance segmentation technique to label and segment neoplastic cell nuclei from multiple instances of whole-slide images (WSI). For this process, a contemporary neural network architecture called the mask region-based convolutional neural network (Mask R-CNN) was used. This proposed technique generates a pixel-wise binary mask. These masks are capable of segmenting these instances and facilitating the advancement of intelligent systems in medical imaging and computational pathology. This time can instead be devoted to developing better cures by conducting more research. The paper also highlights the best techniques and practices that can be employed while training a model for a task of such complexity. The results of these techniques provide a mean average precision (mAP) score of 0.756 and a binary panoptic quality (bPQ) score of 0.675.

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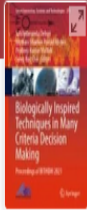
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Image Colorization Using CNNs

R. I. Minu , S. Vishnuvardhan, Ankit Pasayat & G. Nagarajan

Conference paper | [First Online: 04 June 2022](#)

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Abstract

This paper presents a survey on the current technological processes that are used to colorize images with little or no human intervention, using image processing and machine learning techniques. We also analyze the more recent deep- learning-based approaches, specifically those using convolutional neural networks (CNNs), which are specially optimized mathematical models for image processing and manipulation. By diving deep into the mathematical and

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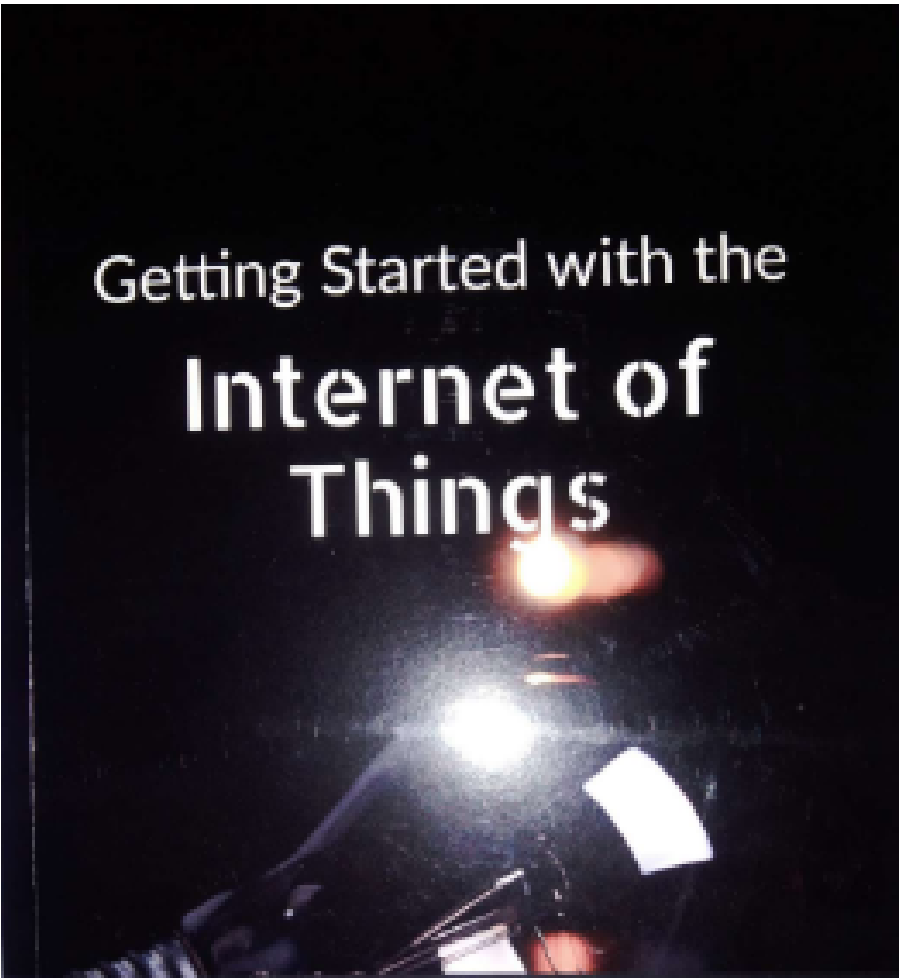
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An Efficient Model for Predicting Admission at Emergency Department using Data Mining

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Abstract:

The Emergency Departments (ED), which save many people's lives, have a negative impact as well. If the ED is overcrowded, there is a risk that some individuals' condition might become fatal due to delayed care, even before they are hospitalized. As a result, there is a need to examine the use of innovative ways to increase patient flow and prevent overcrowding. Machine Learning [ML] has the potential to assist in this process by learning the relevant data, evaluating, and predicting the future outcomes. This research study intends to reduce the overload in the ED by using the Machine Learning [ML] algorithms to predict the outcome of a patient's confirmation and making the resources available beforehand.

Published in: 2022 International Conference on Inventive Computation Technologies (ICICT)

Date of Conference: 20-22 July 2022

INSPEC Accession Number: 21972079

Date Added to IEEE Xplore: 18 August 2022

DOI: 10.1109/ICICT54344.2022.9860780

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Abstract

In this work, data mining, and cloud computing problems such as privacy protection, intrusion detection, identification system have been realizing. Social-Cybersecurity is an evolving science-focused field for characterizing, interpreting, and predicting improvements in human behavior, social, cultural, political outcomes, and development. The cyber-infrastructure is required to sustain its critical existence cyber-mediated knowledge climate under shifting circumstances and cyber threats that are immediate or imminent. When the data moves from the local cloud to another cloud, some security issues automatically arise. At this stage, an advanced robust security system with advanced encryption or decryption algorithm is necessary. At the same time, intrusion may attack the cloud for hacking or modifying the existing information. There an advanced deep learning algorithm is essential to make the cloud efficient. The Logistic net regression Optimization is proposed for cybersecurity and protection. A final performance measures, estimating accuracy, 0.952 sensitivity of 0.39, Recall, F1 score 0.54 and processing time.

Keywords

Logistic net regression

Auto stack FCNN

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Data Analysis on Detection and Prediction of Covid-19

Publisher: IEEE

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Abstract

Abstract:

Covid-19 has created a huge problem throughout the world. Due to the sudden increase in spread of Covid-19 many of them has lost their lives. Currently there is no proper solution for prevention of virus. Many research are working on to find out the spread of the disease as well as the preventive measures that can be taken to control. We are going to survey various set of research work proposed by different researchers. Based on the information that are collected from different research work. The paper analyses the spread of covid across particular location and to generate the graph based on the data. The details of the particular location such as the no of persons affected, recovered and other details.

Published in: 2022 3rd International Conference for Emerging Technology (INCET)

Document Sections

I. Introduction

II. Related Works

III. Proposed Work

IV. Conclusion

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Date of Conference: 27-29 May 2022

INSPEC Accession Number: 21903377

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Date Added to IEEE Xplore: 15 July 2022

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Publisher: IEEE

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Conference Location: Belgaum, India

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Efficient Framework for Hidden Camera Detection & Jamming using IoT

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Abstract

Abstract:

Hidden Camera so called "Spy Camera" is frequently used to record something without prior knowledge. Usually, the hidden camera will not be visible for objects that are recorded. The use of hidden cameras in public spaces has rapidly increased, and correspondingly the hidden camera recordings may be shared over a network. This research study has proposed a IoT-based architecture for performing camera detection and jamming. The client recognizes the network, where the camera is recording/streaming and jams the camera linked to that network through IoT. The cameras connected to the entire network may be jammed here. An extension to this RFID is introduced to identify the hidden camera signals and forecast the presence of a camera in that location.

Published in: 2022 8th International Conference on Trends in Electronics and Informatics (ICOEI)

Document Sections

I. Introduction

II. Related Works

III. Proposed Work

IV. Results

V. Conclusion

Authors

Date of Conference: 28-30 April 2022

INSPEC Accession Number: 21859733

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Date Added to IEEE Xplore: 24 May 2022

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RESEARCH ARTICLE | NOVEMBER 29 2022

Ship detection using high resolution remote sensing image

L. K. Joshila Grace, K. Rajashakar Reddy, K. Pavan Kalyan, P. Asha, G. Kalpanasri

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+ Author & Article Information
AIP Conf. Proc. 2446, 180004 (2022)
<https://doi.org/10.1063/5.0108808>

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Deep convolutional neural network (DCNN) can understand the undertaking of ship recognition on high-goal distant detecting pictures. In any case, bogus alerts brought about by transport like items ashore may lessen the precision and achievability of these DCNN-based identification systems. In our work, we propose a start to finish strategy called "scene cover R-CNN" to decrease coastal bogus cautions. As the organization part of scene division, the scene mask extraction network (SMEN) was creatively brought into the recognition system. The non-target region territory is joined with the construed scene veil to take out bogus applicant focuses in the non-target region. The new DCNN-based ship recognition component can keep up the discovery exactness, yet additionally viably stifle the bogus alerts of non-target targets. At last, the viability and adequacy of the strategy are checked on the ship informational collection created by high-goal optical distant detecting pictures precision.

Topics

[Remote sensing](#), [Artificial Intelligence](#), [Water transportation](#)

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Abstract

Abstract:

The goal is to use a Multi-Branch Cross-Connected Convolutional neural network to construct a new model for expression detection based on a novel face decomposition. CNN, residual connections, and Multi Networks are all included in this strategy. Other approaches may not be able to extract as many features as this method. This method adds a shortcut link, resulting in a highly smooth data or feature flow, as well as good feature extraction. Some methods are not that great in extracting complete features; this will be sorted out in this method. This method can recognize all the emotions, the emotion which shows the highest value is our output. The data flow in Single-structure CNN is not smooth, and feature extraction is insufficient. The proposed method can perform well in terms of emotion recognition and has a high level of accuracy. More fluid data transfer between networks improves feature extraction and increases emotion recognition performance.

Authors

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Keywords

Metrics

Published in: 2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICICT)

Date of Conference: 11-12 August 2022

INSPEC Accession Number: 22190014

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Detection of Network Intrusion Using Machine Learning Technique

L. K. Joshila Grace , P. Asha, Mercy Paul Selvan, L. Sujithelen & A. Christy

Conference paper | [First Online: 26 May 2022](#)

639 Accesses

Part of the [Communications in Computer and Information Science](#) book series (CCIS, volume 1591)

Abstract

The aim is to estimate a Windows device's risk of being corrupted by different malware families based on the machine's various properties. By merging movement and studies of threats obtained by Microsoft's endpoint security solution, Windows Defender, the simple data containing these properties and system infections was created. A Machine Identifier uniquely identifies each row throughout this dataset, which relates to a machine. The similarity measure has Detections, which means that Malware was found on the computer. You should estimate the value for Detections of each system in test.csv using the details and labels in train.csv. Using the Malware data collection, this analysis tests the output of the new proposed classifier algorithm. That proposed updated version of the Random forest classifiers provides improved outcomes in case of intrusion detection and false incidence, according to the empirical findings of our research.

Keywords

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Detect Fire in Uncertain Environment using Convolutional Neural Network

[L. K. Joshila Grace](#), [P. Asha](#), [J. Refonaa](#), [S. L. Jany Shabu](#) & [A. Viji Amutha Mary](#)

Conference paper | [First Online: 17 May 2022](#)

190 Accesses | 1 Citations

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 430)

Abstract

Haptic Internet can distinguish inventiveness through versatile edge figuring and information move to 5G organizations, hence incorporating more innovations. All the more as of late, numerous strategies dependent on convolutional neural networks (CNNs) intended for front line innovation have been utilized to find a fire some place with the right exactness and season of activity. Nonetheless, these strategies cannot identify a fire in an unsure zone of Internet of things (IoT) with smoke, mist, and day off. Furthermore, in confined hardware, it is a test to get great precision while shortening the working time and lessening the model size. Hence, in this article, we propose a CNN-based compelling fire identification framework for recordings taken in dubious checking circumstances. Our technique utilizes a profound non-hefty neural organization without completely packed layers, which makes its computation costs low. Tests were performed on a bunch of fire information, and the outcomes showed that our strategy worked better contrasted with the most recent innovation. We trust it is the opportune individual to distinguish fire discovery in established and inserted vision applications during reconnaissance in an unsure IoT environment.

Keywords

Neural networks

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Prediction of Network Attacks Using Supervised Machine Learning Algorithm

Publisher: IEEE

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Allen V Jose ; Mercy Paul Selvan ; Vijji Amutha Mary ; Joshila Grace ; S. Jancy ; Suji Helen ; Asha P All Authors

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Abstract:

Intrusion Detection System (IDS) needs a data and for this it is important to keep the real working environment to find out all the possibilities of how an attack is about to happen and this seem to be expensive. A Software to detect network attacks in a computer network from unidentified users, including known personnel. The attack detector's learning task works up a predictive model which is a classifier in this case which differentiates the "bad" (i.e., intrusions or attacks) and "good" or "normal" connections. The primary aim is to use machine learning based techniques to provide packet connection transfer in a better way by predicting results with the at most accuracy. Comparing and discussing the outputs from the couple of machine learning algorithms used for the given dataset with evaluated classification report, find the confusion matrix and categorize the data from priority and the result which shows that the efficiency of the claimed machine learning algorithm method is to be compared with the best accuracy techniques such as Precision, Recall and F1 Score.

Published in: 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT)

Date of Conference: 10-11 March 2022

INSPEC Accession Number: 21745105

Date Added to IEEE Xplore: 12 May 2022

DOI: 10.1109/IC3IoT53935.2022.9767948

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RESEARCH ARTICLE | MAY 02 2022

Detection of Covid-19 from chest X-ray scans using machine learning

Cina Mathew, P. Asha

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AIP Conf. Proc. 2463, 020040 (2022)

<https://doi.org/10.1063/1.5080967>

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Machine Learning (ML) can be used to track the disease and predict the growth of the epidemic. Several detection models for COVID-19 are developed. Due to the uncertainty and lack of essential data, many existing models have shown low accuracy in detection. In several technology domains, ML models have been used to define and prioritize adverse threat variables. This study proposes an improved model to analyses and detect the amount of COVID-19-affected patients. In this study, we propose a classification model that detect the infected condition through the chest X-ray images. A dataset containing chest x-ray images of normal people, people with pneumonia such as SARS and pneumococcus and other patients with COVID-19 were collected. Histogram of oriented gradients (HOG) is used for image features extraction. The images are then classified using Support Vector Machines (SVM), random forests and K-nearest neighbors (KNN). These results may contribute well in detecting COVID-19 disease.

Topics

[Machine learning](#), [Coronaviruses](#)

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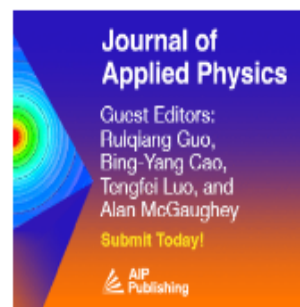
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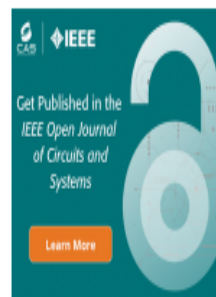
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Abstract	Abstract: Locker control system with movement recognition and extra security can be utilized in face recognition. Signals are only the development of parts of the human body. Face recognition or face recognition is utilized for different applications like biometrics, photography, showcasing, passionate warm-up and then some. Movement recognition can likewise be utilized for an assortment of utilizations, for example, mechanized gesture-based communication recognition, human association, and then some. Our proposed system presents the utilization of movement and face recognition to open the storage when the recorded face is recognized alongside the necessary movement recognition. On the off chance that an unapproved endeavor is made to open the storage, the storage proprietor will get an alarm through the mobile application. In this way, the consequence of our venture is the advancement of a solid storage control system just utilizing face recognition alongside movement discovery utilizing man-made brainpower methods and without the utilization of any sensors.	
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I. Introduction		
II. Review on Existing Work		
III. Proposed Methodology		
IV. Results and Discussion		
V. Conclusion		
Authors	Published in: 2022 6th International Conference on Trends in Electronics and Informatics (ICOEI)	
Figures	Date of Conference: 28-30 April 2022	INSPEC Accession Number: 21776844
References	Date Added to IEEE Xplore: 24 May 2022	DOI: 10.1109/ICOEI53566.2022.9776796
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11.3.2.1. Lithology

11.3.3. Land use and land cover

11.3.4. Digital elevation map

11.3.5. Slope

11.3.6. Slope gradient

11.3.7. Lineaments



Advances of Artificial Intelligence in a Green Energy Environment

2022, Pages 203-221



Chapter 11 - Artificial intelligence-based intelligent geospatial analysis in disaster management

R. Subhashini¹, J. Joshua Thomas², A. Sivasangari¹, P. Mohana³, S. Vigneshwari¹, P. Asha¹

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Abstract

In natural disasters, landslides are one among the major disaster in the world. Hilly terrains with high slope and high number lineaments are more prone to the landslides.

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Enhancing Agricultural System and Agro Food Transportation Management Using IoT

T. Anandhi[✉], P. Malathi, D. Deepa, M. S. Roobini & G. Nagarajan

Conference paper | First Online: 30 August 2022

189 Accesses

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 467)

Abstract

In Internet of Things is an global data composed of web-related objects or things that are embedded with apps, electronic devices are now an important part of the internet of the future. Field based work has established a device to track both the agricultural field and the agriculture field efficiently. Using idea of IoT, transportation and produce alerts/alarms or make intelligent decisions. Live camera output Streaming, via raspberry pi camera, for live Checking the agricultural field through the internet itself. The Agricultural Business The fields are under the live stream for the heat of the climate, humidity and moisture. The fields are tested for environment, humidity sensor device and soil moisture and temperatures.

Automated irrigation will be carried out on the basis of the temp sensor device, humidity device and soil moisture sensor set points. In IoT, the data obtained from the field is tracked, the data is then analyzed, and appropriate information is transferred for countermeasures by the field owners. The maintenance of Agro Food Transport is carried out by tracking the temperature of the product being shipped and updating the status on the site page and ensuring the supplier's on-time distribution of the product.

Keywords

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Sneha Gupta ; Suchismita Chakraborti ; R Yogitha ; G. Mathivanan All Authors

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Abstract:

Vision loss is a serious factor that can affect one's course of life and quality of life, making them barred from independence, easy mobility, unnecessary tripping over objects, etc. As per World Health Organization's most recent studies, there are around 2.2 billion people on the planet who are visually impaired, and a major proportion of the population is over the age of 50 years. The primary cornerstone of this paper is about how a simple Object Detection model, done with the help of some python libraries and APIs, shall prove to be helpful for visually impaired people, and help with those subtle challenges. In this proposed methodology, to overcome the aforementioned drawbacks, a Machine Learning model whose key purpose is to detect the location of the object surrounding the person and provide voice feedback using Google Text-to-Speech API has been implemented. To train the model around various aspects of the object, the MS -COCO dataset is being used.

Published in: 2022 International Conference on Applied Artificial Intelligence and Computing (ICAAIC)

Date of Conference: 09-11 May 2022

INSPEC Accession Number: 21798097

Date Added to IEEE Xplore: 16 June 2022

DOI: 10.1109/ICAAIC53929.2022.9792755

► ISBN Information:

Publisher: IEEE

Conference Location: Salem, India

SECTION I.

Object Detection



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Adaptive Transmission of Sensitive Information in Online Social Networks

Publisher: IEEE

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FUTURE WORK](#)[Authors](#)[Figures](#)[References](#)[Keywords](#)[Metrics](#)

Abstract:

Nowadays, there is an increase in sensitive data like rumors and private content in popular social media platforms like Twitter. So, it has become a severe issue. To limit the increase of sensitive information there is one approach like restricting the transmission among social network users. Transmission limiting methods, on the other hand, curb the transmission of insensitive data as well which results in poor experiences. To address the challenge of this kind by examining how we can reduce sensitive data dissemination at the same time as maintaining the insensitive data transmission in this research, and create this as a restricted reduction problem to maintain insensitive data transmission as the restraint. Now it is time to investigate this type of problem in the company of all user's transmission capabilities in a fully known network which is known in advance and with partial users' transmission abilities in a semi known network which is unknown in advance. Now we can cooperatively develop a way out using a bandit framework in a fully known network and semi known network by representing sensitive transmission size as a reward of bandit. Furthermore, In the construction of algorithms it is impossible to define the data dissemination size because of the semi-known network's uncertain diffusion capabilities. To address the problem, It will be good if we use the bandit framework that helps us to study unfamiliar transmission capabilities through a process of transmission and adjustably perform different measures to restrict the transmission on the basis of transmission capabilities. Extensive tests on natural and artificial datasets show the methods that we use have efficiently constrained sensitive data transmission while achieving forty percent reduction in non-sensitive information transmission loss when compared to four baseline techniques.

Published in: 2022 IEEE 7th International conference for Convergence in Technology (I2CT)

Date of Conference: 07-09 April 2022

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Hand Gesture Interpretation Model for Indian Sign Language using Neural Networks

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Rishitha S. P.; Jebakani C.; R. Aishwarya; Yogitha. R.; G. Mathivanan All Authors

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Abstract

Abstract:

Exchange of words among the community is one of the essential mediums of survival. Besides that, as claimed by the World Health Organization in 2021 over 5% of the world population suffers from speech impairments, they are lacking the basic prerequisite that is needed for the survival of the human race. These people communicate using "Sign Language" among their communities which has its meaning, grammar, and lexicons, and it may not be comprehensible for every other individual. Our proposed methodology focuses on creating a vision-based prototype that interprets the Indian sign language into understandable speech or text on an embedded device and this is done using deep learning technique which is an advanced extension of machine learning technology. our model makes use of an integrated webcam for capturing the real-time hand gestures and a Raspberry Pi to process the collected samples. The model uses a dataset that has 1200 images for every gesture for better results. Training data and test data have been partitioned into 9:1 ratio. This work involves CNN, IoT, and Python Language.

Published in: 2022 IEEE 7th International conference for Convergence in Technology (I2CT)

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2020 IEEE International Conference on Robotics and Automation (ICRA)
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Application of Machine Learning in Healthcare: An Analysis

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Abstract

Document Sections

I. INTRODUCTION

II. RELATED STUDIES

III. Analysis of application of ML in tumor and cancer prediction

IV. Analysis of application of ML in early detection of alzheimer's disease

V. Analysis of application of ML in early detection of diabetes

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Abstract:

Health care field is facing a lot of challenges due to the huge volume of people need medical support. The pandemic situation has created a lot of challenges to the healthcare field. This paper analyses how advancement in machine learning can be best utilized in improving health care services. Machine learning techniques are based on the idea of how systems can learn from the already existing data and can work with minimal human supervision. Thus machine learning has huge scope in healthcare. Machine learning algorithms can be effectively utilized for disease prediction, disease detection, providing personalized healthcare etc. These models can effectively predict the presence of diseases and also helps in detecting the diseases at earlier stage itself. Both supervised and unsupervised algorithms will be helpful in this field. Personalized healthcare applications aim to provide patient oriented healthcare services. Machine learning in combination with internet of things technologies made the personalized health care possible. The data collected from wearable devices and sensors can be effectively processed using machine learning algorithms and effective predictions can leads to quality of life improvements. In this chapter authors studies some of the existing applications of machine learning in healthcare field. Authors also propose a model that will add value to the existing applications.

Published in: 2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC)

Date of Conference: 17-19 August 2022

INSPEC Accession Number: 22088335

Date Added to IEEE Xplore: 19 September 2022

DOI: 10.1109/ICESC54411.2022.9885296

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Aketi Ajay ; S. Revathy ; Bheemireddy Nagavijayasivasuryaprakashreddy ; Mary Posonia ; B. Ankayarkanni [All Authors](#)

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IV. Result and Discussions:

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Abstract:

Roads are viewed as the fundamental method of transportation. Nonetheless, because of the substantial gridlock, these roads require framework upkeep. Frequently this support isn't done on the grounds that it is difficult to control anyplace or on account of obliviousness. This prompts a pothole, which leads to and fro and causes a great deal of mishaps. This paper examined how to recognize potholes with the assistance of a camera mounted on a light strip. The picture handling strategy utilized, was informed to BMC authorities without really wasting any time utilizing an electronic framework to diminish difficult work. To test its presentation, the gave framework was carried out in Windows utilizing a CV library. To recognize potholes, straightforward picture handling innovation is utilized, for example, form discovery and Hough changes.

Published in: 2022 6th International Conference on Intelligent Computing and Control Systems (ICICCS)

Date of Conference: 25-27 May 2022

INSPEC Accession Number: 22481451

Date Added to IEEE Xplore: 08 June 2022

DOI: 10.1109/ICICCS53718.2022.9788349

▼ ISBN Information:

Electronic ISBN: 978-1-6654-1035-9

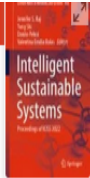
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S. L. Jany Shabu , S. Bharath Vinay Reddy, R. Satya Ranga Vara Prasad, J. Refonaa & S. Dhamodaran

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304 Accesses | **1** Citations

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 458)

Abstract

The 2019 COVID-19 is otherwise called COVID-19. Intense Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is brought about by a beta-type COVID-19. The seriousness of the illness can be related to an enormous number of passing and diseases all over the planet. Assuming analyzed early, the illness can be successfully controlled. It is feasible to perform lab tests for examination, yet they are dictated by the accessible test hardware. Computed tomography (CT) can analyze the illness. Specifically, in the infection location organization, the pipeline is

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An Efficient Model for Predicting Admission at Emergency Department using Data Mining

Publisher: IEEE

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Abstract

Abstract:

The Emergency Departments (ED), which save many people's lives, have a negative impact as well. If the ED is overcrowded, there is a risk that some individuals' condition might become fatal due to delayed care, even before they are hospitalized. As a result, there is a need to examine the use of innovative ways to increase patient flow and prevent overcrowding. Machine Learning [ML] has the potential to assist in this process by learning the relevant data, evaluating, and predicting the future outcomes. This research study intends to reduce the overload in the ED by using the Machine Learning [ML] algorithms to predict the outcome of a patient's confirmation and making the resources available beforehand.

Document Sections

[I. Introduction](#)[II. Related Work](#)[III. Proposed Methods](#)[IV. Result Analysis](#)[V. Conclusion](#)

Published in: 2022 International Conference on Inventive Computation Technologies (ICICT)

Date of Conference: 20-22 July 2022

INSPEC Accession Number: 21972079

Date Added to IEEE Xplore: 16 August 2022

DOI: 10.1109/ICICT54344.2022.9850780

Authors

► ISBN Information:

Publisher: IEEE

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SECTION I.

T. Judgi ; N. Srinivasan ; T. Prem Jacob ; A. Pravin ; C. M. Suja

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A Hybrid Machine Learning Based Feature Selection Technique for Attack Detection in NIDS

J Karthika¹, Sathyapriya Loganathan¹ and M. Vanathi¹

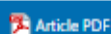
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Online

Citation J Karthika et al 2022 J. Phys.: Conf. Ser. 2335 012033

DOI 10.1088/1742-6596/2335/1/012033



References

Article and author information

Abstract

Network security has arisen as a critical investigation area in the last period as the internet and communication technologies have grown in popularity. The network is protected by firewalls, antivirus software, and intrusion detection systems (IDS) and its related assets in a cyberspace against unauthorised access. These include a network-based intrusion detection system (NIDS) that constantly screens network traffic for hostile and suspicious behaviour in order to ensure the confidentiality, integrity, and availability of the data being transmitted over the Internet. However, researchers have made huge efforts to improve detection accuracy while decreasing False Alarm Rates (FAR) and to detect novel incursions, but they still confront difficulties. There has been an increase in the use of IDS systems based on machine learning and deep learning (ML and DL) in recent years. The study's main goal is to detect attacks using a hybrid ML technique, and essential traits are identified via the Crow Search Algorithm (CSA). In order to improve classification accuracy, the decision tree is mapped to the Extreme Learning Machine (ELM). The decision tree selects features that are good at classifying. Additional weights for the selected features are calculated to improve their categorization accuracy. On the KDDCup dataset, the experiment is carried out in terms of a variety of parameter metrics.

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Design and Development of Side Channel Attack Prevention in Quantum Cryptography

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Gopinath N ; Prayla Shyry S All Authors

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Abstract

Abstract:

Cryptography plays a crucial and significant part in key transmission between two users. To send the keys in a secure manner, quantum implementations are used. A recent method of distributing keys across users is known as quantum key distribution. There is a substantial disconnect between quantum key distribution (QKD) theory and practice in this regard. Gadgets no longer meet the security evidence's assumptions. This hole is accessed as an input here. A simple and direct measurement methodology that is independent of the QKD device and is primarily based on any potential flaws and/or failures. A quantum language exchange facet channel that is part of the QKD device. Our simplest technique is experimentally give up to one unpaired parameter for each transmitted pulse. This explains the high dissatisfaction with the source. Also, unlike DI (Device Independent) QKD, Stats leaked from user labs critical to ensuring QKD's security avatar. In that sense, its security is more than what DI QKD offers, but it provides a secret.

Document Sections

I. Introduction

II. Protocol Description

III. Side Channel

IV. Safety Evidence

V. Experiment Result

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Published in: 2022 1st International Conference on Computational Science and Technology (ICCST)

Date of Conference: 09-10 November 2022

INSPEC Accession Number: 22627530

Date Added to IEEE Xplore: 14 February 2023

DOI: 10.1109/ICCST55948.2022.10040440

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Abstract

Recently, car parking space is one of the hard tasks in modern-day traits. Area operation and supervision of vehicles' area is now a required area of study. Searchings' for an unfilled parking' vacancy in overfilled visitors is a time-taking manner. The prevailing to be had parking area popularity techniques are not robust or worldwide for photos took from one-of-a-kind photographic digicam lookouts. Final results of a right parking space in a hectic town is simply a stimulating trouble and public are facing this elaborate on an everyday base. The most reason of this observe is to extensively speak the previous research of vehicle parking area recognition and equivalence them from modified factors. To conquer these problems, we suggest an aircraft-primarily based method which adopts an operational three-D parking lot characteristic such as abundant planar aspects. The aircraft-based totally three-D segment model performs a key element in conduct inter-item occlusion and point of view alteration. However, to relieve the interference of unpredictable illumination deviations and sun shades, we endorse an aircraft-based class system. Furthermore, by using supplying a Bayesian categorized framework to participate the three-D prototypical with the aircraft-based organization technique, we methodically infer the space popularity. Final, to triumph over the insufficient lighting fixtures within the night-time, we additionally gift a preprocessing step to improve picture excellence. The investigational consequences expression that the deliberate framework can comprehend strong locating of car parking places in each sunlight hours and night-time.

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Hybrid Deep Learning Neural System for Brain Tumor Detection

Publisher: IEEE

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K. Sudharsan ; A.M. Sermakani ; V. Parthipan ; D. Dhinakaran ; G. Eswari Petchiammal ; N.S. Usha All Authors

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Abstract

Document Sections

- I. Introduction
- II. Related Works
- III. Proposed Works
- IV. Results and Discussions
- V. Conclusions and Future Enhancement

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Abstract:

Image classification is among the most important responsibilities in medical visual assessment and is typically the first and foremost basic progression in numerous medical purposes. MRI Image division is used in brain research regularly for analyzing and visualizing anatomical structures, collapsing brain alterations, showing compulsive places, and for careful organization and image-directed therapy. We emphasize disparities between them and discuss about its strengths, reference points, and constraints. To tackle the complexities and difficulty of the brain MRI partition problem, we primarily introduce the core notions of image separation. At that time, we detail varied MRI pre - processing techniques covering image enlisting, predisposed field restoration, and removal of non brain tissue. This system examines items using a controlled division technique based on Convolution Neural Networks (CNN). Because there are fewer strains in the machine, using minor parts allows for more in-depth architecture and a good outcome against additional matching. In addition, we investigated the use of strength in normalization as a preprocessing phase in Hybrid CNN-based partition techniques, which is beneficial for brainstem tumor partitions in MRI image scans when combined with knowledge enlargement.

Published in: 2022 2nd International Conference on Intelligent Technologies (CONIT)

Date of Conference: 24-26 June 2022

INSPEC Accession Number: 21992254

Date Added to IEEE Xplore: 18 August 2022

DOI: 10.1109/CONIT55038.2022.9847708

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III. METHODOLOGY

IV. EXISTING SYSTEMS

V. PROPOSED SYSTEMS

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Metrics

Abstract:

Every educational institution recognises the importance of campus placements in assisting the student in achieving their objectives. According to the criteria of the company, the analysis of the placements needs to be created to estimate the likelihood that students will be put in a particular organisation. The placement analysis uses a different number of parameters that can be used to evaluate the student's skill level. While some criteria are based on university standards, others come from assessments made using the placement management system itself. By combining these data points, the analysis must correctly forecast whether the student will be hired by a company. Finding a classification method that would work for our data collection and be as accurate as possible was the challenge. The type of problem an algorithm must solve and the data collection it must use will determine the accuracy of the algorithm. In order to analyse the accuracy levels of each algorithm regarding our problem and data set, this study ultimately chooses SVM, Random Forest, Decision Tree as Existing algorithms and Logistic Regression, KNN, Gradient Boosting Classifier as Proposed Algorithms. This study may use the results of this test to decide which method to apply when integrating our analysis into the placement analysis system.

Published in: 2023 8th International Conference on Communication and Electronics Systems (ICCES)

Date of Conference: 01-03 June 2023

INSPEC Accession Number: 23516089

Date Added to IEEE Xplore: 01 August 2023

DOI: 10.1109/ICCES57224.2023.10192633

▼ ISBN Information:

Publisher: IEEE

Electronic ISBN: 979-8-3503-9663-8

Conference Location: Coimbatore, India

DVD ISBN: 979-8-3503-9662-1



Malware Detection in Android Systems Using Deep Learning Techniques

V. R. Niveditha, Santhiya Parivallal, Maria Jones, Amandeep Singh K., P. Rajasekar

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Abstract

Due to the smoothness and various other characteristics, the Android OS is familiar among all kinds of mobile users. Traditionally signature-based techniques are applied to identify malware. But this technique is not able to identify the latest malware. Classification algorithms can support huge datasets needed to protect Android-based platforms. At the same time, a huge dataset needs scalability for detecting and classifying automatically at the malicious identification stage and feature retrieval. In this chapter, enhanced CNN (ECNN) classifier is used for identifying malware in smart devices. The outcome of this suggested classifier is compared with the existing models like XGBoost, random forest, and CNN. The performance of the proposed work is assessed based on their accuracy, precision, and recall values. From the results it is proved that proposed enhanced CNN (ECNN) produces accuracy of 95.8%, precision of 0.96, and recall of 0.92, which is high compared to other algorithms. The tool used for execution is python.

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Data Security Analysis of PHY Layer Using Artificial Intelligence and Machine Learning

Publisher: IEEE

[Cite This](#)[PDF](#)Panduraju Pagidimalla ; T. Venketababu ; J. K. Kanimozhi ; S. Renuka ; Nandula Anuradha ; S. Surenderkumar [All Authors](#)

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Document Sections

I. Introduction

II. Threat Analysis In The Phy Layer

III. Results And Discussion

IV. Evaluation Of Security Technologies And Future Concerns

V. Conclusion

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Metrics

Abstract:

Artificial Intelligence (AI) and Machine Learning (ML) plays a critical role in determining the future of wireless networks. The advancements in technology will unleash a significant Internet of Things (IoT) where numerous interconnected processes, people and devices will be served in a simultaneous manner. Open and broadcast wireless channels make wireless networks particularly susceptible to espionage, jamming, and disturbance attacks. Physical Layer (PHY layer) security becomes a major concern since typical secure methods do not operate well in wireless PHY networks. As a starting point, we examine the PHY layer of wireless connections for threats and hazards. When it comes to PHY layer security systems, there are three basic categories: Spatial Domain-Based (SDB), Temporal (TTB), and Frequency (FF). We will weigh the benefits and drawbacks of the most recent safe technology in each area along the way. The methodologies and methods employed in these areas, as well as the open research questions and prospects in this field, are also discussed.

Published in: 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS)

Date of Conference: 17-18 March 2023

INSPEC Accession Number: 23115547

Date Added to IEEE Xplore: 05 May 2023

DOI: 10.1109/ICACCS57279.2023.10112749

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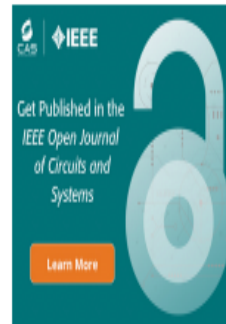
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I. Introduction

II. Literature Survey

III. Existing Methods

IV. Dataset Details

V. Proposed Method

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Abstract:

The capacity to identify emotions from speech has drawn increasing attention throughout time. Speech emotion recognition is an emerging topic in the domain of human computer interaction It can be used for a wide range of things, such as communicating with robots, banking, contact centres, car dashboards, video games, and more. The process of accurately determining a human's emotion from their speech is called speech emotion recognition. It enhances computer and human communication. Despite the challenge of annotating audio and the subjective nature of emotions, SER makes it possible to forecast a person's emotional state. The benchmark RAVDESS dataset is used in this study's analysis of speech emotion. We attempted to locate underlying emotions in speech by examining the acoustic properties of recorded audio data.

Published in: 2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS)

Date of Conference: 17-19 May 2023

INSPEC Accession Number: 23244004

Date Added to IEEE Xplore: 08 June 2023

DOI: 10.1109/ICICCS56087.2023.10142443

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2017 International Conference on Computing Methodologies and Communication (ICCMC)
Published: 2017

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Human Emotion Recognition by Audio Signals using MLP Classifier

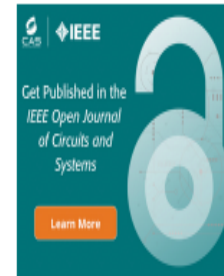
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Abstract	Abstract: The capacity to identify emotions from speech has drawn increasing attention throughout time. Speech emotion recognition is an emerging topic in the domain of human computer interaction It can be used for a wide range of things, such as communicating with robots, banking, contact centres, car dashboards, video games, and more. The process of accurately determining a human's emotion from their speech is called speech emotion recognition. It enhances computer and human communication. Despite the challenge of annotating audio and the subjective nature of emotions, SER makes it possible to forecast a person's emotional state. The benchmark RAVDESS dataset is used in this study's analysis of speech emotion. We attempted to locate underlying emotions in speech by examining the acoustic properties of recorded audio data.	
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Enhancing the Security for Healthcare Data using Blockchain Technology

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Abstract

Document Sections

I. Introduction

II. Related Work

III. Proposed System

IV. Results and Discussion

V. Conclusion

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Abstract:

Cyber security is the safest way to protect the data from hackers and unauthorized users. Healthcare technologies nowadays face lots of cyber security issues related with the security of the health information and privacy of the data. Cyber security is one of the popularized ways to protect the data from hackers and spammers. HealthCare is the field where the data is highly sensitive and the security for the systems is low. Protecting the sensitive data is achieved by the blockchain method, which is similar to a database but the difference is the data stored in the blockchain in blocks. The new blocks included are connected to previous blocks from a chain like structure, it is very secure, each block stores data and also the hash of previous blocks. So, data cannot be easily accessed or manipulated. The mechanism used in blockchain for the security of the data consensus mechanism which contains the different methodologies includes Proof of Work (PoW), Proof of Stake (PoS), Proof of Space and Proof of Authority. Enhanced proof of stake is a combination of the PoS and DPoS used to increase the security of the system by eliminating the 51% attack in blockchain and reduces the data theft threats and protects the medical records of patients from hackers.

Published in: 2023 International Conference on Computer Communication and Informatics (ICCCI)

Date of Conference: 23-25 January 2023

INSPEC Accession Number: 23200508

Date Added to IEEE Xplore: 24 May 2023

DOI: 10.1109/ICCCI56745.2023.10128545

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Author's Profile



Dr. Sanaj M S, is working as an Associate Professor in the Department of Computer Science and Engineering at Adithyashankar Institute of Engineering and Technology, Kallady, Erode, Tamil Nadu, India. He completed Ph.D in Computer Science and Engineering from Sathyabama University Chennai, Tamil Nadu, India. With a teaching experience of over 16 years, he has international and national paper publications to his credit. He has edited conference proceedings ISBN books. He is an active academician and has organized national and international conference and seminar. His main area of interest includes Cloud Computing, Artificial Intelligence and Internet of Things.



Dr. S. Bangaru Kamatchi is a Assistant Professor, Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology (Deemed to be University) Chennai, Tamil Nadu, India. She did her Ph.D. at VIT Chennai and completed her M.E. in Computer Science and Engineering at Adithyashankar Engineering college Kallady. Her area of research includes Machine Learning, Deep Learning and Data Analytics. She has published research papers in various reputed international journals and conferences.



Dr. Shikha Verma, M.Tech & Ph.D. has more than 15 Years of Teaching, Research, and Programming experience. She worked with many reputed institutes i.e. Krishna Engineering College, Ghaziabad, IIMT Group of Colleges, Greater Noida, K. N. Modi College, Ghaziabad & Bhopal Engineering College, Bhopal/Varanasi. She is currently associated with ABES Engineering College, Ghaziabad as an Associate Professor. Her major areas of teaching & research are Artificial Intelligence, Computer Networking, DBMS, and Oracle. She is IQAC and NBA coordinator at ABES Engineering College's department level. She provides CSDCO training to MCA students. During her journey, she has performed many roles other than teaching like Industrial staff coordinator, Proctor, Event organizer, Students Training program facilitator, and many more. She got ten appreciation letters for best faculty feedback from students in Krishna Engineering College, Ghaziabad, and achieved the III prize at Doctoral Conference held at Hindustan College, Madurai. She has attended many Webinars and conferences in different areas such as Big Data & Hadoop, Computer Networking, Software Testing, Design of algorithms, DBMS from IITs and NITs, and other private and government agencies. She also got certifications from NPTEL in DBMS and Computer network and Internet Protocol. She has published more than 20 Research papers in International and National Journals and conferences. She has four patents published in India Patent Journal. She also got an Educator training certificate from Cerebra Educator Training Program.



Prof. Dr. Devendra Kumar, M.Tech. & Ph.D. has more than 20 years of teaching, research, programming, and administration experience. He worked with educational institutions like ABES Engineering College Ghaziabad, Gulabdas College of Engineering and Technology, Greater Noida, and IIMT Institute of Management & Technology Greater Noida, and many more. Currently working as a Professor and Head Department of Computer Applications at ABES Engineering College, Ghaziabad. His primary areas of research are Data Mining, Security, IoT, AI, etc. He has published more than 75 publications in International Journals, Proceedings of International Conferences, and National conferences of repute. He has published 16 Indian patents and 1 patent Granted. He has organized several international conferences under the banner of IEEE and CSI. He is a Member of IEEE, CSI, IASNO, IACS, IEDC, IET, etc. He has received Shiksha Samman for respectable work in the field of education by Rashtriya Shiksha Mahasamithi, Research Work Oriented Faculty Award in Appreciation of his taking initiatives in R&D activities at ABES Engineering College, Ghaziabad, Top Mentor award by IBM, Long, Active & Continuous Service Award in appreciation of his long services rendered, active interest and development in the College affairs at ABES Engineering College, Ghaziabad, Significant Contributions Award to CCED Activities in Appreciation of his enthusiastic zeal to make a meaningful contribution for the development of the College at ABES Engineering College, Ghaziabad, Best Faculty Award at ABES Engineering College, Ghaziabad, Improved Teaching Performance Award in Appreciation of improved teaching performance at ABES Engineering College, Ghaziabad. He is IBM Certified Academic Associate DB2.9 Database and Application Fundamentals, IBM Certified Associate Developer Rational Application Developer (RAD) WebSphere Software V8.0, IBM Certified Specialist Rational Team Concert (RTC) V2, and Wipro Mission 10X certified Trainer in Teaching & Learning. He is a reviewer/technical committee member/ editorial board of many journals and conferences. He has organized and attended many FDPs, workshops, seminars, and Conferences. He is also involved in social and welfare activities.

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ISBN
978-93-5757-090-9

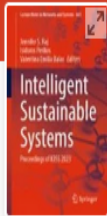
ADVANCED DRUG DELIVERY SYSTEMS: PRINCIPLES AND PRACTICE

HANDBOOK ON CLOUD COMPUTING



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↳ ICoISS 2023: **Intelligent Sustainable Systems** pp 421–428 | [Cite as](#)

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Review on Deep Learning Algorithms for Object Detection

R. Sasirekha , [J. Jeyshri](#), [A. TinaVictoria](#), [J. Subha](#) & [P. Kamaleswari](#)

Conference paper | [First Online: 16 June 2023](#)

151 Accesses

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 665)

Abstract

Recently, Computer vision has been one of the widespread forms of object detection. It is challenging to detect an object. When the dataset is trained by a luminous during bad weather like a rainy day, cloudy day, or foggy day and the pictures are taken in a dark place like a

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Multi-Scale and Context Aware Optimized Glucose Prediction using Neural Networks

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2 Literature Survey
3 System Architecture and Methodology
4 Evaluation Metrics
5 Results
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Abstract:

Diabetes is a chronic condition characterized by an increase in blood glucose levels in the human body as a result of either insufficient insulin production or body cells that do not respond to insulin. At most hospitals, numerous tests are performed to collect diabetes diagnostic information. The data are then used to advise treatment. Obtaining an accurate diabetes prediction is highly challenging due to the availability of limited amount of data and the occurrence of outliers. Deep learning has recently been utilized in healthcare and medical research to achieve good results in a variety of tasks such as predicting patient conditions and disease identification. This study has compared the ARIMA (Auto Regressive Integrated Moving Average) model and LSTM model to fore-cast Blood Glucose Level (BGL). The deep learning model consists of the LSTM NN model. The performance of the suggested LSTM NN is compared to the ARIMA model in terms of Root Mean Square Error (RMSE).

Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)

Date of Conference: 11-13 April 2023

INSPEC Accession Number: 23162059

Date Added to IEEE Xplore: 24 May 2023

DOI: 10.1109/ICOEI56765.2023.10125715

▼ ISBN Information:

Electronic ISBN:979-8-3503-9728-4

DVD ISBN:979-8-3503-9727-7

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MAGNUS PUBLICATIONS

Comparative Study on Mental Stress Detection Using Various Stressors and Classification Techniques

Publisher: IEEE

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Geethu S Kumar ; **B Ankayarkanni** All Authors

47

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Abstract

Document Sections

I. Introduction

II. Classification of Stress

III. Physiological Stress Analysis Methods

IV. Discussion and Analysis

Authors

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Metrics

Abstract:

Our body's natural safeguarding in an intensified psycho-physical situation is stress. Stress inducing factors are stressors, which may affect a person's physical or mental state due to an extended exposure to various stressors. So, an efficient stress monitoring mechanism is highly essential in this busy daily environment. Stress can be identified as biological signals which can be psychological or physiological signal. In this paper a detailed study of various sources for identifying stress and an efficient way for classifying or detecting this stress by various machine learning and deep learning techniques has performed. Here various stressors, methodologies, outcomes, benefits, limitations for various stress detection techniques are highlighted which can serve as a guide for further investigations.

Published in: 2022 International Conference on Advancements in Smart, Secure and Intelligent Computing (ASSIC)

Date of Conference: 19-20 November 2022

INSPEC Accession Number: 22889221

Date Added to IEEE Xplore: 04 April 2023

DOI: 10.1109/ASSIC55218.2022.10088365

▼ ISBN Information:

Electronic ISBN:978-1-6654-6109-2

Publisher: IEEE

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Conference Location: Bhubaneswar, India

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Approaches to Overcome Human Limitations by an Intelligent Autonomous System with a Level of Consciousness in Reasoning, Decision Making and Problem-Solving Capabilities

[A. Jemshia Mirriam](#) ✉, [S. Rajashree](#), [M. Nafees Muneera](#), [V. Saranya](#) & [E. Murali](#)

Conference paper | [First Online: 15 February 2023](#)

287 Accesses

Part of the [Communications in Computer and Information Science](#) book series (CCIS, volume 1749)

Abstract

With the nonstop advancement of software engineering and innovation, PCs are bit by bit applied to numerous fields, including the craftsmanship plan. In this chapter, to work on the effectiveness and far reaching level of craftsmanship plan, the workmanship plan colleague framework was concentrated on the reason of the entire request of craftsmanship plan. In this

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An Enhanced Intrusion Prevention System Using Neural Network Classifier

Publisher: IEEE

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S. Rajashree ; A. Jemshia Miriam ; Nafees Muneera ; V. Saranya ; E. Murali [All Authors](#)

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II. Functions of Firewall Technology

III. IPS Technology

IV. Related Works

V. Proposed Methodology

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[Metrics](#)

Abstract:

The development of Internet has brought a lot of conveniences to people and facilitated people's life greatly. However, with the gradual development of network, a variety of computer viruses such as Trojan virus are threatening our network security and our use of accounts. Any careless move will cause the loss of the account or even our properties, which sounded the alarm on network security. In previous network security defence practices, simple firewall was used as an important defence method against virus. However, in recent virus attacks, it is found that simple firewall can no longer meet the demands of defence against computer virus. Hence, the combination of firewall and IPS is surely an important method for future network security protection. Regarding the researches on firewall and IPS interaction technology, the research levels abroad are prior to that of domestic researches. Especially, Network ICE Company possesses a world-class research level in both intrusion detection system (IDS) and intrusion prevention system (IPS). Intrusion detection is the most common way of recognizing assaults on PC frameworks and making ready for interruptions, interruptions, and other PC related takes advantage of. Be that as it may, the development of Internet-based gadgets confounds the location interaction and requires computerized frameworks to recognize assaults. In light of this, this paper proposes a programmed interruption location strategy utilizing the Brainstorm-Crow Search-based Actor Critic Neural Network (BCS-ACNN) classifier. Information grouping bunches the information utilizing the proposed scanty fluffy C-implies (Probabilistic Sparse FCM) grouping calculation. The group is exposed to a two-level characterization performed utilizing the proposed streamlining calculation, and the second degree of order identifies information interruptions. The Brain Storm-Crow Search (BCS) calculation, which is a reconciliation of Brain Storm Optimization (BSO) and Crow Search...

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Date of Conference: 26-27 December 2022

INSPEC Accession Number: 22777251

Date Added to IEEE Xplore: 15 March 2023

DOI: 10.1109/ICERECT56837.2022.10080128

▼ ISBN Information:

Electronic ISBN: 978-1-8654-5635-7

Print on Demand(PoD) ISBN: 978-1-8654-5636-4

Publisher: IEEE

Conference Location: Mandya, India

SECTION I.

Evaluation of Biometric Classification and Authentication Using Machine Learning Techniques

Publisher: IEEE

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N. Umasankari, B. Muthukumar, All Authors

30
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Abstract
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I. Introduction
II. Related Work
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IV. Results and Discussions
V. Conclusion
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Abstract:
This research article proposed the performance measurement of biometric image with computational methodology. This research adopts the following procedures: pre-processing, Feature extraction and Classification. Designing and building the algorithm and simulation programs have been done in a MATLAB environment. My SQL has been utilized for the maintenance of overall dataset. By employing the classification technique comparative analysis was carried out by inspecting three data mining techniques which were: Random Tree, The multilayer Perceptron neural network (MPNN), and the C4.5 decision tree (DT) algorithms. As per the final conclusion, the Random Forest Classifier algorithm exhibits greater performance in contrast to the other techniques. It has been found that the 93.5 % accuracy exhibited by Random Forest Classifier is much greater and enhanced.

Published in: [2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering \(ICECONF\)](#)

Date of Conference: 05-07 January 2023 **INSPEC Accession Number:** 22888468

Date Added to IEEE Xplore: 03 April 2023 **DOI:** 10.1109/ICECONF57129.2023.10083610

▼ ISBN Information: **Publisher:** IEEE

Electronic ISBN:979-8-3503-3436-4 **Conference Location:** Chennai, India

Print ISBN:979-8-3503-3435-7

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Mr. S. Manikandan has been working as an Assistant Professor of Electrical and Electronics Engineering Department at Muthaiah Swamikal Engineering College, Chennai, Tamil Nadu. He has done ME and pursuing PhD as part of his academics. He is a power electronics drives specialist with an amazing 10 years of experience in the teaching field. His areas of interest are I-vehicles, Battery Management System and Machine learning and he has also published many research papers in journals of International and National repute. He is Joint Secretary of National Institution for Quality and Reliability.



Ms. N. Umasankari is a Research Scholar at Sathyabama Institute of Science and Technology (Deemed to be University), Chennai, Tamil Nadu. She received her B.E. degree in Information Technology from the erstwhile Periyar Maniammal College of Technology for Women, Chennai, M.Tech. degree in Information Technology from the erstwhile Sathyabama University, Chennai, Tamil Nadu, in 2011, and also M.B.A. degree in General, from Alagappa University, in 2008. She has 15 years of teaching experience. At various times in her career, she has taught, full-time in various reputed universities from 2003 to 2016 in Tamil Nadu and Produced 100% result. She has been a life time professional membership in CSI chapter. Under her Guidance one team was selected for CSI-In-App 7th National level competition. Prepared and Co-ordinated the DST project as a role of R&D In-charge in 2018 for reputed institution in Hyderabad. She acted as a technical committee member in reviewing and guiding for internal and external UG and PG projects under reputed universities in Tamil Nadu and guided UG projects in Hyderabad since 2017. She has presented 10 conference publications and 5 international journal publications. She has published 2 National Patents. She is currently working as an Assistant Professor at School of Computing, Department of CSE, Sathyabama Institute of Science and Technology, Chennai, India. Her research interests include Multimodal Biometrics, Image Processing, Network Security, Data Science, Cyber Security, and Secured data transmission on IoT Devices.



Mr. Gangidi Srikanth Reddy completed M.Tech from ANU, Guntur. Had 12 years of experience in Teaching, working as Associate Professor in Vignana Bharathi Institute of Technology, Chaitanya, Hyderabad. Published various papers in international journals and conferences. Area of interest in Network Security, Cyber Security, Data mining, Machine Learning, Artificial Intelligence and Data science.



Prof. Kalyani Alisetty completed MCA degree in the year 2006, from Omania University, Hyderabad, and M.Tech CSE from JNTU Hyderabad, Telangana. She is working as Assistant Professor at "Srihithad Institute Of Business Administration and Research", MCA Department, which is permanently affiliated to "Savitribai Phule Pune University" Maharashtra (India). She is having 10 plus years of regular fulltime teaching experience, has taught various subjects for post-graduation level MCA, MBA(IT). She has published a total of 10 plus research papers in reputed National/International Journals and conferences. She has filed a design patent on "Machine Learning Based Device to Detect Happiness of A Teacher" in the field of computer science. She is the life member of the "Indian Society for Technical Education (ISTE)", International Association of Academicians and Researchers (INAAR), CSI (Computer Society of India) & SACH. She is Certified from University of Cambridge, ESOL Entry level Certificate (Business English). She has contributed to few book chapters publication for subjects like CC, CRM, ISA, MIS, PPMOB. Her subjects of interest are Cloud Computing, Software Project Management, Information Security Management, Principles and Practices of Management and Organizational Behaviour (PPMOB), Salesforce, Software Automation Testing Using Selenium Tool.



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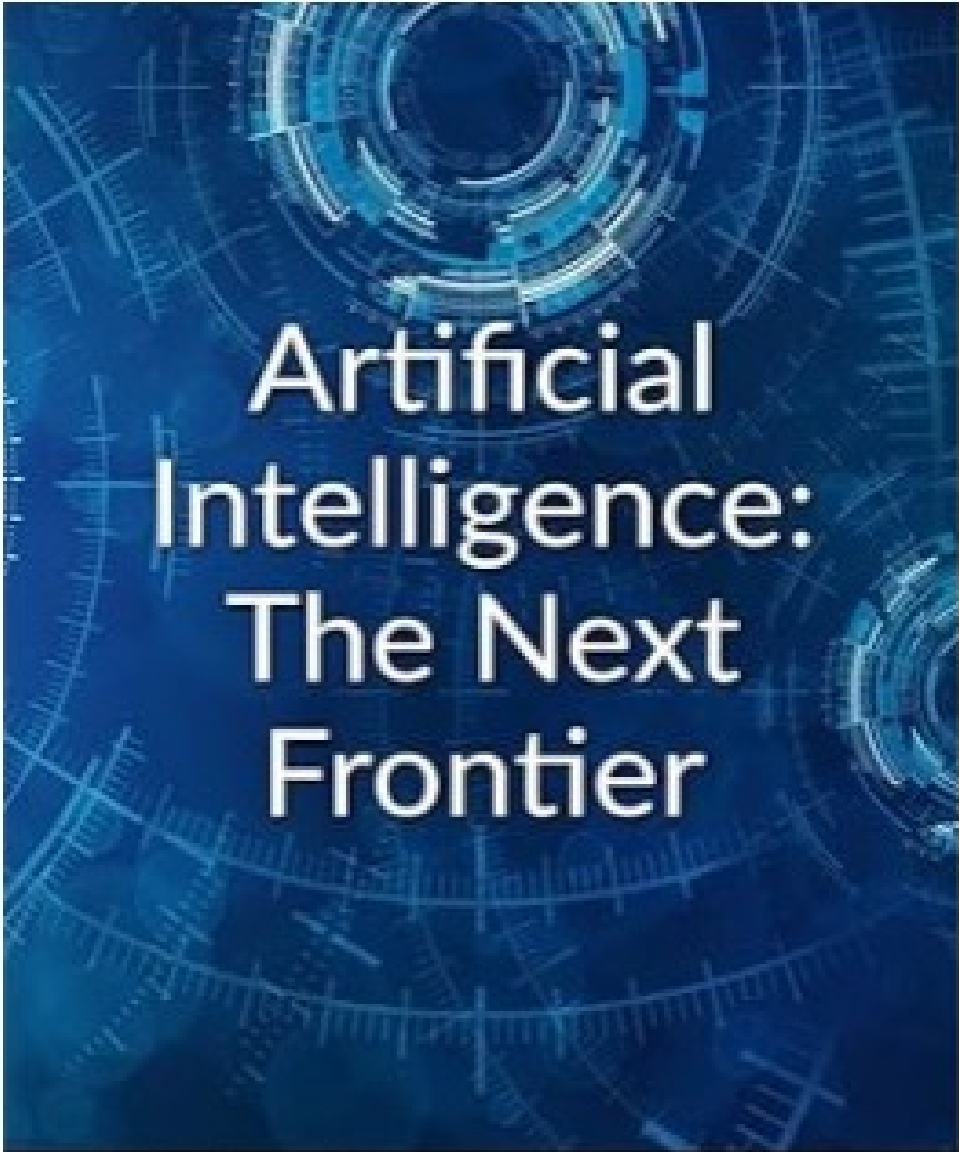
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Augmented Reality based Furniture Application

Publisher: IEEE

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Sai Bhavan Gubbala ; Dhruv Naidu Altı ; S. R. Srividhya ; S. Pothumani All Authors

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Abstract

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- V. Methodology

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Abstract:

In the modern digital transformation era, providing customers with confidence in the suitability of the furniture they choose for various situations in which it will be used is the major problem in online furniture sales. While buying furniture, purchasers must ensure the furniture's model, size, and color are appropriate for and complement the space in which they will be put. The flexibility and appropriateness of the furniture product when placed in a particular area may be seen by prospective buyers with suitable instruments. For furniture to be sold online correctly, these issues must be resolved. By using Augmented Reality, this is feasible, to do. When it comes to online product customization, certain application models in the furniture sector employ Augmented Reality and mobile technology. A 3D product visualization tool, product pricing, and an enhanced renderer are all included. For the purpose of creating AR-based furniture technology, Google AR is used in the development process. It provides a framework for people or teams to creatively and flexibly address challenging tasks and issues in order to generate and deliver the best performance. The study is finished using Android Studio and Google AR services. Based on the results of the studies, it is advised that this application be enhanced to have a greater degree of performance. This might be achieved by creating a variety of various creator patterns using barcodes or QR codes, classifying surfaces like ceilings and walls so that the program can accurately show 3D things on them, and improving 3D models to fit them in the projecting space.

Published in: 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAIC)

Date of Conference: 04-06 May 2023 INSPEC Accession Number: 23243523

Date Added to IEEE Xplore: 08 June 2023 DOI: 10.1109/ICAIC56823.2023.10140855

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Internet of Things based Smart Water Leakage Monitoring and Alert System

Publisher: IEEE

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Keerthana S; Elango S; **Judgi T**; Vivek K S; Ponmurugan P; Neelam Sanjeev Kumar [All Authors](#)

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Abstract
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IV. Hardware Implementation
V. Results and Discussions
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Abstract:
It is critical to manage water supply in a safe and efficient manner. Significant amounts of water are lost each year as a result of leaks in water distribution systems (WDN). As a result, locating leaks in a reliable manner is critical. Water leaks can be detected using monitoring software that analyses the flow of water. Apps that track the user's location can be extremely useful. If this technology is widely adopted, it will aid in the resolution of water management issues such as human error and waste of limited water resources. Water leaks can be located predictably using the Internet of Things (Internet of Things). Many countries struggle to get enough water, but the situation is not hopeless. It is critical to accurately locate water leaks in order to reduce system resistance.

Published in: 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS)

Date of Conference: 17-18 March 2023	INSPEC Accession Number: 23115468
Date Added to IEEE Xplore: 05 May 2023	DOI: 10.1109/ICACCS57279.2023.10113024
▼ ISBN Information:	Publisher: IEEE
Electronic ISBN:979-8-3503-9737-6	Conference Location: Coimbatore, India
DVD ISBN:979-8-3503-9735-2	
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Navigating the Cloudscape: A Comprehensive Guide to Cloud Computing

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Evaluation of Security of Cloud Deployment Models in Electronic Health Records

[Nomula Ashok](#)✉, [Kumbha Prasad Rao](#) & [T. Judgi](#)

Conference paper | [First Online: 02 July 2023](#)

55 Accesses

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 673)

Abstract

Most of the doctors have used EHR (Electronic Health Records) for patient record-keeping due to the convenience of data or record sharing at will. Additionally, it is more convenient for the patients, nurses, and other healthcare ecosystem stakeholders. The cloud is becoming the infrastructure for the majority of EHRs due to cheaper costs and application scalability, yet

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A Machine Learning Approach to Predict Skin Diseases and Treatment Recommendation System

Publisher: IEEE

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Suganiya Murugan ; S.R. Srividhya ; S. Pradeep Kumar ; B. Rubini All Authors

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Abstract
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I. Introduction
II. Literature Survey
III. Materials and Methodology
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V. Conclusion
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Abstract:

In medical science, dermatology is the department dedicated to identify, diagnose, and suggest a treatment for skin disease. Diseases that occur on human skin is mostly unpredictable and tough to analyze, in recent days, the occurrence of skin diseases increased unprecedently. Skin diseases are usually caused by bacteria or other related infections. Some skin diseases like ringworm, yeast infection, allergies etc. will constantly increase and spread over the skin. This type of disease should be identified in its earlier stage to avoid spreading. The identification can be done by considering some factors like clinical parameters, which are considered for identifying the disease. The possible skin diseases are dermatitis for the age group 0-5 years, warts affect 6-11 years old children, and acne vulgaris affect 12-16 years. Dermatomyositis is a type of skin disease that affects children aged 5-15 and adults aged 40-60. Due to unawareness, patients usually ignore the early symptoms. This necessitates the need for skin disease prediction. This research work predicts the type of disease by using the clinical parameter of a patient, which is achieved by using various machine learning classification algorithms. Maximum accuracy of 98.4% is achieved by the Naive Bayes algorithm. The Graphical User Interface (GUI) was developed for easy utilization of this prediction module for both doctors and dermatologists.

Published in: 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT)

Date of Conference: 23-25 January 2023	INSPEC Accession Number: 22777049
Date Added to IEEE Xplore: 14 March 2023	DOI: 10.1109/ICSSIT55814.2023.10061150
▼ ISRN Information	Publisher: IEEE

The objective of the book is to enable the learners to acquire knowledge of organizing the data in non-linear fashion. The idea of balancing the height of trees to optimize the structure and search time is detailed with suitable illustrations. The process of establishing the network between various nodes with minimum cost and finding the shortest path is elucidated and also the method of designing the table data structure and its applications is explained in a precise manner. Overall concepts of trees, Graphs, Minimum Spanning Tree, Tables are explained precisely with simple illustrations. All two mark questions with answers are provided for students reference and understanding in exam point of view too.



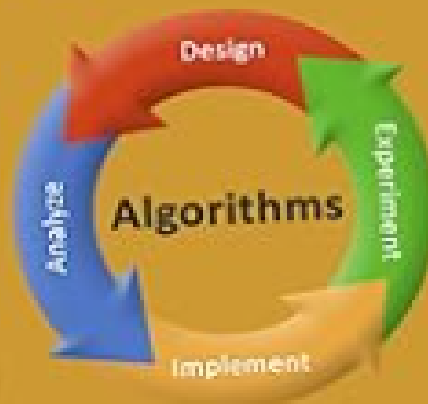
Dr. A. Deepa Nagarajan, Ph.D., M.Tech., M.Sc., B.E. is an Assistant Professor in the Department of Computer Science and Engineering, Anna University, Chennai. She has been teaching for over 15 years. She has published several research papers in international journals and conferences. She is also a reviewer for several international journals. She has a strong research interest in the area of Data Structures and Algorithms. She is currently working on the development of a new algorithm for finding the shortest path in a weighted graph.

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By
Prof. Sathyabama Institute of Science and Technology

Dr. A. Deepa Nagarajan
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DESIGN AND ANALYSIS OF ALGORITHMS



By Profs of
Sathyaabama Institute of Science and Technology
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Artificial Intelligence for Smart Healthcare pp 327–344 | [Cite as](#)

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Estimation of Thyroid by Means of Machine Learning and Feature Selection Methods

[S. Dhamodaran](#), [B. B. Shankar](#), [Bhuvaneswari Balachander](#), [D. Saravanan](#) & [Dinesh Sheshrao Kharate](#)

Chapter | [First Online: 10 June 2023](#)

472 Accesses

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Abstract

In India, hypothyroidism or hyperthyroidism is a major condition when the thyroid-stimulating hormone fails. As part of the conventional approach to diagnostics, there are various blood tests. Detecting thyroid illness in its earliest stages requires several time-consuming and difficult activities. The medical business has handled only a small percentage of this large volume. Data must be processed correctly for a valid diagnosis to be made. Intelligent

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Segmentation of Brain Tumors using traditional Multiscale bilateral Convolutional Neural Networks

Publisher: IEEE

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P. Asha ; Dr. B. Ankayarkanni ; L. K. Joshila Grace ; Km. Kaarthik ; M. Hemanth Reddy All Authors

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Abstract	Abstract:
Document Sections	Non-automated segmentation of brain tumors from the MRI images is a tedious task, which may sometimes produce inaccurate results. Therefore, the accuracy and reliability of brain tumor segmentation is also key to decision-making, treatment design, and analysis of treatment results. The automated brain tumor segmentation strategy uses manually developed parameters. As with convolutional neural networks, training requires excessive amount of annotated data that is generally challenging to retrieve in the medical field. The prior demand is the design of a task adapted along with robust feature selection and representation. This seems mandatory for effective and efficient segmentation of complicated brain tumors, which in turn is possible with two-channel Convolutional Neural Networks (CNN). Hence, two-channel CNN is adapted for the segmentation as it provided promising results for similar research. The two-channel CNN model contributes much in lessening jitter and over fitting parameters. Conclusively, a two-way cascade design to CNN is introduced, where the base CNN output is processed as an auxiliary source and combined at the final level. When testing the model in the BRATS2013 and BRATS2020 knowledge sets, the CNN integrated package in the 2-channel design was not hidden. Compared to the progressive method described above, the overall performance has been improved and the process quality remains attractive.
I. Introduction	
II. Review On Existing Work	
III. Proposed Methodology	
IV. Results and Discussion	
V. Conclusion	
Authors	
Figures	
References	Published in: 2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS)
Keywords	
Metrics	Date of Conference: 23-25 March 2023INSPEC Accession Number: 23001442

Study on Machine Learning and Back Propagation for Crop Recommendation System

Publisher: IEEE

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Polu Shrikhar Reddy ; Bollimuntha Amarnath ; M Sankari [All Authors](#)

1

Cites in
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Abstract

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V. Analysis of Various
Classification Algorithms

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Abstract:

India may be the largest exporter of farm products, but the country's farms are not very productive. Inadequate agricultural production means farmers bring home much less money. The producers need a performance improvement if there is a rise in their revenue. Farmers may boost output by cultivating land more effectively by first determining what will thrive there. The land's potential production can be enhanced by growing the correct crops. As a result, crop recommendation algorithms may be quite useful for agriculturalists. Crop yields are influenced by a wide variety of external influences. The production is affected by environmental conditions like as heat, moisture, soil pH, precipitation, and the availability of nutrients like potash, ammonium, & phosphate. There is a lot of confusion among farmers regarding which crops should be produced in particular regions to get the highest possible yield and financial return. As a result, the purpose of this study is to show how a ml algo may be used to forecast crops and associated prices. Soil is fundamental to the proper functioning of the terrestrial ecosystem, and its primary duty is the cultivation of crops for the purpose of providing food for the world's ever-increasing population. Yet global soil deterioration poses a serious challenge to food security. The stresses of urbanization and industry, among others, contribute to soil degradation. Habitat loss, altered green spaces, soil erosion, unchecked livestock, illegal dumping, and ineffective land management are all major contributors to soil deterioration. More than 1.5 billion people are in danger of losing their way of life due to the rapid pace of land degradation, which now stands at 24 percent (350M sq.km). In this situation, keeping up with the rising demand for food is a problem made more difficult by the need to maintain soil quality). As a result, maintaining agricultural output and adapting to the uncertainties brought by climate change needs constant ...

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Published in: 2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS)

Date of Conference: 23-25 March 2023

INSPEC Accession Number: 23001427

Date Added to IEEE Xplore: 25 April 2023

DOI: 10.1109/ICSCDS56580.2023.10104734

▼ ISBN Information:

Electronic ISBN: 978-1-8654-9199-0

DVD ISBN: 978-1-8654-5579-4

Print on Demand(PoD) ISBN: 978-1-8654-9200-3

Publisher: IEEE

Conference Location: Erode, India

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Issue	ITM Web Conf. Volume 56, 2023 First International Conference on Data Science and Advanced Computing (ICDSAC 2023)
Article Number	06001
Number of page(s)	8
Section	Networks & Information Security
DOI	https://doi.org/10.1051/itmconf/20235606001
Published online	09 August 2023

ITM Web of Conferences 56, 06001 (2023)

Dynamic Access Control Through Cryptography in Cloud

Sankari M, Kamatchi KS, Venketbabu T, Sangeetha G and Sheema D

Abstract

In recent days, enabling encrypted access control to hosted data is attractive to organizations and many users in untrusted cloud. However, an efficient encrypted progressive access control system designing in the cloud remains a challenge. This paper proposes DAC in cryptographic, for effective access control that provides practical encryption in the system. DAC in cryptography removes permission by designate to update the encrypted data in cloud. DAC in cryptography includes file encryption with a well- formed key list that document a file key and a set of lock keys. A dedicated administrator is required to replace a new revocation key by comparing the previous key. Revocation requires a dedicated administrator to upload a new revocation key to encrypt files with the new encryption level and update the encryption key list accordingly in cloud. DAC in cryptography proposes a three-key technique to limit the key list size and later on encryption. As a result, change in access control is enforced using DAC in cryptography. This improves efficiency by not requiring high decryption or re-encryption and to upload or re-upload of large quantity of data by the administrator and

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RESEARCH ARTICLE | JANUARY 30 2023

Classification system on diabetes prediction using deep learning approach 🛒

S. Thaiyalnayaki ✉; G. Kalaiaarasi; M. Nithya; R. Padmavathy



+ Author & Article Information

AIP Conf. Proc. 2523, 020017 (2023)

<https://doi.org/10.1063/5.0110266>



Diabetes is considered one of the deadliest and most persistent diseases that cause glucose levels to increase. Complications can arise if diabetes is left untreated and undiagnosed. Patient visits specialist to determine the results of the patient status are usually to found. No matter how you look at it, the growth of methods to cope with AI is critical. There is a goal in this study to develop a model that can accurately predict the risk of diabetes in a patient population. Decision Tree, SVM, and Naive Bayes are used in this study to detect diabetes. The UCI AI library's Pima Indians Diabetes Database (PIDD) performs experiments. The presentation of each of the three computations is based on various factors, such as precision, accuracy, f-measure, and recall. Precision is measured by comparing instances to categorize the results as normal or abnormal and verify using the Receiver Operating



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Dr. S.Dhamodaran, presently working as Assistant Professor Department of Computer Science and Engineering in Sathyabama Institute of Science and Technology, Chennai. Myself more than 12 years working in Sathyabama Institute of Science and Technology holding different positions. I completed my Ph.D at Sathyabama Institute of Science and Technology in the Research Area Spatial Data Analytics I published 33 Scopus Papers in International Journals, Conference and national Conferences and 6 Papers are on the web of science publication. Published one patent. Co-ordinate and Organized National conferences, Faculty development programs and many workshops for students, faculty and Research scholars.



Dr. S.L. Jany Shabu received her Bachelor of Science in Mathematics and MS (Information Technology & Ecommerce) from Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu. She got her Master of Technology in Information Technology and completed her Ph.D. Programme in Computer Science from Sathyabama University, Jeppiaar Nagar, Sholinganallur, Chennai, Tamil Nadu. She worked as a systems trainee at Universal Software Technology Park, Trivandrum. She is currently an Associate Professor in Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India. She has over Fifteen years of teaching experience. Her area of interest in research is in Image Processing, Big Data, Data Science, Database Management System & Web Technology etc. and published more than 30 papers in various reputed journals and conferences. She is a member member of the ACM.



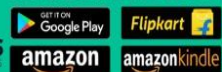
Dr. J. Refonaa has graduated from Anna University with Bachelor's Degree in Information Technology she has received her M.E degree in Computer Science and Engineering from Anna University, Chennai in 2013. She has more than Nine years of teaching experience in the Department of Computer Science and Engineering in Sathyabama Institute of Science and Technology. She has graduated with her Ph.D from Sathyabama Institute of Science and Technology. Her research interests are Spatial Data Mining/Big Data. She has presented her research findings in various reputed national/international journals and also in the proceedings of national/ international conferences.



Dr. A. Yovan Felix received Ph.D. from Sathyabama Institute of Science and Technology. He received award for securing, high Score (Sathyabama Score) for overall performance in Academics, Research & Outreach for the period June 2020 to May 2021 at Sathyabama Institute of Science and Technology where he works as Associate Professor in the Department of Computer Science and Engineering since 2003. He mentored students in the project areas of big data, deep learning, networks and Internet of Things. 22 projects at UG level and 11 Projects at PG level were successfully guided and some of the works are completed at technology readiness level. He has published technical papers in National and International Journals. He is having over 20 years of experience and having expertise in data analytics, smart prediction systems and deep learning algorithms. He also coordinated in organizing several events at both national and international level.

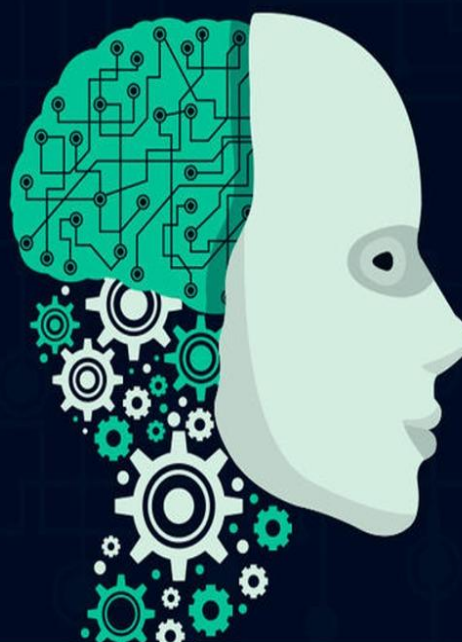


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Prognosis and Diagnosis of Cancer Using Robotic Process Automation

M. Sreekrishna & T. Prem Jacob

Chapter | [First Online: 08 June 2023](#)

42 Accesses

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Abstract

The clinical management of cancer data storage for cancer treatment, analyzing cancer outcomes, providing services for cancer care, accurate measurement for research in future prediction, treatment history, and comparative future research work, plays a very important role in precision cancer health care. However, cancer stage data registries are often found to be inaccurate, missing data, or data are not collected perfectly. To perform all these tasks the need for manpower increases. Therefore, centralization in monitoring and analysis of cancer

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An Extensive Study of Scheduling the Task using Load Balance in Fog Computing

Publisher: IEEE

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B Sandhya ; R.Aroul Canessane

[All Authors](#)

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Abstract:

The proliferation of IoT has resulted in a rise in the demand for services provided by the fog layer, a novel dispersed computing pattern that supplements cloud computing. The fog system enables location awareness and mobility assistance by extending storage and multiplication to the network's edge, dramatically reducing the issue of service computing in delay-sensitive applications. More requests from more users means more stress for the VMs running in the fog layer. When it comes to fog networks, Load Balancing (LB) is crucial since it prevents some fog nodes from being under- or overworked. Fairly dividing up the fog layer's burden across the available virtual machines (VMs) is now an absolute must. LB can enhance quality-of-service metrics including cost, response time, performance, and energy ingesting. Although there has been limited investigation of load complementary techniques in fog networks in recent years, no comprehensive analysis has been conducted to compile this information. This article takes a systematic look at the various load-balancing procedures in fog computing, categorizing it as either approximate, precise, fundamental, or hybrid. In addition, the study explores (Load Balancing) LB metrics, including the benefits and drawbacks of the techniques used for fog networks. There is also an examination of the methods and instruments used in the aforementioned evaluations of each research under consideration. The most unanswered questions and emerging tendencies for these algorithms are also covered. In the final section, the study suggests potential avenues for further research.

Published in: 2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS)

Date of Conference: 23-25 March 2023

INSPEC Accession Number: 23001330

Date Added to IEEE Xplore: 25 April 2023

DOI: 10.1109/ICSCDS56580.2023.10105030

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Cosine Similarity Based Word2Vec Model for Biomedical Data Analysis

Publisher: IEEE

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Abstract:

The conversion process of words to vectors involves mapping each word or term in the biomedical data to a unique numerical vector, called a word embedding. One of the key advantages of using word embeddings is that they capture the meaning and context of words in a numerical format, which can be used as input for various machine learning and data analysis tasks. The Milvus vector engine is an open source software that allows for the efficient and accurate representation of large-scale data in vector space. It is particularly useful for high-dimensional data such as biomedical data that contains a large number of unique words and terms. The use of the Milvus vector engine is to convert biomedical data into numerical vectors for machine learning and data analysis tasks. In the context of biomedical data, the use of word embeddings can enable new discoveries and insights by allowing for more accurate and efficient analysis of large datasets. This word embeddings can be used to identify patterns and relationships in biomedical literature, or to classify medical articles based on their content.

Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)

Date of Conference: 11-13 April 2023

INSPEC Accession Number: 23161973

Date Added to IEEE Xplore: 24 May 2023

DOI: 10.1109/ICOEI56765.2023.10125794

▼ ISBN Information:

Electronic ISBN:979-8-3503-9728-4

DVD ISBN:979-8-3503-9727-7

Print on Demand(PoD) ISBN:979-8-3503-9729-1

Publisher: IEEE

Conference Location: Tirunelveli, India

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Dynamic and Unified Approach to Distinguish Malicious URL Using LSTM

[A. Velmurugan](#) [J. Albert Mayan & G. Nagarajan](#)

Conference paper | [First Online: 30 August 2022](#)

179 Accesses

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 467)

Abstract

Hackers can embed malwares in the pages to take client data and procure cash illicitly. Actually, it is noticed that near 33% of all sites are conceivably malicious in nature. In this manner, It bodes well to rapidly distinguish malicious URLs on the Internet. Unique in relation to the vast majority of past strategies, right now, propose a strategy for online malicious URL identification dependent on versatile learning. By gathering the network traffic from spine

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Vision Based Detection and Analysis of Human Activities

Publisher: IEEE

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Abhiram Ravipati ; Rakesh Krishna Kondamuri ; Mary Posonia A ; Albert Mayan J All Authors

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Abstract:

These days, it's not uncommon to see video cameras installed to keep an eye on pedestrians and motorists alike in a variety of public spaces. The proliferation of camera footage necessitates the creation of some means of deducing the nature of the activity captured on film. Due to the widespread availability of acquisition devices like handsets & camcorders, HAR may be used in a wide variety of contexts. The proliferation of electronic gadgets and software has been matched by a revolution in data extraction made possible by breakthroughs in AI. Difficulties such backdrop congestion, partly blockage, variations in size, perspective, illumination, & look, make it difficult to recognize human actions in video frame or still photographs. Multimodal recognition is necessary in several fields, such as CCTV, human computer interaction for characterizing human behavior. This study surveys the most current and cutting-edge findings from the study of how to categorize human actions. This research proposes a taxonomy for studying human activity and explore the benefits and drawbacks of this diverse set of approaches. Disabled people's daily routines, including resting, moving, traveling down & up the stairs, speaking, & laying, have been frequently tracked using cellphones. Human motion detection often makes use of well-established ML & DL techniques include CNN, & LSTM Network.

Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)

Date of Conference: 11-13 April 2023	INSPEC Accession Number: 23162046
Date Added to IEEE Xplore: 24 May 2023	DOI: 10.1109/ICOEI56765.2023.10125829
▼ ISBN Information:	Publisher: IEEE
Electronic ISBN: 979-8-3503-9728-4	Conference Location: Tirunelveli, India

A Survey on Organic Agro Data Towards Agriculture Using Data Mining

Publisher: IEEE

Cite This



Murali E ; Vignesh R ; Deepa D ; Priyanka N ; Hemalatha S ; Rajashree S [All Authors](#)

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Abstract

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II. ORGANIC AGRICULTURE AND DATA MINING METHOD

III. ORGANIC AGRICULTURE AND ITS APPROACH

IV. ORGANIC AGRICULTURE COMPARATIVE AND CASE STUDY

V. CONCLUSION

Abstract:

In India, 60.6% of the land has been used for agricultural purposes. Farmer invests much in chemical fertilizers, manual labor, weed collection, pesticide management, and at last, they gain low productivity. In this paper, different data mining techniques are going to be analyzed for improving crop productivity and the use of organic farming. Here nutrient content of different food products is also going to be analyzed by comparing organic and inorganic food products. III effects of Inorganic farming are listed. Food produced using organic farming will bring out the health and well-being of human beings for a better future. Seasonal crop recommendations will also be done by making a complete study on an attribute such as PH, water holding capacity, erosion, etc. Weather data are collected to bring out the prediction of rainfall in a particular region. The accuracy of different data mining algorithm are also listed

Published in: 2022 Seventh International Conference on Parallel, Distributed and Grid Computing (PDGC)

Date of Conference: 25-27 November 2022

INSPEC Accession Number: 22723914

Date Added to IEEE Xplore: 01 March 2023

DOI: 10.1109/PDGC56933.2022.10053164

▼ ISBN Information:

Publisher: IEEE

Contact Tracing Detection Application for Covid-19 using Machine Learning Techniques

Publisher: IEEE

Cite This



M. Vengateshwaran ; A. S Harshana ; N. Valarmathi ; S. Jayanthi ; E. Srividhya All Authors

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Abstract	Abstract: A Contact Tracking Model is designed to combat the COVID-19 outbreak by incorporating Clustering/DBSCAN Algorithms, which fall under the realm of Machine Learning. The procedure used by public health ministry's to assist control the spread of infectious diseases like COVID-19 within a community is known as contact tracing. Performing contact tracing correctly during a pandemic can assist limit the number of people who become infected or speed up the process of treating those who are already affected. We will create clusters using this model, which will assist us find infections by filtering the data in the clusters. The high-density clusters are the areas where a big number of people are likely to come into contact with an infected person, whereas the low-density areas can be overlooked because they contain a lower number of people collected together.	
Document Sections		
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II. System Study		
III. Existing Systems		
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V. System Architecture	Published in: 2022 International Conference on Applied Artificial Intelligence and Computing (ICAAIC)	
Show Full Outline ▼	Date of Conference: 09-11 May 2022	INSPEC Accession Number: 21782196
Authors	Date Added to IEEE Xplore: 16 June 2022	DOI: 10.1109/ICAAIC53929.2022.9792889
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Cloud based Weather Station using IoT Technology to Track the Air Parameters

Publisher: IEEE

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S. Jayanthi ; E. Srividhya ; N. Ramshankar ; Srinivasan T R ; P. B. Edwin Prabhakar [All Authors](#)

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Abstract:

The Internet of Things (IoT) technology is a viable alternative for monitoring meteorological data in a specific area and making the data accessible from anywhere in the world. This is based on the idea that IoT technology connects electronic sensors to the public internet. Data from the embedded system can be accessed via the internet from anywhere in the world. In some regions, it may be impossible to examine and monitor vital weather parameters utilizing wires and analog devices during some weather threats. This research proposes a comprehensive approach for monitoring the weather conditions in a particular region and making the information accessible in other parts of the globe using a system described in this study. The IoT is the underlying technology that enables this. It is a highly developed and effective method for connecting things to the internet and bringing the whole internet of things together in a network. This research work has developed an IoT-based forecast concerning sustainable development using an embedded system that can report weather status such as air pressure, heating rate, moisture, air quality, illuminance, and so on in real time. The measurement data has been given as an input to Thingspeak's server for processing and assessment.

Published in: 2023 Second International Conference on Electronics and Renewable Systems (ICEARS)

Date of Conference: 02-04 March 2023

INSPEC Accession Number: 22927822

Date Added to IEEE Xplore: 05 April 2023

DOI: 10.1109/ICEARS56392.2023.10085362

▼ ISBN Information:

Electronic ISBN:979-8-3503-4664-0

Print on Demand(PoD) ISBN:979-8-3503-4665-7

Publisher: IEEE

Conference Location: Tuticorin, India

Sensor Node Communication based Selfish Node Detection in Mobile Wireless Sensor Networks

Publisher: IEEE

Cite This

PDF

S. John Justin Thangaraj ; N. Ramshankar ; E. Srividhya ; S. Jayanthi ; R. Kumudham ; C. Srinivasan All Authors

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Abstract	Abstract: A mobile wireless sensor network (MWSN) is a self-configuring network that does not require a fixed structure, which minimizes its operation time. At the same time, every node in this network is free to move and make the network change its topology frequently. Several routing algorithms designed for MWSNs are established on every node that forwards data packets in the network. However, in real time, some of the nodes may act as selfish nodes. Those selfish nodes use the network and its services but do not cooperate with other nodes. Therefore, detecting these nodes is essential for the WSN. Thus, this approach, "sensor node communication-based selfish node detection" (CSND) in MWSN, is proposed. In this approach, it can be verified that the node communicates based on the route request and reply messages sent within the communication network. The article's objective is to distinguish the selfish node in WSNs. This approach elects the forwarder node based on the highest energy level and node communication ratio (RNC). The BS is noticing the behaviour of every communication in the MWSN. The simulation illustrates that it enhances delivery and drop rates and improves energy efficiency during data transmission.	
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Authors	Published in: 2023 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE)	
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Citations	Date Added to IEEE Xplore: 10 April 2023	DOI: 10.1109/IITCEE57236.2023.10091048
Keywords	► ISBN Information:	Publisher: IEEE
... ..		

Portable Camera based Identification System for Visually Impaired People

Publisher: IEEE

Cite This



Ashveena A; Bala Deepika J; S. Prince Mary; D.Usha Nandini [All Authors](#)

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Cites in Paper	Full Text Views



Abstract	Abstract: The global expansion of visual impairment is a very sensitive subject. Living in constant uncertainty has always had a negative impact on many aspects of their lives. The digital revolution is accelerating in the fast-paced culture, and it has had a good impact on blind people's life as well. This study intends to develop a support system for those who are blind or visually impaired. People with visual impairments from the partially unsighted to the completely blind can use the image recognition and text navigation system to support and direct them via auditory commands. The tool includes the sequential operations of indoor obstacle detection and recognition. The presence of an object is identified using an ultrasonic sensor. Here, a single chip known as a Raspberry Pi is being integrated with both the text navigation device and the identification system. The Raspberry Pi operates with great accuracy and speed. An object is photographed by the navigation system's camera module, processed using the single shot detection (SSD) algorithm, and then converted to text by an optical character recognition (OCR) engine before being communicated over the speaker using the text-to-speech (TTS) converter tool. The object recognition and the text navigation system are specially designed for blind individuals to operate the tool conveniently in a solitary manner.	
Document Sections	Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)	
I. Introduction	Date of Conference: 11-13 April 2023	
II. Literature Survey	INSPEC Accession Number: 23162062	
III. Existing System	Date Added to IEEE Xplore: 24 May 2023	
IV. Proposed System	DOI: 10.1109/ICOEI56765.2023.10126008	
V. Methodology	Publisher: IEEE	
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Automatic Accident Detection and Reporting System using NodeMCU

Publisher: IEEE

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Amikaa. A; Anshi Bhardwaj; S. Prince Mary; B. Ankayarkanni [All Authors](#)

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Abstract:

The technology that has advanced the fastest has improved our way of life. However, because of insufficient emergency facilities, technology has also increased the risks associated with driving and the frequent road accidents that result in significant life losses. This paper will help with this displacement. The process is completed when an accident occurs, the MEMS (Micro-Electromechanical Systems) sensor analyses the signal, and the microcontroller receives this signal. To alert the rescue team, the notification is transmitted via the GSM (Global System for Mobile communication) module, and the position of the accident is acquired with the aid of the GPS (Global Positioning System) module. After receiving the information, the rescue crew can track down the area quickly using the location coordinates. The necessary action will then be done after the location has been confirmed. In this instance, a buzzer has been placed to warn onlookers. The objective of this effort is to automatically identify an accident and notify the rescue crew or command centre.

Published in: [2023 7th International Conference on Trends in Electronics and Informatics \(ICOEI\)](#)

Date of Conference: 11-13 April 2023

INSPEC Accession Number: 23162081

Date Added to IEEE Xplore: 24 May 2023

DOI: [10.1109/ICOEI56765.2023.10125625](#)

▼ ISBN Information:

Electronic ISBN: 979-8-3503-9728-4

DVD ISBN: 979-8-3503-9727-7

Print on Demand(PoD) ISBN: 979-8-3503-9729-1

Publisher: IEEE

Conference Location: Tirunelveli, India

Enabling Gesture-based Application Interaction on Head Mounted VR Display

Publisher: IEEE

Cite This

PDF

K Rishi Kalis ; V Rohith ; G Kalaiarasi All Authors

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Abstract
Document Sections
I. Introduction
II. Literature Survey
III. Proposed System
IV. Result
V. Conclusion
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Abstract:

With the integration of smartphones, VR head-mounted displays that are affordable (HMDs) have made VR more accessible to the general public and increased its widespread use. However, due to their lack of interaction, these systems frequently have limitations. GestOnHMD, a technique for a pipeline for classifying gestures and gesture-based interaction, is presented in this study. It makes use of the gesture technique in smartphones to detect hand gestures, detecting 21 points on hand on VR headset. Initially, gesture-elicitation research is carried out using specific headset the Google Cardboard to detect the 21 hand points which detects the hand gestures and display the meaning of the hand gesture. Based on signal detectability and user choices, different kinds of gestures are selected to input the dataset. It uses the neural networks to map the hand points and the cam detects the hand gestures and recognizes it and the displays the meaning of each On the VR device's screen. Each gesture can be made specifically for the commands and its meaning by showing the hand gesture in front of the cam and storing it in the dataset. It can be used to read American Signal Language, etc. which makes people to understand hand gestures and might help in future exploring. The output is displayed on the Google Cardboard Virtual Reality device screen which is connected to the laptop.

Published in: 2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS)

Date of Conference: 17-19 May 2023	INSPEC Accession Number: 23243962
Date Added to IEEE Xplore: 08 June 2023	DOI: 10.1109/ICICCS56967.2023.10142772
▼ ISBN Information:	Publisher: IEEE
Electronic ISBN:979-8-3503-9725-3	

SVM Algorithm based Fitness App Development with Age Classification using Andriod Studio

Publisher: IEEE

[Cite This](#)

[PDF](#)

L Flavya ; V Shreya ; P Sardar Maran [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Literature Survey

III. Problems In the Existing System

IV. Proposed System Methodology

IV.1 Hardware and Software Requirements.

[Show Full Outline](#)

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Abstract:

People's lives have been evolving due to the advancement of technology, especially in the aspect of mobile internet which has promoted the usage of fitness apps. With this app, users can exercise at anytime and anywhere. These fitness apps changed people's exercise and habits radically. With the help of this good exercise participation, people have gotten accustomed to making use of this fitness app as it has also brought additional attributes like advising on health tips which have made this app ever so special, which acts as an element of construction for obtaining the research. The drastic improvement in the information gathering at online portals has helped fitness apps like springing to cope with the latest updates and help to act accordingly. Although public guidance has been crucial in decision-making, Studies show it is not favorable to follow those particular pieces of advice. Studies show that there are too many problems with fitness apps. A deficiency in time management, and no proper development, people do not refer to technical obstacles and relevant databases. The other major complication is that it is not able to keep up with the specification of different age groups.

Published in: 2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS)

Date of Conference: 17-19 May 2023

INSPEC Accession Number: 23243897

Date Added to IEEE Xplore: 08 June 2023

DOI: 10.1109/ICICCS56967.2023.10142361

▼ ISBN Information:

Publisher: IEEE

Electronic ISBN: 979-8-3503-9725-3

Conference Location: Madurai, India

PUB ISBN: 979-8-3503-9701-6

Food Wastage Management Application using Android Studio

Publisher: IEEE

Cite This

PDF

Katakam Sudheepa ; Padmashetti Rashmitha ; P. Sardar Maran All Authors

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Abstract
Document Sections
I. Introduction
II. Literature Survey
III. Existing System
IV. Proposed System Methodology
V. Hardware and Software Requirements
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Authors
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Abstract:

Society struggles with food waste on a regular basis. As a result, proper food waste management can improve the environment as well as the economic situation. Poverty will be alleviated if people reduce food waste, and the environment will be conserved. This research study intends to create a mobile app that will efficiently collect food and other items and delivers donated ones. Donors and recipients can register their details, as well as post availability or requirement of food, via the mobile application. This app accepts both cooked food as well as raw food. Donors can use the app to upload photos of their food, which serves as proof that there is food available and also motivate others to donate.

Published in: 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC)

Date of Conference: 04-06 May 2023

INSPEC Accession Number: 23243476

Date Added to IEEE Xplore: 08 June 2023

DOI: 10.1109/ICAAIC56838.2023.10140489

▼ ISBN Information:

Electronic ISBN:978-1-6654-5630-2

DVD ISBN:978-1-6654-5629-6

Print on Demand(PoD) ISBN:978-1-6654-5631-9

Publisher: IEEE

Conference Location: Salem, India

Convolutional Neural Networks (CNN) and Facial Features based Smart Driver Alertness Detection

Publisher: IEEE

[Cite This](#)

[PDF](#)

K.V Pavan Kumar ; M. Chidanand ; S.L.Jany Shabu ; L.K.Joshila Grace ; D. Poornima [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Literature Survey

III. Existing Work

IV. Proposed Work

V. Results and Discussion

[Show Full Outline ▼](#)

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[Keywords](#)

[Metrics](#)

Abstract:

The development of machine learning assists drivers in the form of unmanned automobiles etc. Nearly 22% of accidents are caused by the driver's drowsiness and lack of alertness. This study intends to monitor the alertness of driver by analyzing their facial expressions and eye variations. The developed smart processing system substantially reduces highway accidents. The proposed model considers various facial characteristics like PERCLOS, Eye Aspect Ratio (EAR), blink values, and yawning. The driver is continually observed by the camera in the proposed method. HC classifiers are used to identify the driver's face. CNN uses the extracted eye images to determine whether the eyes are closed. Based on the classification results, EAR is measured. If the mouth is detected to be open, the lip distance (yawn) is measured. Finally, a warning will be generated if the driver is in a drowsy state.

Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)

Date of Conference: 11-13 April 2023

INSPEC Accession Number: 23162078

Date Added to IEEE Xplore: 24 May 2023

DOI: 10.1109/ICOEI56765.2023.10125701

▼ ISBN Information:

Electronic ISBN:979-8-3503-9728-4

Publisher: IEEE

DVD ISBN:979-8-3503-9727-7

Conference Location: Tirunelveli, India

Print on Demand(PoD) ISBN:979-8-3503-9729-1

Development of an E-Commerce System using MEAN Stack with NX Monorepo

Publisher: IEEE

[Cite This](#)

[PDF](#)

S.L. Jany Shabu ; S.Pradeep Kumar ; R. Pranav ; S. Refonaa ; Maheswari [All Authors](#)

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Abstract

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[II. Literature Survey](#)

[III. Existing Work and Their Limitations](#)

[IV. Proposed System](#)

[V. Working](#)

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Abstract:

E-commerce is the backbone of online sellers. It also opens opportunities in the business sector. MEAN stack is used in e-commerce websites as it provides two-way data binding for most trafficking sites. The advantages they provide can no longer meet the challenges for the developers as the demand increases. Nx plays a major role to overcome challenges, when Nx is added to a modern Front-end like Angular and Back-end like Express, it makes scaling easy. Modern techniques such as distributed task execution and computation make sure the CI times remain fast, even after adding projects to the workspace. The focus of this study is to design and implement an E-commerce system using some emerging JavaScript technologies that include MongoDB, Express. JS, Node. JS, and Angular 14 along with NxMonorepo which is an added advantage of speed and flexibility of this technology when compared to another traditional stack. Nxmonorepo makes the MEAN stack implementation 3 times faster than the previous implementation of the MEAN stack.

Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)

Date of Conference: 11-13 April 2023

INSPEC Accession Number: 23200151

Date Added to IEEE Xplore: 24 May 2023

DOI: 10.1109/ICOEI56765.2023.10125948

▼ ISBN Information:

Electronic ISBN:979-8-3503-9728-4

Publisher: IEEE

DVD ISBN:979-8-3503-9727-7

Conference Location: Tirunelveli, India

Print on Demand(PoD) ISBN:979-8-3503-9729-1

Utilizing Machine Learning Models to Determine the Security Level of Different Cryptosystems

Publisher: IEEE

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Kantipudi Pranathi ; Bodepudi Lakshmi Priya; A. Yovan Felix [All Authors](#)

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Abstract

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[II. Literature Survey](#)

[III. Proposed System](#)

[IV. Methodology](#)

[V. Results and Discussion](#)

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[Metrics](#)

Abstract:

Due to recent developments in multimedia technology, digital data security has emerged as an important concern. To improve upon the state of the art in terms of security, researchers often recommend modifications to procedures that have previously been implemented. However, many suggested encryption algorithms have proved unsafe over the previous several decades, putting sensitive data at risk. It is crucial to use the most suitable encryption strategy to defend against such attacks; nevertheless, the type of data being protected might affect the method that is most appropriate for each given situation. However, systematically evaluating various cryptosystems to choose the optimal one may consume significant computational effort. To rapidly and reliably choose the appropriate algorithm, an SVM (support vector machine) is proposed as a security-level identification tool for photo encryption algorithms. In this research, a dataset was compiled with the help of common encryption security criteria, including Security, Peak signal to noise ratio, Homogeneity, Correlation, Contrast, Energy, Entropy, and Mean Square Error. These values are used as extracted characteristics from various cypher pictures. There are three tiers of security for dataset labels: strong, acceptable, and weak. For evaluating the effectiveness of the proposed model, the calculated accuracy and results demonstrate the value of this SVM system.

Published in: 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)

Date of Conference: 11-13 April 2023

INSPEC Accession Number: 23200158

Date Added to IEEE Xplore: 24 May 2023

DOI: 10.1109/ICOEI56765.2023.10125757

▼ ISBN Information:

Publisher: IEEE

Detection of Plant Disease Using Machine Learning and Deep Learning Algorithms

Publisher: IEEE

Cite This

PDF

Kalyani Gollapudi ; Preethi Varigonda ; S. Jancy ; S. PushpaLatha ; Vijji Amutha MaryA ; Suji Helen [All Authors](#)

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Abstract

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I. Introduction

II. Literature Survey

III. System Analysis & Feasibility Study

IV. Methodology And Algorithms

V. Software Development Life Cycle–Sdlc:

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Abstract:

Agriculture performs an critical position in India's economic system. Early detection of plant illnesses is critical to save you crop damage and similarly spread of diseases. Most plants, along with apple, tomato, cherry, grape, show symptoms of leaf ailment. These visible patterns may be found to correctly predict the disorder and take early movement to save you it. This can be triumph over with system getting to know and deep getting to know algorithms. We therefore recommend a method that determines tomato plant disease from pix of leaves. This method is performed with aid vector device (SVM), random woodland gadget studying algorithm, and look at algorithms Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), and ResNet that is one of the switch learning techniques. Snoring. After the facts set is processed by way of the algorithms, the accuracy of the algorithms is compared and the snapshots are categorized.

Published in: 2023 Eighth International Conference on Science Technology Engineering and Mathematics (ICONSTEM)

Date of Conference: 06-07 April 2023

INSPEC Accession Number: 23242198

Date Added to IEEE Xplore: 07 June 2023

DOI: 10.1109/ICONSTEM56934.2023.10142422

▼ ISBN Information:

Publisher: IEEE

Electronic ISBN:979-8-3503-4779-1

Conference Location: Chennai, India

Print on Demand(PoD) ISBN:979-8-3503-4780-7

An Extensive Study of Scheduling the Task using Load Balance in Fog Computing

Publisher: IEEE

Cite This

PDF

B Sandhiya ; R.Aroul Canessane All Authors

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Abstract
Document Sections
I. Introduction
III. Background
III. 3. Essential for LB in Fog Computing
IV. LB Practices
V. Related Works
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Keywords
Metrics

Abstract:

The proliferation of IoT has resulted in a rise in the demand for services provided by the fog layer, a novel dispersed computing pattern that supplements cloud computing. The fog system enables location awareness and mobility assistance by extending storage and multiplication to the network's edge, dramatically reducing the issue of service computing in delay-sensitive applications. More requests from more users means more stress for the VMs running in the fog layer. When it comes to fog networks, Load Balancing (LB) is crucial since it prevents some fog nodes from being under- or overworked. Fairly dividing up the fog layer's burden across the available virtual machines (VMs) is now an absolute must. LB can enhance quality-of-service metrics including cost, response time, performance, and energy ingesting. Although there has been limited investigation of load complementary techniques in fog networks in recent years, no comprehensive analysis has been conducted to compile this information. This article takes a systematic look at the various load-balancing procedures in fog computing, categorizing it as either approximate, precise, fundamental, or hybrid. In addition, the study explores (Load Balancing) LB metrics, including the benefits and drawbacks of the techniques used for fog networks. There is also an examination of the methods and instruments used in the aforementioned evaluations of each research under consideration. The most unanswered questions and emerging tendencies for these algorithms are also covered. In the final section, the study suggests potential avenues for further research.

Published in: 2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS)

Date of Conference: 23-25 March 2023 **INSPEC Accession Number:** 23001330

Date Added to IEEE Xplore: 25 April 2023 **DOI:** 10.1109/ICSCDS56580.2023.10105030

A Comprehensive Study on Various Preprocessing Techniques for brain MRI image

Publisher: IEEE

[Cite This](#)[PDF](#)Ashly Mathew ; A Christy [All Authors](#)

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Abstract

Document Sections

[I. Introduction](#)[II. PREPROCESSING METHOD](#)[III. LITERATURE REVIEW](#)[» CONCLUSION](#)[Authors](#)[Figures](#)[References](#)[Keywords](#)[Metrics](#)

Abstract:

Nowadays, MRI images of the brain are extremely useful in the medical field for diagnosing various diseases and injuries related to the brain. Magnetic resonance imaging (MRI) of the brain provides high-quality 2D or 3D images of the brain and cerebrum stem utilizing magnetic flux and radio signals. In medical image analysis, it is necessary to perform image preprocessing steps to prepare the image for segmentation and classification. It aids in the improvement of image quality by removing noise effects. This paper focused on a review of various preprocessing methods used in brain MRI images.

Published in: [2022 3rd International Conference on Electronics and Sustainable Communication Systems \(ICESC\)](#)

Date of Conference: 17-19 August 2022

INSPEC Accession Number: 22068115

Date Added to IEEE Xplore: 19 September 2022

DOI: [10.1109/ICESC54411.2022.9885631](#)

▼ ISBN Information:

Electronic ISBN:978-1-6654-7971-4

Publisher: IEEE

DVD ISBN:978-1-6654-7970-7

Conference Location: Coimbatore, India

Print on Demand(PoD) ISBN:978-1-6654-7972-1

SECTION I.

Introduction



Covid-19 Future Forecasting Using Supervised Machine Learning Models

Publisher: IEEE

Cite This

PDF

Basseti Lakshmi Lavanya ; Vemula Katyayani ; S. Jancy ; S.Pushpa Latha ; Vijji Amutha Mary A ; L. Sujihelen ; Mercy Paul Selvan All Authors

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Abstract

Document Sections

I. Introduction

II. Literature Review

III. System Analysis

V. Conclusion

Authors

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Keywords

Metrics

Abstract:

The outbreak of the unconventional coronavirus or COVID-19 is affecting the whole global in various parts of the arena and has resulted in hundreds of thousands of deaths. This stays an ominous public fitness caution and may be celebrated as certainly one of the largest pandemics in world history. This file targets to better recognize how special machine mastering fashions may be applied in actual-international situations. Apart from global overall performance solution, this paper additionally analyzethe present day fashion or transmission pattern of Covid-19 in India. With the assist of datasets from the Ministry of Health and Family Welfare of India, this observe gives diverse tendencies and patterns located in one-of-a-kind parts of the arena. The statistics for the study became carried out for 154 days, that is, from January 22, 2020 to June 24, 2020. For further use the facts may be similarly analyzed and further outcomes received.

Published in: 2023 Eighth International Conference on Science Technology Engineering and Mathematics (ICONSTEM)

Date of Conference: 06-07 April 2023

INSPEC Accession Number: 23242170

Date Added to IEEE Xplore: 07 June 2023

DOI: 10.1109/ICONSTEM56934.2023.10142413

▼ ISBN Information:

Electronic ISBN:979-8-3503-4779-1

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Conference Location: Chennai, India

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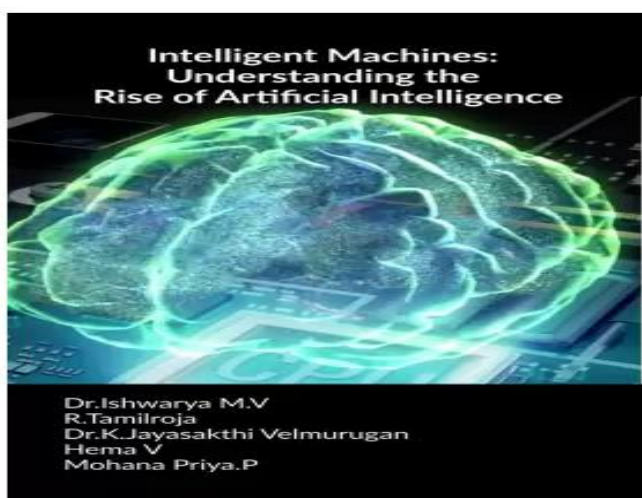
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3.4.6 Number of books and chapters in edited volumes published per teacher during the year

3.4.6.1: Total number of books and chapters in edited volumes / books published, and papers in national/international conference-proceedings during the year

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2. Dr.B.Sathiyaprasad -Blockchain: Creating Smart Healthcare with Advanced Digital Technology,

Shashimala Tiwari

6. Impact of Blockchain in Drug Traceability

Mandeep Singh, Ruhul Amin Choudhury, and Vasudeva Kilari

7. Patient Selection and Treatment Strategies Using Computational Machine Analysis

Anjali Gupta, Neha Sharma, and Pavan Kumar Arya Padarthi

8. Artificial Intelligence in Healthcare to Improve the Quality of the Elderly

Gayatri Prajapati and Khwairakpam Sharmila

9. Affordable Healthcare: The Promise of Blockchain

Abhitav Tiwari, Mallika Tamminana, Shalini Perada, B. Srividya Yadav, Ankita Moharana, and Dhanalekshmi U. Meenakshi

10. Smart Contracts: Medical Insurance Contracts for Patient

Kamlesh Kumar Raghuvanshi, Subodh Kumar, Sushil Kumar, and

11. Remote Patient Monitoring with Blockchain: Powerful and Patient Observation Systems

Shweta Kumari, Vikash Kumar, Jyotirmaya Sahoo, Manjeet Kumar, and Sudhanshu Mishra

12. Secure Data Transmission Based on Deep Q-Learning Architecture in an Internet of Things Module in Healthcare Applications

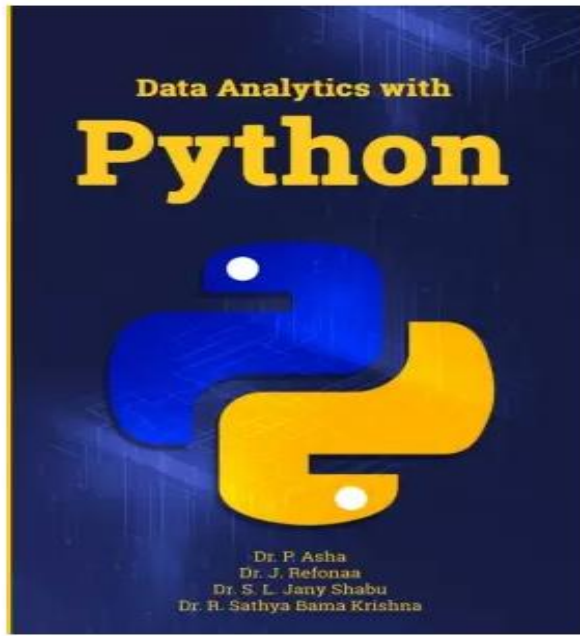
B. Sathiyaprasad and B. Satheesh Kumar

13. A Heterogeneous Graph-Based E-Health Solution in Cloud with Semi-Supervision During Pandemic Periods

Antony Xavier Branson, Sai Shanmuga Raja, Sendilvelan Subramanian, P. Saravkaya, Francis Jeyaraj, Geetha Saman, Kapya Na

3. Dr.R.SathyaBama Krishna

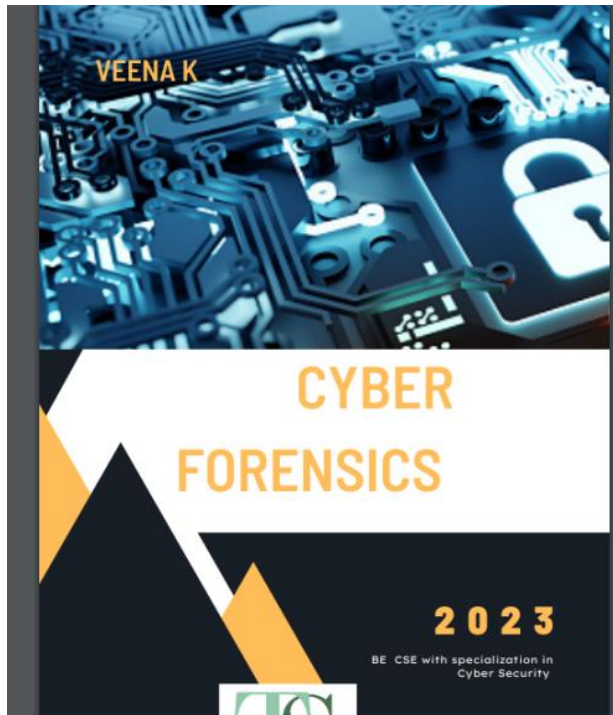
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Cyber Security





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Blockchain: A Compendium on Contemporary Privacy Preservation Approaches and Its Manifestation in Varied Realms

[Ledia Kama](#) & [B. Jebereson Retna Raj](#)

[Conference paper](#) | [First Online: 04 March 2022](#)

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Part of the [Lecture Notes in Networks and Systems](#) book series (LNNIS, volume 420)

Abstract

Blockchain is a distributed ledger based technology that was incipient as an elementary base of primary decentralized crypto currency namely, Bitcoin. It piles and maintains records without any centralized authority or trusted third party. The decentralized, immutable, transparent characteristics of this breakthrough innovation gained wide acceptance rapidly, since its inception in 2009 and are now applied in a variety of use cases. But still, blockchain faces issues with respect to privacy, security, and scalability that hinder its practical applications. This paper reviews the challenges, privacy threats and forefront privacy-preserving mechanisms in blockchain based systems and also makes a study of various privacy-preserving mechanisms as applied to various realms of blockchain namely IoT, VANET, smart agriculture, etc.

Keywords

[Blockchain](#)
[Challenges](#)
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Clustering of Various Diseases by Collagen Gene Using the Positional Factor

[S. Gowri](#) , [S. Revathy](#), [S. Vinodhwar](#), [J. Jabea](#), [Vignu Felix](#) & [Sunduru Srinivasulu](#)
Chapter | [First Online: 28 September 2020](#)
10 Accesses

Abstract

Collagen Gene is a protein which is otherwise called alpha-1 type I collagen is found in human beings in type of COL1A1 encoded. The real encoding segment is type I collagen which is the fibrillar collagen. This fibrillar collagen includes the cartilage which is mainly found in the connective tissues. The diseases caused by this collagen are Osteogenesis imperfecta, Chondroplasia, Ehlers-Danlos Syndrome, Alport syndrome, Osteoporosis and Knobloch Syndrome. These syndromes are associated according to the kinds of collagen which are from Type I to XVIII. Each kind of syndrome has respective impacts over human in which these five syndromes have real impact over the body. Clustering is one of the information mining techniques which is utilized to gather similar articles. The proposed framework is mainly utilized to assemble the significance of disease according to the phases of the collagen gene compose. This procedure of clustering is finished using the Dynamic Path Selection Clustering algorithm to assist in the prompts over the recurrence, conditional changes and its clinical significance which demonstrates the analytical factor in the gene behaviour.

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Hand Gesture Recognition Control for Computers Using Arduino

January 2021
DOI:10.1007/978-981-15-8530-2_45
In book: Data Intelligence and Cognitive Informatics (pp.569-578)

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Sentiment Analysis on Twitter Data Using Deep Learning approach

Publisher: IEEE

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Vishu Tyagi; Ashwini Kumar; Sanjoy Das All Authors

14 Cites in Papers

1088 Full Text Views

Abstract

Document Sections

I. INTRODUCTION

II. RELATED WORK

III. METHODOLOGY

IV. EXPERIMENT AND RESULTS

V. CONCLUSION

Abstract:

The recent developments of many social networking websites have created large collections of product reviews and polarity of opinions etc, data for customer around the world. Data collection from these social media can be utilized to solve objectives such as market prediction, product recommendation, and reviewer's sentiment. It is very difficult task to manage of unstructured data available on social media. To handle such type of data, Deep learning algorithms is an appropriate solution for analysis these challenges. In this paper, we propose a CNN- LSTM based deep learning method with pre trained embedding approach learns to extract feature automatically for analysing sentiments and classification of reviews or opinions labelled into two polarity as positive or negative. Our proposed model to implement the result gives better performance on benchmark dataset. The performance of CNN-LSTM based deep learning method has compared with baseline machine learning methods.

Published in: 2020 2nd International Conference on Advances in Computing, Communication Control and Networking

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Advances of Artificial Intelligence in a Green Energy Environment

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Chapter 11 - Artificial intelligence-based intelligent geospatial analysis in disaster management

R. Subhashini¹, J. Joshua Thomas², A. Sivasankari¹, P. Mohana³, S. Vigneshwari¹, P. Asha¹

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Abstract

In natural disasters, landslides are one among the major disaster in the world. Hilly terrains with high slope and high number lineaments are more prone to the landslides. Recent year's landslide hazard zonation using geospatial technologies was carried out by various researchers around the world. In this chapter, using recent advanced technique artificial intelligence (AI) and geographical information system (GIS) to demarcate the Landslide Susceptibility Zones (LSZ). The hilly zones of Sirumalai being a part of Palani Hills in Dindigul taluk was taken as a study area. IRS P6 satellite imagery was used to prepare the various thematic layers and using weighted overlay algorithm in GIS prepared the LSZ map. By integrating with the advanced AI technique, the multilayer feedforwarded CNN (convolutional neural network) algorithm has been applied for landslide detection by using the training data sets. The performance measures were evaluated for CNN networks and compared the results with recurrent neural networks. The proposed classification performance metrics outperforms well in CNN architecture and provides better results. The resulted LSZ of the study area were assessed using the existing landslide record in the geographical location of interest.

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This milk storage coolers are used regularly only at the collection point to cool the milk; thus preserving the milk consistency. Bulk milk coolers are accessible in varying configurations, such as direct expansion, indirect cooling through chiller water, etc. Raw milk must be cooled instantly from 35Å °C and held at 4Å °C to retain quality and consistency. Now is the time to improve the milk quality to provide customers with hygienically healthy milk and milk products. The main criteria for quality determination will no longer be the FAT/SNF but the milk's bacteriological consistency, which can only be accomplished by careful handling of milk from the animal's udder to the store shelf. Our system calculates Milk's pH calculation acidity, agitator's rpm, individual compressor phase level, and BMC's temperature profile making the total system an actual health monitoring system. Throughout the bulk milk storage systems, acidity is specifically related to lactose to the conversion of lactic acid and bacterial colonies, as well as to the consistency of milk.

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In this modern era, everything and everyone is innovative, where everyone competes with being better than others. The emergence of many entrepreneurs, competitors, and business interested people has created a lot of insecurities and tension among competing businesses to find new customers and hold the old customers. Because of this one should need and maintain exceptional customer service and it becomes very appropriate irrespective of the business scale. And also, it is equally important to understand the needs of customers specifically to provide greater customer support and to advertise them with the most appropriate products. In the pool of these online products, customers are confused about what to buy and what not to and also the company or the business people are confused about which section of customers to be targeted for selling their particular type of products. This confusion will probably be possible by the process called "customer segmentation". The process of segmenting the customers with similar interests and similar shopping behavior into the same segment and with different interests and different shopping patterns into different

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Microbes are naturally prevalent on surfaces in clinical as well as industrial environment. The adherence, persistence, and colonization of surfaces by numerous pathogens, known as microbial surface pollution, is increasingly recognized as harmful to human health and society. Antibiotic resistance, a notorious natural occurrence, becomes a major public health concern when it is magnified by human overuse and negligence. One of the reasons for the growth of multidrug resistance infections is the undiscerning use of antibiotics as a prophylactic in feed. Researchers have been investigating the use of nanoparticles as a food supply and antibacterial agent as a result of advances in nanoscience and technology. Various characterization approaches for probing numerous characteristics of nanostructured materials have been developed during the last few decades. Many experiments

CHAPTER 33

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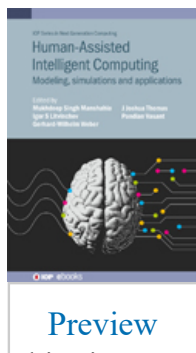
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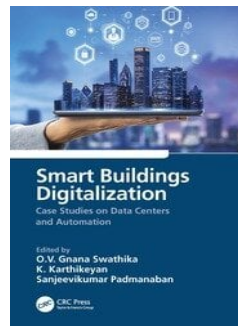


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To promote pollution-free environment and to enhance the power production with the available natural resources thereby saving other depleting sources of energy. Off-grid and on-grid inverters are used to generate utility AC frequency. In order to get the desired output power, the photovoltaic (PV) system can be connected in series or parallel. The grid-integrated PV system has been designed and modeled in MATLAB/Simulink. The simulation results are shown for a PV array consisting of 4×20 modules. To reduce current ripple injected to the grid, LCL-type filters are preferred over L- or LC-type filters. The size and cost of the power converter can be reduced by employing LCL filters compared to other filters. As the rating of power converter increases, ultimately the size of the L or LC filter becomes bulky and also results in high cost. This entire arrangement of solar PV system can be extended for retrieval of solar power to meet the light/motor loads of the specific building using rooftop terracing. Specific control techniques at the active end of the LCL filter are needed to decrease the current ripples and to synchronize with grid switching frequency.

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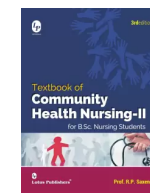
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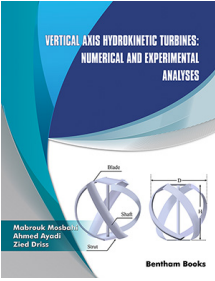
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The **Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention** investigates and presents the recent innovations, procedures, and technologies implemented in medical imaging. Covering topics such as automatic detection, simulation in medical education, and neural networks, this major reference work is an excellent resource for radiologists, medical professionals, hospital administrators, medical educators and students,

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Reviews & Statements

Regarding article 5, "Fairness and Ethics in Artificial Intelligence-Based Medical Imaging":

"Given the vast number of issues concerning usage, failure, success, strategies, and applications of medical imaging, the Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention encompasses the most pertinent research on the applications, impacts, uses, and strategies of medical imaging. This chapter addresses safety and regulatory barriers that impede data sharing in medicine as well as potential changes to existing techniques and frameworks that might allow ethical data sharing for machine learning. With these developments in view, the authors also present different algorithmic models that are being used to develop machine learning-based medical systems that will potentially evolve to be free of the sample, annotator, and temporal bias."

– Prof. Thomas Heinrich Musiolik, Berlin University of the Arts, Germany

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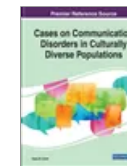
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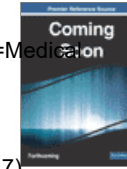


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Kirti Raj Bhatele, Vivek Gupta, Kamlesh Gupta, Prashant Shrivastava

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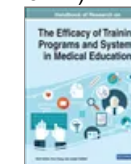
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Yamini G., Gopinath Ganapathy

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V. R. S. Mani

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Pandian R.

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Katha Chanda, Ashish Issac, Malay Kishore Dutta

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Rajalingam B., Priya R., Bhavani R., Santhoshkumar R.

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Hassiba Talbi, Mohamed-Khireddine Kholladi

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Ahan Chatterjee, Swagatam Roy

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Srikanth M. V., V. V. K. D. V. Prasad, K. Satya Prasad

In this article, an attempt is made to diagnose brain diseases like neoplastic, cerebrovascular, Alzheimer's, and sarcomas by the effective fusion of two...

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Beaulah Jeyavathana Rajendran, Kanimozhi K. V.

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Sudhir Kumar Mohapatra

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Vinayak Majhi, Sudip Paul

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Sneha Kugunavar, Prabhakar C. J.

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Jiamin Luo, Alex Noel Joseph Raj, Nersisson Ruban, Vijayalakshmi G. V. Mahesh

Color fundus image is the most basic way to diagnose diabetic retinopathy, papillary edema, and glaucoma. In particular, since observing the morphological...

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Ranit Karmakar, Abhishek Basu

Electronic health records (EHR) contain patients' medical as well as

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Rajalingam B., Priya R., Bhavani R.

In this chapter, different types of image fusion techniques have been studied and evaluated in the medical applications. The ultimate goal of this proposed...

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Nithin Prabhu G., Trisiladevi C. Nagavi, Mahesha P.

Medical images have a larger size when compared to normal images. There arises a problem in the storage as well as in the transmission of a large number of...

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Samsul Ariffin Abdul Karim, Nur Atiqah Binti Zulkifli, A'fza Binti Shafie, Muhammad Sarfraz, Abdul Ghaffar, Kottakkaran Sooppy Nisar

This chapter deals with image processing in the specific area of image zooming via interpolation. The authors employ bivariate rational cubic ball function...

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Sumesh Sasidharan, M. Yousuf Salmasi, Selene Pirola, Omar A. Jarra
Artificial intelligence (AI) broadly concerns analytical algorithms that iteratively learn from big datasets, allowing computers to find concealed insights....

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Kesavan Suresh Manic, Imad Saud Al Naimi, Feras N. Hasoon, V. Rajinikanth

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Prabha Sathees

Segmentation is necessary for dental images for finding the parts of the teeth, surrounding tissues, and bones. The human identification system in dental...

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Hakima Zouaoui, Abdelouahab Moussaoui

Multiple sclerosis (MS) is a chronic autoimmune and inflammatory disease affecting the central nervous system (CNS). Magnetic

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This paper presents a segmentation method to detect multiple sclerosis (MS) lesions in brain MRI based on the artificial immune systems (AIS) and a support...

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V. Vijaya Kishore, R.V.S. Satyanarayana

A vital necessity for clinical determination and treatment is an opportunity to prepare a procedure that is universally adaptable. Computer aided diagnosis...

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Shabana R. Ziyad, Radha V., Thavavel Vaiyapuri

Cancer is presently one of the prominent causes of death in the world. Early cancer detection, which can improve the prognosis and survival of cancer...

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Satya Praksh Sahu, Bhawna Kamble

Lung segmentation is the initial step for detection and diagnosis for lung-related abnormalities and disease. In CAD system for lung cancer, this step traces...

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Nandhini Abirami, Durai Raj Vincent, Seifedine Kadry

Early and automatic segmentation of lung infections from computed tomography images of COVID-19 patients is crucial for timely quarantine and effective...

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Majid Mohammad Sadeghi, Emin Faruk Kececi, Kerem Bilsel, Ayse Aralasmak

Shoulder arthroplasty is an important operation for the treatment of shoulder joints, with an increasing rate of operations per year around the world....

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R. Murugan

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The retinal parts segmentation has been recognized as a key component in both ophthalmological and cardiovascular sickness analysis. The parts of retinal...

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Malathi M., Sujatha Kesavan, Praveen K.

MRI imaging technique is used to detect spine tumours. After getting the spine image through MRI scans calculation of area, size, and position of the spine...

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Liver segmentation is instrumental for decision making in the medical realm for the diagnosis and treatment planning of hepatic diseases. However, the manual...

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Image segmentation is an important task in image processing, which is widely used in medical applications such as abnormality detection and after treatment...

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R. Meena Prakash, Shantha Selva Kumari R.

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In the present time, the identification of blood vessels is a basic task for diagnosis of various eye abnormalities. So, this article offers an instinctive...

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C. Helen Sulochana, S. A. Praylin Selva Blessy

Brain tumor is a mass of abnormal growth of cells in the brain which disturbs the normal functioning of the brain. MRI is a powerful diagnostic tool providing...

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Abdul Kayom Md Khairuzzaman, Saurabh Chaudhury

Multilevel thresholding is widely used in brain magnetic resonance (MR) image segmentation. In this article, a multilevel thresholding-based brain MR image...

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Kannan S., Anusuya S.

Brain tumor discovery and its segmentation from the magnetic resonance images (MRI) is a difficult task that has convoluted structures that make it hard to...

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G. Durgadevi, K. Sujatha, K.S. Thivya, S. Elakkiya, M. Anand, S. Shobana

Magnetic resonance imaging is a standard modality used in medicine for bone diagnosis and treatment. It offers the advantage to be a non-invasive technique...

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Kavya N, Sriraam N, Usha N, Bharathi Hiremath, Anusha Suresh, Sharath D, Venkatraman B, Menaka M

Breast cancer is the most common cancer among women in the world today. Mammography screening gives vital information about normal and abnormal regions. The...

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nisanan krishnaraj, A. Mary mekala, Baskar M., Rudan Nersissov,
Alex Noel Joseph Raj

Early prediction of cancer type has become very crucial. Breast cancer is common to women and it leads to life threatening. Several imaging techniques have...

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Renuka Veerappa Tali, Surekha Borra, Mufti Mahmud

Manual analysis of microscopic blood smears by highly expert pathologists is labor-intensive, time-consuming, and is subject to inter-observer variations....

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N. Sri Madhava Raja, S. Arunmozhi, Hong Lin, Nilanjan Dey, V. Rajinikanth

In recent years, a considerable number of approaches have been proposed by the researchers to evaluate infectious diseases by examining the digital images of...

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Gajendra Kumar Mourya, Manashjit Gogoi, S. N. Talbar, Prasad Vilas Dutande, Ujjwal Baid

Volumetric liver segmentation is a prerequisite for liver transplantation and radiation therapy planning. In this paper, dilated deep residual network (DDRN)...

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Ahmed H. Almulih, Fahd S. Alharithi, Seifeddine Mechti, Roobaee Alroobaee, Saeed Rubaiee

People suspected of having COVID-19 need to know quickly if they are infected, so that they can isolate themselves, receive treatment, and inform those with...

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Garv Modwel, Anu Mehra, Nitin Rakesh, K. K. Mishra

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Sivakami A., Balamurugan K. S., Bagyalakshmi Shanmugam, Sudhagar Pitchaimuthu

Biomedical image analysis is very relevant to public health and welfare. Deep learning is quickly growing and has shown enhanced performance in medical...

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Debapriya Banik, Debotosh Bhattacharjee

Medical images mostly suffer from data imbalance problems, which make the disease classification task very difficult. The imbalanced distribution of the data...

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Durjoy Majumder, Madhumita Das

Cancer diagnoses so far are based on pathologists' criteria. Hence, they are based on qualitative assessment. Histopathological images of cancer biopsy...

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E. Sudheer Kumar, C. Shoba Bindu, Sirivella Madhu

Breast cancer is one of the main causes of cancer death worldwide, and early diagnostics significantly increases the chances of correct treatment and...

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Loris Nanni, Alessandra Lumini, Gianluca Maguolo

In this chapter, the authors evaluate several basic image processing and advanced image pattern recognition techniques for automatically analyzing bioimages...

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Pavithra D., Vanithamani R., Judith Justin

Knee osteoarthritis (OA) is a degenerative joint disease that occurs due to wear down of cartilage. Early diagnosis has a pivotal role in providing effective...

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Arun Prasad Mohan

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Law Kumar Singh, Pooja, Hitendra Garg, Munish Khanna

Glaucoma is a progressive and constant eye disease that leads to a deficiency of peripheral vision and, at last, leads to irrevocable loss of vision

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Punya Prabha V., Sriraam N.

Recognition of presence of fetal cardiac chambers through ultrasonic Doppler imaging poses a huge challenge for the clinical community. The four-chamber view...

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Nourhan Mohamed Zayed, Heba A. Elnemr

Deep learning (DL) is a special type of machine learning that attains great potency and flexibility by learning to represent input raw data as a nested...

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Ahmad Hashim Aal-Yhia, Bernard Tiddeman, Paul Malcolm, Reyer Zwiggelaar

Groupwise non-rigid image alignment is a difficult non-linear optimization problem involving many parameters and often large datasets. Previous methods have...

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Medical images have always occupied a very important position in modern medical diagnosis. They are standard tools for doctors to carry out clinical...

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Soumya Ranjan Nayak, Jibitesh Mishra

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Hardev Mukeshbhai Khandhar, Chintan M. Bhatt, Simon Fong

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Charu Bhardwaj, Urvashi Sharma, Shruti Jain, Meenakshi Sood

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Adekanmi Adeyinka Adegun, Roseline Oluwaseun Ogundokun, Marion Olubunmi Adebisi, Emmanuel Oluwatobi Asani

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Evgenia Parioti, Stavros Pitoglou, Arianna Filntisi, Athanasios Anastasiou, Ourania Petropoulou, Dimitris Dionisios Koutsouris

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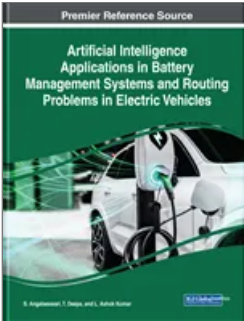
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Release Date: February, 2023 | Copyright: © 2023 | Pages: 342
DOI: 10.4018/978-1-6684-6631-5
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B. V. A. N. S. S. Prabhakar Rao, Rabindra Kumar Singh

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Shyam Sihare

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Amuthan Nallathambi, Sivakumar Nallathambi, Gopal Samy B.

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Bavly Hanna

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Kavipriya P., Ebenezar Jebarani M. R., Lakshmi S., G. Jegan

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Saravanan Subramani, Sivaramapandian J., Ranjith Raj A.

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Lane Detection and Tracking Algorithm Based on Curve Fitting Model

Rajakumar.R^{a,1}, Pandian.R^b, and PremJacob.T^c,

^aUG Scholar, Dept of ECE, Sathyabama Institute of Science and Technology, Chennai, India

^bUG Scholar, Dept of ECE, Sathyabama Institute of Science and Technology, Chennai, India

^cUG Scholar, Dept of ECE, Anna University, MIT Campus, Chennai, India

Abstract. Lane Detection is the fundamental vehicle driving system and self-driving. The proposed concept is to employ the pixel difference in the expected lane and the road backdrop to detach the lane from the road, and then the Curve fitting model is made use of in the segregated lanes to locate the straight line in the image as the lane line. This paper offers a lane detection method based on the Sobel filter and Curve-fitting model for lane line tracking in different conditions. The main objective is to improve the accuracy of the Xi'an city database and the KITTI vision benchmark suite dataset. To achieve this HLS color space was performed which identifies the lane by adding pixel values.

Keywords. Sobel filter, Curve fitting model, Lane detection, Lane tracking, sliding window, deep neural network.

1. Introduction

Most accidents occur due to invisible road lanes. The accidents can be reduced drastically, by employing improved driving assists. A system that warns the driver, can save considerable number of lives. In driving assistance to achieve safety on roads, the challenging tasks are road lanes' detection or boundaries' detection which is exposed in white and yellow lines on roads. In this work, we developed a Curve fitting model improving the robustness of detecting and tracking the lane for safe transportation. In our method, inspection of lane and its tracking will be done by the Curve fitting model and related component function to improvise the working of the lane detection and tracking.

2. Related Works

The literature[1] extracted the Adaptive Region of Interest to minimise computational complexity. Then Kalman filter is used to find road boundaries sensed in the AROI using Progressive Probabilistic Hough Transform (PPHT) in the succeeding frame.

¹Rajakumar.R, UG Scholar, Dept of ECE, Sathyabama Institute of Science and Technology, Chennai, India.
e-mail:rrkmird@gmail.com



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Abstract

Glaucoma is an eye disease that can result in permanent blindness if not detected and treated in the early stages of the disease. The worst part of Glaucoma is that it does not come up with a lot of visible symptoms, instead, it can go from the preliminary stage to a serious issue quickly. A Deep Learning (DL) model is capable of detecting the presence of Glaucoma by analyzing the image of the retina which is uploaded by the user. In this research, two DL algorithms were used to detect the presence of Glaucoma in the uploaded image. The DL algorithms include the convolutional neural network or the CNN and the transfer learning algorithm. The transfer learning algorithm is implemented by the VGG-19 model. Once two DL models were developed using the above-mentioned algorithms, the models were trained and tested using the images of the retina. The trained models are tested to find the better model. The efficiency of the model is measured based on some metrics. These metrics include the True Positive (TP), True Negative (TN), False Positive (FP), and False Negative (FN). Using these metrics, the true positive rate, the true negative rate, the false-positive rate, and the false-negative rate are calculated. From the above values, the DL algorithm, which is more efficient than the other one in identifying Glaucoma, can be found.

Keywords: CNN, DL Algorithm, Glaucoma, Performance Metrics, VGG-19

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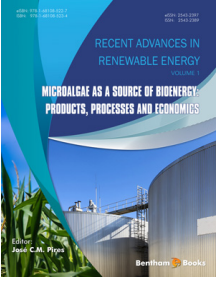
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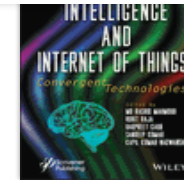
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Summary

In today's era, when technology is growing rapidly, the Internet of Things (IoT) is a technology having massive applications, which are employed in various domains. Similarly, the Healthcare Internet of Things (IoT) applies IoT to the healthcare industry. The IoT is indeed a networked platform comprising connectable devices that can acquire, transfer, and store data without human or computer intervention. The IoT promises a plethora of



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hazards. It is becoming equally important to consider how existing, as well as upcoming, IoT technologies might help healthcare systems provide therapeutic benefits. The goal of this chapter is to provide an understanding of recent IoT in healthcare and to illustrate how the Internet of Things devices are boosting healthcare delivery and how IoT technology may revolutionize and disrupt global healthcare in the coming decade. Healthcare IoT capabilities are additionally investigated in order to theorize how IoT might assist us in moving away from our existing different levels of health systems towards a more integrated, progressive, and continuous approach. Patient care may be ensured on time, and with on-time assistance, treatment expenses can be decreased, and therapies can be made more effective by employing IoT in healthcare practitioners. From smartwatches to cancer care, smartwatches are used to monitor one's health and wellbeing. Finally, this chapter will look into potential concerns with IoT, such as impediments to market acceptability from healthcare providers and consumers, interoperability, security and privacy, remuneration and standardization, information storage, and control and ownership. Policy support, cybersecurity-focused guidelines, rigorous strategic planning, and open policies will be critical enablers of IoT in contemporary healthcare within healthcare organizations. IoT has a lot of potential for enhancing the efficiency of the healthcare system and societal well-being.

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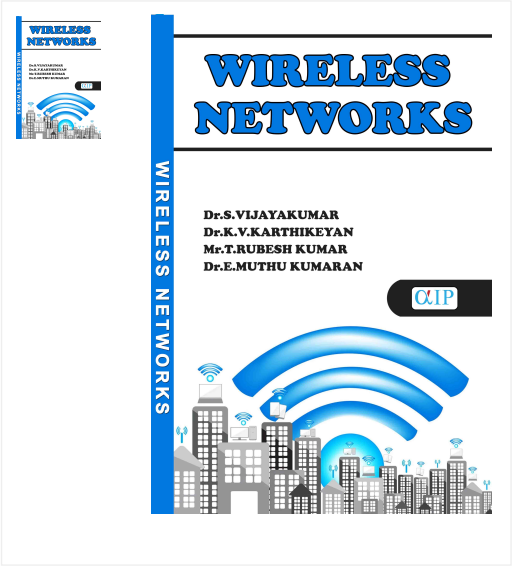
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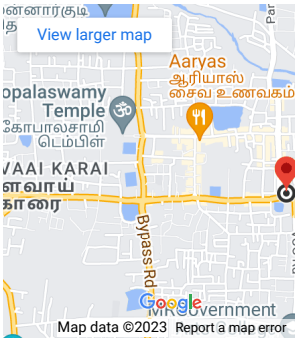


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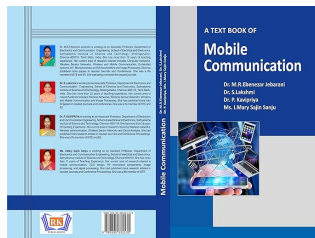
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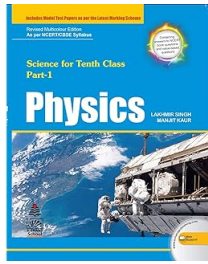
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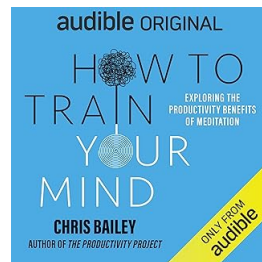
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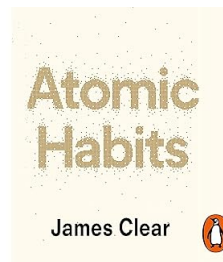


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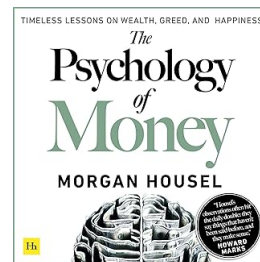


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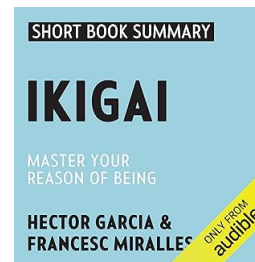


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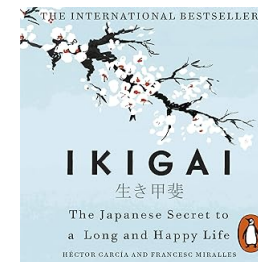
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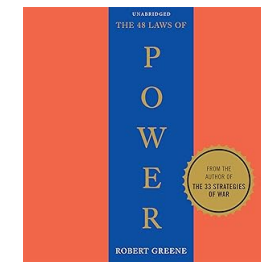


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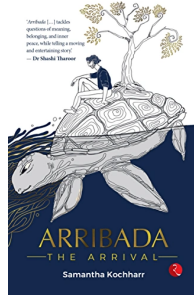
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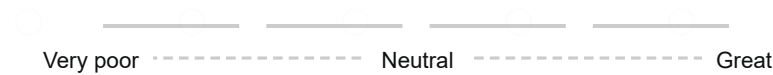
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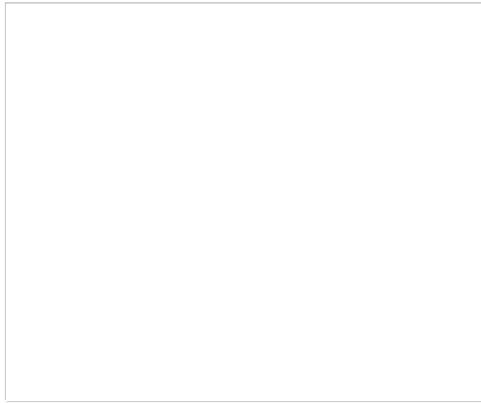


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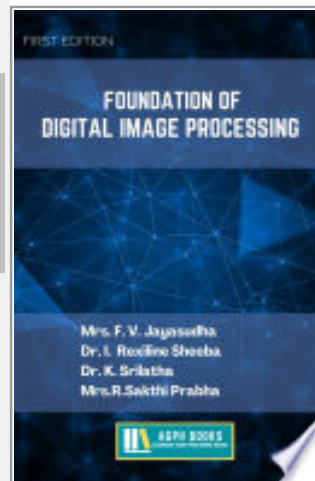


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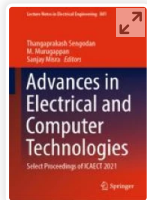
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Automated Ultrasound Ovarian Tumour Segmentation and Classification Based on Deep Learning Techniques

[K. Srilatha](#) , [F. V. Jayasudha](#), [M. Sumathi](#) & [P. Chitra](#)

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Abstract

Ovarian Tumour is one of the common generally occurring tumours in females. Transvaginal (US) ultrasonography is used as a screening examination to identify the appearance of tumours. But for different types of ovarian tumours, malignancy can only be sustained through medicine. A computerised system to achieve the disclosure and fatality estimate of specific tumours is important to restrict undesirable oophorectomies. This proposed method shows a computerised ovarian tumour segmentation method in the ovarian ultrasound image brought

by classification. Because, in this process, an efficient ovarian tumour detection, segmentation and classification system is intended by combining GLCM-contourlet transformation (CT) features and CNN. The proposed system comprises four steps: preprocessing, segmentation, feature extraction, and optimisation and also classification. Primary, speckle noise removal is done by combining boxcar filter and median filter as the pre-processing step at the ovarian ultrasound images. Following the classification system, irregular Ovarian tumour (US) images are presented to the segmentation portion to identify tumours and segments using robust graph-based (RGB) and Fast-Global-Minimisation for Active-Contour (FGMAC) segmentation approach. Following that, GLCM-CT and Ant colony optimisation (ACO) features are obtained from certain noiseless ovarian US images. The enormous amount of features is reduced according to the optimisation of ant colonies (ACO) and the optimisation of the particle swarm (PSO). Eventually, extracted features are given to the Convolutional Neural Network (CNN) classifier to analyse Ovarian tumour US images as abnormal or usual. The proposed system execution is examined in several metrics, and experimental results are compared with existing methods.

Keywords

Ovarian tumour Fast Global Minimisation for Active Contour (FGMAC) GLCM
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Author information

Authors and Affiliations

Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, 600119, India

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Abstract: Artificial intelligence (AI) technology is a broad field which has greater impact on people, communities, and society with substantial implications for humanity. Artificial intelligence makes machine smarter. AI measures are designed to empower people to build their trust and practice their use in real-time application. The new devices are invented with AI technology progresses with time. Microchip is an integrated semiconductor circuit which began as a controller to perform specific task. Microchips have been progressively curtailed to the point where they can fit on a fingertip. New types of chips are being developed to achieve advances in AI by embracing deep neural networks for voice recognition and image processing. The microchips handle data in different way from the silicon logic circuits to hardware for decades.

Keywords: Human Health, Implanted, Microchip, RFID tag,

I. INTRODUCTION

Microchip use RFID tag for transmission and reception which has integrated circuit to store data and antenna for reception and transmitting signals between that circuit and reader. AI based microchip provides unprecedented access to the capacities of data required to design chips optimized to run them.[2] The microchip broadcast electromagnetic signal with associated reader that any RFID chip within its signal range and frequency will respond with an encrypted signal that is decoded by the reader. Microchips are changing everyone's life. It can be used in homes, ATM, transportation, machinery, security even it can be implanted in human and animal bodies to monitor their health and activity. Microchip offers a better interaction with machine world. Microchips offer immeasurable uses in multidisciplinary field of engineering and technology areas.

II. MICROCHIP IN HEALTH MONITORING AND TRACKING

AI based microchip applications increase the health results and value of life for millions of people in recent years. Microchip can be injected to the individuals which keeps track of their health system. For patients, even it could able to detect the tumor at faster rate instead of waiting for days to get their result. It can be used to gain quick access to the patient medical records and it can be implant to the person who is suffering from heart disease and diabetics. Even hospital equipment can be tracked using RFID microchip. Fig.1 illustrates microchip implanted in human muscles to prevent health disorders. Health issue is not a primary concern if microchips have been used.



Fig.1 Micro Chipping In Human finger

III. MICROCHIP IMPLANTED IN PET

Previously pet owners would add collar tags for their PET. Currently many pet owners are implant microchips for their pet to track them if they were lost, monitor their health status continuously and it can act as travel assistance if pets were boarded in flight.

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This paper describes the load circuit parameters of SEPIC converter and its design aspects with the help of design and analysis of BLDC motor. The applications of brushless DC motors are vitally increasing in every field day by day, so the design aspects are need to improve with respect to customer satisfaction is veryimportant. Depending upon the customer needs the usage of brushless DC motor is designed. The entire design has been done with the help of controllers and filter. Results are analyzed using the Power system simulation software.

Published in: 2022 8th International Conference on Advanced Computing and Communication Systems (ICACCS)

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Date Added to IEEE Xplore: 07 June 2022

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A DC to DC conversion is achieved by a SEPIC converter in which a three phase inverter circuit would receive a high voltage dc input and appropriate control of the duty cycle of the converter is achieved with the help of which the motor speed is also varied [1]. Our work aims at controlling the speed of the BLDC motor by employing a SEPIC converter [2]. The SEPIC converter being employed to step up the DC input voltage and the duty cycle of the converter decides the SEPIC converter output voltage value. The BLDC motor has improved reliability, better efficiency, high torque/inertia ratio, offers better cooling effect, negligible radio

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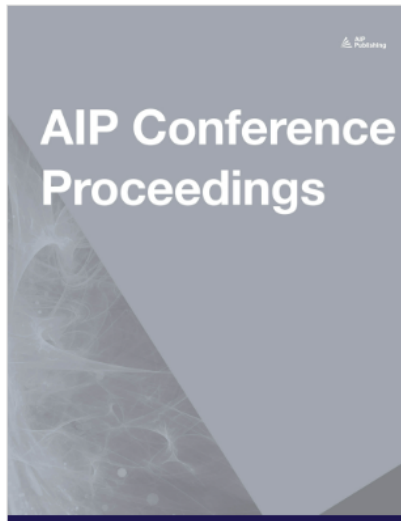
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The field which encompasses predictive data analysis known as machine learning is quickly developing. Agricultural outcomes have been improved due to its suitability in automation, weather prediction, and share market applications. This article covers the latest on using machine learning to various fields in agriculture. The broad variety of machine learning methods applicable for said predictive modeling within important agricultural It is a great difficulty to be living in a densely populated nation, since one must meet the requirements of everyone. Agriculture ranks ahead of almost everything else when it comes to moving our nation forward. Machine learning makes the system adaptive to various environmental conditions by reducing human involvement This article talks

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An effective implementation of a three phase multilevel inverter for electric vehicle 🛒

S. Sundar; R. Vidyalakshmi ; R. Suresh; N. Subalakshmi; T. Ganesh; S. Jayaprakash[+ Author & Article Information](#)*AIP Conf. Proc.* 2519, 050061 (2022)<https://doi.org/10.1063/5.0110006>

Presently a day's fossil fuel by products from the vehicles have expanded air contamination significantly. To lessen contamination because of transportation Electric Vehicles have been arisen as another option. In this manner Inverter for electric vehicle was planned and grown effectively. Another three stage multi-inverter with decreased number of parts checks is proposed. This inverter is planned to utilize a solitary DC source for each stage to create different level yield voltage which makes it appropriate for low and medium voltage applications, including electrical vehicle additionally this can be utilized in ac-coupled renewables or in energy stockpiles. A summed-up circuit setup is displayed beneath with the quantity of yield voltage level can be expanded according to assumption. Albeit every component bears the voltage stress identical to the information DC voltage, the value of total standing voltage (TSV) is diminished by the use of limited number of parts concerning

High Voltage Gain Circuit for DC Bus Integration in Renewable Energy System Implemented by Interleaved Re-boost Converter

Publisher: **IEEE**

[Cite This](#)

[PDF](#)

A. Santhi Mary Antony ; M. Kavitha ; V. Meenakshi ; D. Godwin Immanuel ; G.T. Sundar Rajan ; C.R. Edwin Selva Rex [All Authors](#)

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Abstract

Document Sections

- I. Introduction
- II. Three Winding Coupled Inductor Circuit
- III. Circuit description of proposed Interleaved Re-boost Converter with VMC
- IV. Interleaved Re-Boost Converter with VMC
- V. Results and Discussions

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[Authors](#)

[Figures](#)

Abstract:

Renewable sources are encompassed for all the applications of electrical systems due to its easy availability. Due to the increase in the energy demand PV systems are used for high power applications by using a voltage multiplier circuit. The interleaved Reboost converter with elevated voltage-multiplier circuit is proposed. PV system and fuel cell output is asserted to Re-boost converter where the voltage ratio from 1:5 is increased in terms of 1:14. Integration of PV systems and fuel cell with the dc bus are obtained by using this high voltage gain multiplier circuit. DICK-SON charge pump is used in the voltage multiplier circuit as voltage cells. The proposed interleaved Re-boost converter numbers of MOSFET switches are reduced. The switching stresses are less and efficiency of the converter is more. The soft switching PWM techniques are used for reliable operation of switches. A prototype is designed for the DC input of 22V. The DC output is boosted to 310V with the turn's ratio 1:14.

Published in: [2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems \(ICSES\)](#)

Date of Conference: 15-16 July 2022

Date Added to IEEE Xplore: 14 October 2022

► **ISBN Information:**

INSPEC Accession Number: 22137474

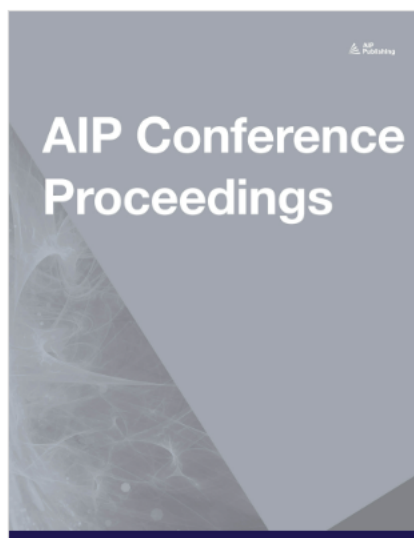
DOI: [10.1109/ICSES55317.2022.9914075](#)

Publisher: IEEE

[Conference Location: Chennai, India](#)

Volume 2519, Issue 1

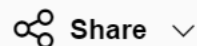
3 October 2022

 THE FIRST
INTERNATIONAL
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ADVANCES IN

RESEARCH ARTICLE | OCTOBER 03 2022

High voltage gain AC-DC one stage converter for a DC drives with ZVT

M. Kavitha ; K. Ragul Kumar; S. Kaliappan; G. Ramakrishnan; M. Kumarasamy; Balachandra Pattanaik; M. Sivaramkrishnan.

[+ Author & Article Information](#)*AIP Conf. Proc.* 2519, 050066 (2022)<https://doi.org/10.1063/5.0110785>

This project is proposing a single power conversion AC to DC converter. For output control and power factor correction, a novel control technique is implemented in the converter in the proposed converter. A single power converter is provided. The boost converter, which

Harmonic Comparison of 10 Bus Loop and Radial Distribution Networks

Publisher: IEEE

[Cite This](#)[PDF](#)P. Abirami ; K.R.Shanmuga Vadivu ; R.Hannah Lalitha ; M. Pushpavalli ; P. Sivagami [All Authors](#)

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Abstract

Document Sections

I. Introduction

III. Harmonic Analysis Of Distribution Networks

IV. Comparison Between Radial And Loop Distribution Networks

V. Conclusion

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[Metrics](#)

Abstract:

In the present scenario, people are migrating towards innovations and technological advancements. Because of this thirst for technological development and innovations, they are fond of innovating automated systems for industrial as well as for domestic applications. All these automated appliances depend on electronic circuitry and hence on semiconductor devices. In modern power systems also, smart grid technologies implement smart control circuitry and smart meters. All these smart technologies adopt power electronic devices in their circuitry. Though power electronic devices play a major role in automation and aiding smart technologies, they silently spread subtle poison in the system like harmonic components. These harmonics may cause severe damage to the electrical and electronic appliances set up at customer end. So, it is necessary for any power system engineer to analyze the percentage of harmonics injected into the power network. So, he can able to measure it and try to mitigate its effect on the system to safeguard the appliances. Here, in this research, 10 bus radial and loop test networks are analyzed for the quantity of harmonic injection in them. The harmonic analysis is carried out by means of MATLAB Simulink and the results of both the networks are compared and plotted for different nodes present in the network. Harmonics are measured by using percentage total harmonic distortions and finally comparing the values for loop and radial suggesting that the loop network is more stable than the radial network.

Published in: 2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSSES)

Date of Conference: 15-16 July 2022

INSPEC Accession Number: 22137313

Date Added to IEEE Xplore: 14 October 2022

DOI: 10.1109/ICSSES55317.2022.9914353

PLC based ATS Working with Load Sensing of Power Generator

Publisher: IEEE

[Cite This](#)

[PDF](#)

M. Pushpavalli ; D. Susitra ; P. Sivagami ; M. Kavitha ; C. Bhuvaneswari ; W. Abitha Memala ; P. Jai Sudharson ; S. Vino [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Proposed System

III. Circuit Diagrams

IV. Ladder Diagram

V. Flow Chart Diagram

[Show Full Outline ▾](#)

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[References](#)

[Keywords](#)

[Metrics](#)

Abstract:

This article proposes and analysis the system which is used for automatic source switching and monitoring. The system is fully programmable logic controller (PLC) based and highly desirable in field of energy. An automatic transfer switch (ATS) for a 1 ø power source has been intended to empower the programmed activity and transmission of the supply between a public effectiveness of supply and a power generator. The ATS, which is a switchgear control framework, that gives a programmed switching of force supply within an important source and an optional sourcedepends on load. The strategies applied in planning the ATS contain the consumption of relays, contactors, PLC, and HMI as fundamental parts of the framework. The deliberate voltage and current amounts to advanced values for show on human-machine interface (HMI).The aftereffect of the programmed move change shows its capacity to perform programmed power change over actions effectively and with practically zero human communication.

Published in: [2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems \(ICES\)](#)

Date of Conference: 15-16 July 2022

Date Added to IEEE Xplore: 14 October 2022

► **ISBN Information:**

INSPEC Accession Number: 22137325

DOI: [10.1109/ICES55317.2022.9914374](#)

Publisher: IEEE

Conference Location: Chennai, India

SMC Controlled SAF for Reduction of Harmonics in DN

Publisher: IEEE Cite This PDF

P. Abirami ; K. R. Shanmuga Vadivu ; R. Hannah Lalitha ; M. Pushpavalli ; P. Sivagami All Authors

25 Full Text Views



Abstract
Document Sections
I. Introduction
II. Existing Methodology
III. Proposed Methodology
IV. Conclusion
Authors
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Metrics

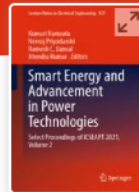
Abstract:

Due to the proliferation of power electronic devices in our power system, the quality of power gets deteriorated mainly by harmonic injection in the system. Here, the power system is safeguarded by mitigating harmonics in a 10-bus distribution network using a shunt active filter. Here, the action of SAF is empowered by analyzing it in a closed path control system. The network is analyzed with conventional control techniques. Conventional control techniques like FOPID and SMC controllers are implemented here. The simulation is carried out by MATLAB Simulink. Here, the non-linear loads are injected at nodes 5 and 9. The propagation of harmonics in the network can be controlled by controlling the SAF at the end of the network. From the simulation results, it is proved that the Sliding Mode Controller is performing better than the Fractional order PID controller in mitigating the level of harmonics in the network. The proliferation of harmonics is measured by using the THD percentage. The THD Measured in the SMC controlled system at bus no.5 is 3.58% and at 9 it is 2.41% whereas the THD measured in the FOPID controlled network at bus no.5 is 3.91% and in bus no.9 is 3.26% respectively. Also, the real power of the system enhances from 0.8962MW(FOPID) to 0.9101MW(SMC)..

Published in: 2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSSES)

Date of Conference: 15-16 July 2022INSPEC Accession Number: 22137422

Date Added to IEEE Xplore: 14 October 2022DOI: 10.1109/ICSSES55317.2022.9914359



Smart Energy and Advancement in Power Technologies pp 447–459 | [Cite as](#)

[Home](#) > [Smart Energy and Advancement in Power Technologies](#) > Conference paper

Closed-Loop Analysis of Multi-input KY Boost Converter Applying Fuzzy Logic Controller

[M. Pushpavalli](#) , [N. M. Jothi Swaroopan](#), [R. Harikrishnan](#), [P. Abirami](#), [P. Sivagami](#), [V. Geetha](#) & [M. Kavitha](#)

Conference paper | [First Online: 22 October 2022](#)

500 Accesses

Part of the [Lecture Notes in Electrical Engineering](#) book series (LNEE, volume 927)

Abstract

The hybrid system always focuses on individual converters for renewable sources. It leads to inflation in the volume and expenditure of the system. This researcher mainly focuses on multi-input converter system. This multi-input contains two sources where wind and solar

Biometric Electronic Voting Machine Using Fingerprint Sensor and Arduino

Publisher: IEEE

[Cite This](#)[PDF](#)A. Santhi Mary Antony ; V. Meenakshi ; D. Godwin Immanuel ; G. T. Sundar Rajan ; M. Kavitha ; C. R. Edwin Selva Rex [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Block Diagram

III. Components for Biometric Electronic Voting

D. Infrared Sensor

IV. Working Of Proposed System

[Show Full Outline ▾](#)

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Citations

Abstract:

Election is essential and unavoidable part of democratic country and also it is a right of each and every person in the country. Everyone is responsible for secure and valid vote during the election. Government plays a major role during the election to achieve a successful election. Electronic voting machine is currently employed during election also it is possible to do misuse and man power is required to verify the details of the voter. This paper overcomes the cons of the existing method using biometric verification. This system ensures more secure, reliable and less manpower than the existing method.

Published in: 2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSES)

Date of Conference: 15-16 July 2022

INSPEC Accession Number: 22137328

Date Added to IEEE Xplore: 14 October 2022

DOI: 10.1109/ICSES55317.2022.9914203

► **ISBN Information:**

Publisher: IEEE

Conference Location: Chennai, India

I. Introduction

In ancient history election happens like voter poll their votes by paper for choosing a leader. People designate respective parties which are broached in the paper and sealed the boxes. During the vote counting day the election commission people open the boxes and count the casted vote by manually. After few years counting will be done in automatically by using electronic voting

Conferences > 2023 International Conference...

Performance Analysis of a Sensorless DC Motor Using Neuro Fuzzy Logic Control

Publisher: IEEE

[Cite This](#)

[PDF](#)

G.T Sundar Rajan ; V. Sivachidambaranathan ; J. Barnabas Paul Gladly ; Ramesh Babu ; Ganesan Subramanian ; S. D Sundarsingh Jebaseelan... [All Authors](#)

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Abstract

Document Sections

1. Introduction

2. Principle of Operation

3. Simulation

4. Hardware Description

5. Result and Analysis

[Show Full Outline ▾](#)

[Authors](#)

Abstract:

This paper deals with the speed control of by using a NEURO FUZZY LOGIC controller without any loss of power; in fact energy is conserved during the regenerative period. The random and optimal results are obtained. This method is integrated approach for control and yields excellent results.

Published in: [2023 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics \(IITCEE\)](#)

Date of Conference: 27-28 January 2023

Date Added to IEEE Xplore: 10 April 2023

► **ISBN Information:**

INSPEC Accession Number: 22931580

DOI: [10.1109/IITCEE57236.2023.10090872](#)

Publisher: IEEE

Conference Location: Bengaluru, India

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ADVANCED SEARCH

Conferences > 2023 International Conference...

Hybrid Grid Charging Station for Electric Vehicle Using IoT

Publisher: IEEE

[Cite This](#)[PDF](#)G.T Sundar Rajan ; V. Sivachidambaranathan ; A. Ramesh Babu ; A Santhi Mary Antony ; J. Barnabas Paul Gladly ; S. D Sundarsingh Jebaseelan [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Simulations Circuit and Result

III. Experimental Output

IV. Result and Analysis

V. Conclusion

[Authors](#)[Figures](#)[References](#)

Abstract:

To increase the reliability of supply and focusing the remote area, Hybrid grid charging stations are used in electric vehicle (EV). The hybrid grid charging station using a boost converter with PV array is designed. This method is helpful for transportation systems. This method delivers the power to electric vehicle in a smart way and different tariff rates.

Published in: 2023 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE)

Date of Conference: 27-28 January 2023

INSPEC Accession Number: 22931547

Date Added to IEEE Xplore: 10 April 2023

DOI: 10.1109/IITCEE57236.2023.10091021

► ISBN Information:

Publisher: IEEE

Conference Location: Bengaluru, India

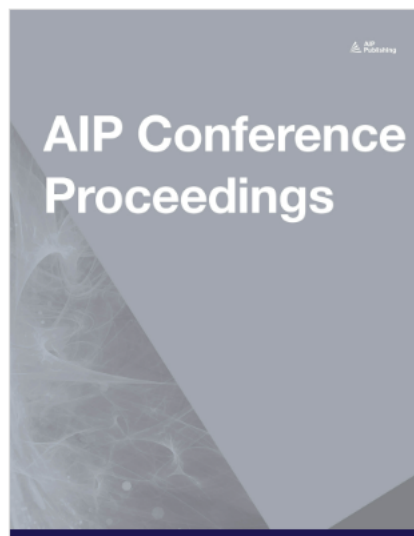
I. Introduction

Hybrid grid charging station [1]–[4] (HGCS) used by from both renewable and non-renewable

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Volume 2519, Issue 1

3 October 2022



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RESEARCH ARTICLE | OCTOBER 03 2022

Image processing based lung tumor-detection and classification using 3D micro-calcification of Ct images



[Y. Muralimohanbabu](#) ; [G. Madhusudhana Rao](#); [D. Santhosha](#); [S. Jayaprakash](#)



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[+ Author & Article Information](#)

AIP Conf. Proc. 2519, 050006 (2022)

<https://doi.org/10.1063/5.0110682>

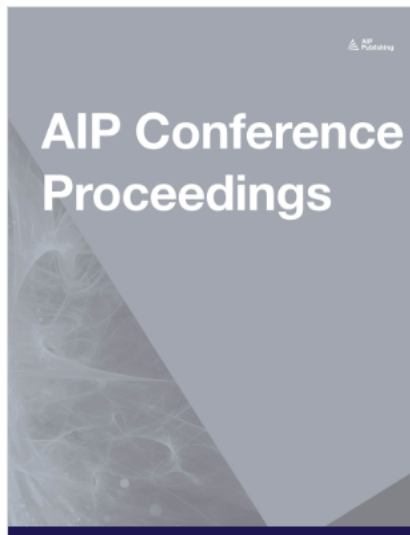
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 **Tools** 

Lung cancer is deadly of all tumor disease with a high death rate as the identification of lung disease at the postponed stage is risky. Hence, the early prediction of lung disease and its treatment is vital to increase the recovery rate. The pattern recognition model based on the micro-calcification of lung CT images aids to classifv the lung lesion disease using

Volume 2519, Issue 1

3 October 2022



THE FIRST
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RESEARCH ARTICLE | OCTOBER 03 2022

Analysis and implementation of a high switching frequency dynamic wireless power transfer technique for electric vehicle charging devices

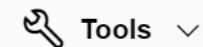
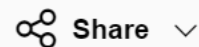
D. Sengeni ; M. Kavitha; Udayakumar Durairaj; K. Sai Subramaniam; V. Prabhu; K. Suriyakrishnaan; H. A. Shivappa



[+ Author & Article Information](#)

AIP Conf. Proc. 2519, 050060 (2022)

<https://doi.org/10.1063/5.0109995>



The Inductively Coupled Power Transfer (ICPT) technology allows for wireless charging of electric vehicles (EVs). This provides user ease and eliminates safety concerns. ICPT has a wide range of applications, including battery charging, industrial loading machines, office

Graph Signal Estimation Based on Maximum Correntropy Criterion (The Work of A. Chandrasekar Was Supported by the MATRICS, SERB, India, Under Grant MTR/2021/000405)

Publisher: IEEE

Cite This

PDF

A. Chandrasekar; S. Radhika All Authors

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Abstract

Document Sections

I. Introduction

II. Preliminary Information Relating To Graph

III. Adaptive g-Mcc Algorithm for Gsp

IV. Simulations

V. Conclusion

Authors

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Abstract:

In order to estimate the graph signal from the small part of samples, a novel adaptive filtering method based on maximum correntropy criterion is proposed in this study. The proposed approach is resistant to environments with impulsive noise. The performance enhancement of the proposed technique is well demonstrated by the simulation results carried out in the context of weather data.

Published in: 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF)

Date of Conference: 05-07 January 2023

INSPEC Accession Number: 22927599

Date Added to IEEE Xplore: 03 April 2023

DOI: 10.1109/ICECONF57129.2023.10084250

► ISBN Information:

Publisher: IEEE

Conference Location: Chennai, India

I. Introduction

Graphs are found to be effective in representation of all data types which results in the popularity of graph-based approach for

Creation of a Drowning Prevention System for Kids Learning in Pool using Computational Technology

Publisher: IEEE Cite This PDF

M. Pushpavalli ; P. Abirami ; P. Sivagami ; M. Kavitha ; C. Bhuvaneswari ; W.Abitha Memala All Authors

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Abstract
Document Sections
I. Introduction
II. Proposed System Block Diagram
III. Simulation Results
IV. Eclipse Software
V. Hardware
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Keywords

Abstract:
Every year, several people drown at the deep end of swimming pools, including young kids, and the lifeguards are ill-prepared to handle these accidents. As a result, it becomes necessary to have a system that will recognize drowning victims and inform lifeguards through voice when such a risk exists. A surveillance system for the swimming pool has a specific function in keeping the area safe. The need for a method to stop newborn drowning is critical. The newborn drowning prevention system prototype was displayed. The project was created using the hardware and software of Android. Differential conductivity sensors are employed in this project to identify drowning incidents. At the earliest possible stage, in swimming pools. When youngsters drown in the swimming pool, their lives are saved. Convenience, cost savings, and a straightforward algorithm are advantages of the conductivity sensor-based demo system. This technology keeps an eye on crucial factors like an infant's movement and drowning state. This information is given to their parents via the GCM network. These important metrics can be measured, and a risky scenario can be communicated to the caregiver through an alarm triggering system to start the appropriate control measures.

Published in: 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF)

Date of Conference: 05-07 January 2023

Date Added to IEEE Xplore: 03 April 2023

INSPEC Accession Number: 22927607

DOI: 10.1109/ICECONF57129.2023.10083598

Evolution of Electric Vehicle-A Review

Publisher: IEEE

Cite This

PDF

R Hari Krishnan ; P Sivagami ; M Pushpavalli ; G Rajesh ; P Abirami ; Mohan Ram

All Authors

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Abstract	Abstract: One of the sectors which play a vital role in causing air pollution is transport sector. The air pollution results in change in climate due to emission of greenhouse gases. Mostly urban regions contribute to more emissions. The global warming has made us to look ahead towards electrification in road transport. Electrification of vehicles replace the internal combustion engines with motors driven by electrical energy. Electric vehicle implies to be promising step towards confronting urban sustainability. Electric mobility technology has a exponential growth, therefore it becomes essential to increase the study about the changes.	
Document Sections	Published in: 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT)	
I. Introduction	Date of Conference: 23-25 January 2023	INSPEC Accession Number: 22810442
II. Types of Electric Vehicles	Date Added to IEEE Xplore: 14 March 2023	DOI: 10.1109/ICSSIT55814.2023.10061001
III. Electric Motors For Ev	► ISBN Information:	Publisher: IEEE
IV. Power Electronics System For Ev	► ISSN Information:	Conference Location: Tirunelveli, India
V. Battery Storage System For EV		
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Authors		
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- -		

T-Type Three Phase Inverter with Grid Connected System used in Renewable Energy Resources

Publisher: IEEE

Cite This

PDF

V. Meenakshi ; M. Kavitha ; A.Santhi Mary Antony ; V.Vijeya Kaveri ; S. Radhika ; D.Godwin Immanuel [All Authors](#)

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Abstract	Abstract:	
Document Sections	To improve the dynamic time response of the grid-connected boost converter and T-type three-phase inverters, this study reviews various models and simulates T-type three-phase inverters using closed loop and open loop systems connected to the grid. A common device in the power quality device family is the active filter. Voltage Source Inverters (VSIs) are used to build the active filter, while sliding mode controllers are used to produce the switching pulses. The active filter is employed to reduce the harmonic current. In order to determine the impact of an active filter using PID and SMC, the simulation results are shown. The simulation outcomes with a coupled system based on PID and hysteresis controllers are compared, together with the corresponding time-domain parameters and lowered voltage and current harmonics are presented. The results show that the Sliding Mode Controller (SMC) system has delivered superior response than PID controlled system.	
I. Introduction	Published in: 2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS)	
II. Voltage Regulation of T-Type Three Phase Inverter with Grid Connected System	Date of Conference: 23-25 March 2023	INSPEC Accession Number: 23001239
III. Simulation Results	Date Added to IEEE Xplore: 25 April 2023	DOI: 10.1109/ICSCDS56580.2023.10104833
IV. Experimental Results	► ISBN Information:	Publisher: IEEE
V. Conclusions		Conference Location: Erode, India
Authors		
Figures		
References		

Hybrid Energy Sources using Current Fed Inverter for High Gain in Single Phase to AC Loads

Publisher: IEEE

[Cite This](#)[PDF](#)Sekar K; Jayaprakash S; Hemalatha M; Raja R [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Literature review

III. Proposed Method

IV. Simulations and Results

V. Conclusion

Authors

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Keywords

Metrics

Abstract:

This article presents the hybrid Renewable Energy Sources (RES) like wind and Fuel Cell (FC) stack used for more efficiency and utilized the current fed inverter. The proposed system has two sources: a current-fed inverter (CFI) and a Proportional Integral (PI) controller controlling the switch. The main objective of the suggested inverter is to provide high voltage gain by two renewable energy sources and produce high voltage for AC loads. Two essential characteristics can achieve this CFI: switching boost inverter and impedance source. Further, the harmonics of the proposed system can be controlled by an LC filter employed nearer to the AC loads. The proposed method is validated by using MATLAB/Simulink software and analyzed through the Simulink waveforms. This THD indicates that the system is executing correctly, and IEEE standards limit THD to 5%. The method with enhanced performance analysis within the range is designed.

Published in: 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS)**Date of Conference:** 02-04 February 2023**INSPEC Accession Number:** 22882081**Date Added to IEEE Xplore:** 27 March 2023**DOI:** 10.1109/ICAIS56108.2023.10073877**► ISBN Information:****Publisher:** IEEE**Conference Location:** Coimbatore, India

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ADVANCED SEARCH

Conferences > 2023 International Conference... ?

Intelligent Power Control Models for the IOT Wearable Devices in BAN Networks

Publisher: IEEE

Cite This

PDF

Arul P ; M. Meenakumari ; Saravanan. L ; Revathi N ; S Jayaprakash ; Subbiah Murugan [All Authors](#)

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Full

Text Views



Abstract

Document Sections

I. Introduction

II. Literature Review

III. Proposed Methodology

IV. Results and Discussions

V. Conclusion

[Authors](#)[Figures](#)[References](#)[Keywords](#)[Metrics](#)

Abstract:

The Internet of Things (IoT) is another useful perspective that brings questions from different disciplines together over the Internet. As more wearable technologies become available on the market, teleworking in Wearable Wireless Body Area Networks (WBAN) is becoming more widespread for Internet of Things-related medical applications. This article proposes a solar-powered wearable touch sensor based on a complete social network (SPWT) and Wi-Fi transmission that connects to a WBAN. Different focal points of the sensor network can be assigned to different points in the frame to determine a person's core temperature and heart rate and understand falls. Software for mobile phones and smartphones that displays sensor data and alerts of falls has also been developed. This software includes a web interface. To increase the service life of the central part of the wearable sensor, the pressure in the middle part mainly uses a full-strength flexible solar-oriented sensor with the result based on superior technology like Maximum power point tracking (MPPT). Preliminary results show that the average element of the wearable sensor performs well, although limited by a fully controlled daylight-based power source. The button-less 24-hour movement is incubated with an initial effect. The proposed local energy storage-based photovoltaic device suggests that WBAN-based long-term continuous medical surveillance is possible because the situation is away from home for a short time per day.

Published in: 2023 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE)

Date of Conference: 27-28 January 2023

INSPEC Accession Number: 22931648

Date Added to IEEE Xplore: 10 April 2023

DOI: 10.1109/IITCEE57236.2023.10090918

Photovoltaic System based Interleaved Converter for Grid System

Publisher: IEEE[Cite This](#)[PDF](#)Kavitha M ; Jones Nirmal L ; Jenin Prabhu R ; Srinivasan P [All Authors](#)**1**Cites in
Paper**39**Full
Text Views

Abstract

Document Sections

I. Introduction

II. Proposed System

III. Results and Discussions

IV. Conclusion

Authors

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References

Citations

Keywords

Metrics

Abstract:

The MPPT controller of a photovoltaic (PV) system fluctuates, increasing solar irradiance, and has complex voltage-current properties. To balance the solar PV system towards the load and design the solar energy system on MPPT, a two-cell interleaved DC-DC boost connected with an inverter is utilized. Using just load voltage statistics, a voltage control technique is created, excluding array current monitoring. When compared to non-coupled pair interleaved conversions, the current conversion design has lower ripple contents from the loads and supply sides, better efficiency, as well as lower switch stress. Consequently, a decreased array capacitance value is enough to stabilize the array voltage output. For maximum power point functioning, analytical formulas for the solar supply and interleaved boost converter are constructed. The power interleaved converter is functioning using the control technique of MPPT, the Perturb and Observe (P&O) algorithm is employed, and the power is supplied to the alternating voltage conversion, and it is connected to the voltage source converter. The modeling and experimental findings are presented here to demonstrate how well suited that particular kind of power converter is for the application. In addition, a comparison of coupled and non-coupled interleaved boost converters for solar applications is performed.

Published in: 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS)**Date of Conference:** 02-04 February 2023**INSPEC Accession Number:** 22881957**Date Added to IEEE Xplore:** 27 March 2023**DOI:** 10.1109/ICAIS56108.2023.10073708**► ISBN Information:****Publisher:** IEEE**Conference Location:** Coimbatore, India

Women Safety Night Patrolling IoT Robot

Publisher: IEEE

[Cite This](#)[PDF](#)R. Mahalakshmi ; M. Kavitha ; B. Gopi ; S.Mohan Kumar [All Authors](#)

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Paper

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Abstract

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- I. Introduction
- II. Related Works
- III. Proposed Model
- IV. Results and Discussion
- V. Conclusion

Authors

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Citations

Keywords

Metrics

Abstract:

Ladies security has emerged as one of the most important needs in our nation, taking into account what is happening in the metro metropolitan neighborhoods and other big urban locations. A simple safety gadget that aids victims in the event of unforeseen danger is essential in this era of cutting-edge technology and smart devices. This study provides a detailed description of the design and implementation of a prototype for an electronic device that could, in the future, function as a safety wear. These days many women, young girls & mothers are seen vanishing from public spaces, streets, and public transit and they face physical and sexual abuse. Most lawsuits are routinely lodged on issues like abduction, intimidation, or assaults and these crimes are rising day by day. To stop these crimes, an embedded system-based Women Safety Night Patrolling IoT Robot is designed for street surveillance to monitor a live update to the control room during nighttime. This also comes with a unique alarm feature that gets triggered when it receives an abnormal level of sound from the environment (these things don't happen quite usually). This night patrolling robot notifies society's people whenever a woman shouts for rescue. This prototype is predefined to patrol the street at night time. Two robots are installed for a road, and the primary purpose of this project is to ensure public safety in emergencies.

Published in: 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT)**Date of Conference:** 23-25 January 2023**INSPEC Accession Number:** 22777063**Date Added to IEEE Xplore:** 14 March 2023**DOI:** 10.1109/ICSSIT55814.2023.10060955**► ISBN Information:****Publisher:** IEEE

High step up converters with EMI filters for Renewable Energy Resources

Publisher: IEEE

Cite This

PDF

K Dinesh ; Abitha W Memala

All Authors

35

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Abstract

Document Sections

- I. Introduction
- II. Classical Boost Converter and Its Performance
- III. Proposed High Step Up Converter with EMI Filter
- IV. Experimental Results
- V. Conclusion

Authors

Figures

References

Abstract:

This paper presents realization of high step up converters for Renewable Energy Resources (RES). The classical boost converter reveals the performance of circuit in all extreme duty ratios. The active and passive filter circuits enhancing boosting capacity of the converter. The transformer less and continuous conduction mode operation of the circuits provides low electromagnetic interference (EMI). The zero voltage and zero current switching operation provide better efficiency and reliability of the converters. High step up converters utilized for non-conventional energy resources, smart grid and battery management system in hybrid electrical vehicle systems. The circuits are simulated with PSpice 9.2 environment for various load levels and applications.

Published in: 2022 International Conference on Computer, Power and Communications (ICCPC)

Date of Conference: 14-16 December 2022

INSPEC Accession Number: 22840724

Date Added to IEEE Xplore: 23 March 2023

DOI: 10.1109/ICCPC55978.2022.10072052

► **ISBN Information:**

Publisher: IEEE

Conference Location: Chennai, India


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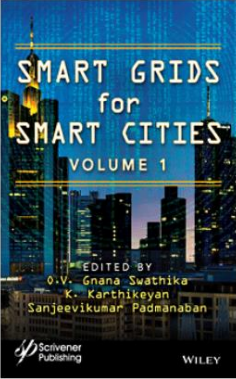
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SMART GRIDS FOR SMART CITIES VOLUME 1



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Kodada Durga Priyanka and Abitha Memala Wilson Duraisamy

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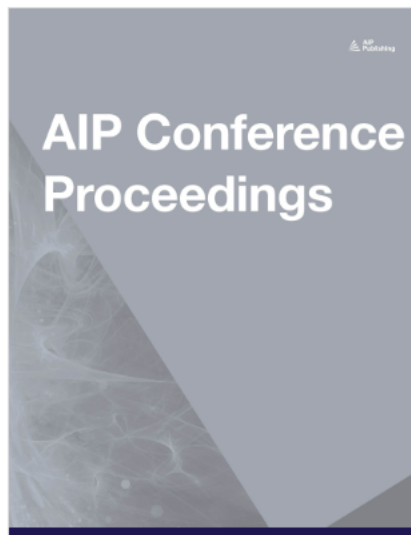
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3.3.3 Multi-Input DC/DC Fundamental Power Converters

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RESEARCH ARTICLE | OCTOBER 03 2022

An application of the frequency-based matrix converter used in a wind energy conversion system using a synchronous generator with synchronous variable-speed, pulse width modulation technique 🛒

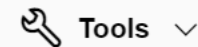
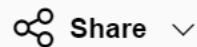
V. Senthil Nayagam ; E. Fantin Irudaya Raj; A. Sasireka; M. Kumarasamy; S. K. Dinesh Kumar; Ram Subbiah; G. Pavithra



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AIP Conf. Proc. 2519, 050001 (2022)

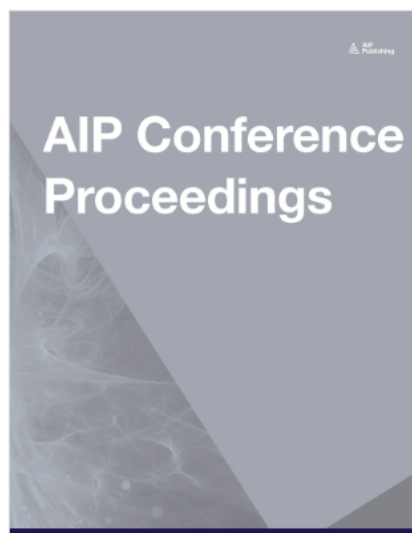
<https://doi.org/10.1063/5.0110786>



An alternative source is growing in popularity with increasing global energy use and

Volume 2519, Issue 1

3 October 2022



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PV system with high voltage gain based DC-DC boost converter for grid applications 🛒

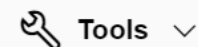
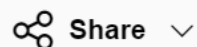
S. Peniel Pauldoss ; K. Sekar; Balachandra Pattanaik; V. Senthil Nayagam



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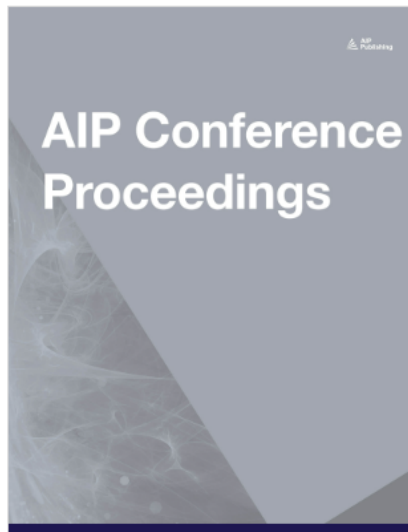
<https://doi.org/10.1063/5.0110680>



The production of electricity from renewable sources is growing. The study proposes to use the wind power grid-based PV system and to use a PWM control system to regulate the solar system with a three-phase grid. This study aims to create a system that enhances

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3 October 2022



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RESEARCH ARTICLE | OCTOBER 03 2022

PV based EV with FC and lead-acid battery

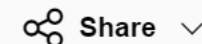
D. Ramya ; D. Godwin Immanuel



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AIP Conf. Proc. 2519, 050062 (2022)

<https://doi.org/10.1063/5.0109720>



The electric vehicle (EV) is set out with less weight as NO STROKE Engine provides customers a pleasant and hospitable atmosphere. Sunshine is used as a source prepared for our solar panels. By charging the engine, the car is running. Hydrogen fuel consumption, battery time and battery energy loss are key markers of fuel cell performance in hybrid cars (FCHVs). The UC and plumbing battery quality shows that a new and simple

IoT-based Solar Panel Tracking System to Enhance the Output Power

Publisher: IEEE

[Cite This](#)[PDF](#)P.K Mani ; Prashant Sunagar ; N S Madhuri ; A. Joseph Lourdu Rajah ; D Ramya. ; I. Kathir [All Authors](#)

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Document Sections

I. Introduction

II. Proposed Work

III. Hardware Requirements

IV. Software Requirements

V. Result and Discussion

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Abstract:

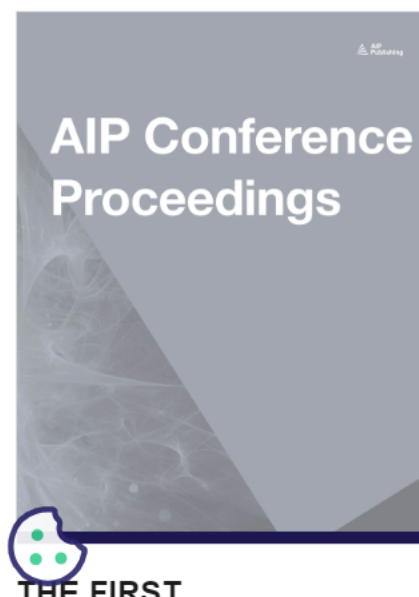
In today's world, power takes an important role in day-to-day life. Power is generated by using different natural resources like light, wind, and water. From the sun, light energy is converted into power with the use of solar panels. Wind energy is converted into power by using a windmill. Hydro energy from water can be converted into power. So, power can be generated with the use of natural resources. By using the solar panel, the light emitting from the sun is converted into power and that power can be used for many purposes. Solar panels can be seen in tall buildings like schools, colleges, offices, and industries. And solar panels can be implemented where the sunlight falls like a terrace in houses, terraces in buildings, and can be on Highway roads. But the sunlight cannot be falling all the time at the same place where the solar panel is implemented in a stable state. So, to observe the light from the sun all the time, Solar Panel Tracking System is implemented based on the domain of the Internet of Things (IoT). With the use of Light Dependent Resistors (LDR), Voltage sensor, Current sensor, Servo motor, NodeMCU, and ThingSpeak Cloud is applied for Solar Panel Tracking System. LDR senses the light from the sun, the Servo motor is used to rotate the panel, and the Voltage and Current sensorssense the voltage and current from the panel for converting to power. NodeMCU configures the sensors and motor and to the cloud. ThingSpeak cloud displays the values of the data.

Published in: 2022 3rd International Conference on Smart Electronics and Communication (ICOSEC)**Date of Conference:** 20-22 October 2022**INSPEC Accession Number:** 22294334**Date Added to IEEE Xplore:** 22 November 2022**DOI:** 10.1109/ICOSEC54921.2022.9952012



Volume 2519, Issue 1

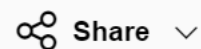
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RESEARCH ARTICLE | OCTOBER 03 2022

Design and comparison of metaheuristic optimization learning approach PID controller for self-balancing bicycle

V. M. Manickavasagam ; M. Prabakaran; K. Balamurugan; Anirudh Srinivas Vellimedu; M. Sudhaka V. Senthil Nayagam; M. Siva Ramkumar

[+ Author & Article Information](#)*AIP Conf. Proc.* 2519, 050067 (2022)<https://doi.org/10.1063/5.0110000>

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Random forest-based method for photovoltaic systems based maximum power point tracking 🛒

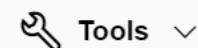
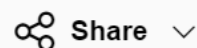
V. Sridevi ; V Senthil Nayagam; K. S. Kavitha Kumari; Shruti A. Gangashetty



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AIP Conf. Proc. 2519, 030016 (2022)

<https://doi.org/10.1063/5.0111043>



Solar energy is one of the key sources of green energy because it is free of emissions, pure, limitless, and plentiful. Solar power has gained tremendous interest across the globe,

Harmonic Distortion reduction in Power System to improve Reliability and power quality

Publisher: IEEE

[Cite This](#)[PDF](#)Dharam Buddhi ; Lijo Jacob Varghese ; Neeraja B ; Sana Sulaiman Hamid ; Ramya.D ; M. Kalyan Chakravarthi [All Authors](#)

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II. Objective

III. Methodology

IV. Monitoring And Control Of
Power System

V. Literature Review

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Abstract:

Power quality issues are caused by the extensive usage of power electronics equipment like rectifiers, inverters, etc. in power systems. One such issue is the the generation of voltage and current overtones that cause equipment heating, demand waveform deformation, overvoltage, dips, and other problems. Additionally, non-linear loads like speed controllers and SMPS exist, and UPS harmonic current production in the power system is caused by etc. They consume reactive energy components of AC mains current, therefore disrupting the supply current waveform. We must thus correct for the harmonic component in order to prevent the effects of harmonics. Shunt Active Power Filters are one of the most efficient ways to eliminate harmonics in a power system, among other methods (SAPF). In order to demonstrate why one technique is superior than another, this paper provides a detailed performance study of SAPF there under dual current management techniques, synchronous frame comparison theory and immediate current and voltage theory (p-q) (d-q). Both methods create a reference current for the filter that balances the power system's reactive power or harmonic current component. The harmonic current controller, which is utilised to provide the IGBT rectifier a corrective gating operation, so aids in the removal of harmonic components, is detailed in this study.

Published in: 2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICESES)

Date of Conference: 15-16 July 2022

INSPEC Accession Number: 22137295

Conferences > 2022 International Conference... ?

Fault Detection and Torque Control in BLDC Motor using AI

Publisher: IEEE

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Karthikeyan Kaliyaperumal ; T. Sathesh Kumar ; Ravi Kant ; Mustafa Mahdi Abdulridha ; Ramya.D ; Anita Gehlot [All Authors](#)

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Abstract

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II. Existing System

III. Proposed System

IV. Simulation Diagram

VI. Conclusion & Future Scope

Abstract:

Due to its longevity, bldc turbines are currently used in many different applications and they are in great demand. In the case of a challenging situation in an aircraft, the powerplant must be securely stopped. In this example, a novel flaw detecting technique is designed to control the frequency of the BLDC motor. LRGF is a synthetic neural network methodology that uses the pole working method to develop systems while taking into account the challenges of dynamically integrating the management system of BLDC motors with analytical problem-solving. All through fault analysis approach, LRGFNN s was used to segregate the fault signal. The adjustable lifting method and otsu thresholding strategy are used to find defects using segregated problem signals with in context of imperfections like both mechanical and electrical mistakes. Reliability of the fault detection system is assessed in a machine that has both a technical and an electromagnetic simulated defect. Additionally, load and resonance problems have been identified.

[Authors](#)

[Figures](#)

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[Keywords](#)

[Metrics](#)

Published in: [2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems \(ICSSES\)](#)

Date of Conference: 15-16 July 2022

INSPEC Accession Number: 22137369

Date Added to IEEE Xplore: 14 October 2022

DOI: [10.1109/ICSSES55317.2022.9914147](#)

► **ISBN Information:**

Publisher: IEEE

Conference Location: Chennai, India

Prediction of Heat Transfer in Smart Buildings using Internet of Things based Artificial Intelligence

Publisher: IEEE

Cite This

PDF

TasneemBano Rehman ; Madiajagan M ; Ramya. D ; M. Saratha ; Mohan Krishna P B ; Prashant Kumar

All Authors

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Abstract	Abstract: With rapid growth and a higher standard of living, the demand for usable energy has increased tremendously over the last few decades, with the construction industry being one of the most notable examples. The energy efficiency of a building is influenced by a variety of factors, including the weather in the area, the structure characteristics, and how people use electricity. These algorithms can be used to generate a prediction model for smart building indoor temperature forecasting using the Internet of Things and several commonly used artificial intelligence algorithms, which can then be used to generate a prediction model for smart building outdoor temperature forecasting. It was necessary to employ freely accessible software tools in order to make geometric and sensory data available in a virtual reality application and to build the PMV and PPD indices. On a low-cost edge computing device, semi-automatic analysis of streaming thermal images from a non-intrusive sensor was performed in order to offer near real-time Mean Radiant Temperature (MRT)estimations. An experimental space that had been mechanically preconditioned was filled with a dynamic temperature environment, and a prototype of the system was employed in a series of trials. Results show that the data backs up the fact that the system output and the heat sensations felt under different settings are consistent.	
Document Sections		
I. Introduction		
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II. Related works		
III. Proposed system		
IV. Results and discussion		
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Authors	Published in: 2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC)	
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References	Date of Conference: 17-19 August 2022 INSPEC Accession Number: 22068201	
Keywords	Date Added to IEEE Xplore: 19 September 2022 DOI: 10.1109/ICESC54411.2022.9885554	

Quality of Service Factor based Unfailing Route Formation in Wireless Sensor Network

Publisher: IEEE Cite This PDF

S. Yuvarani ; A. Gayathri ; K.Jayasakthi Velmurugan ; V. Meenakshi ; S Sadhana ; C. Srinivasan All Authors

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Abstract
Document Sections
I. Introduction
II. Related Works
III. Proposed Method
IV. Simulation Analysis
V. Conclusion
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Abstract:
Nowadays, several analytical methods exist to make unfailing route formation. However, it is still challenging work because the wireless medium is unreliable. Sensor nodes are utilized for widespread distribution. Thus, security issues greatly affect wireless sensor networks (WSN). The Quality of Service Factor-based Unfailing Route (QFUR) Formation in WSN is introduced to solve these issues. In this approach, Quality of Service (QoS) factors like sensor node delay, packet drop, and residual energy is verified to determine whether the sensor node is normal. The value of the QoS factor is less than the threshold for that node to be a normal sensor node in the WSN. This approach is serious to notice and separate the compromised nodes from evading misinformation through the falsified data inserted by the opponent over compromised nodes. The Reinforcement Learning (RL) algorithm computes the reward value based on node energy utilization, hop count, dropped rate, and delay. The simulation outcomes demonstrate a lesser delay and lesser packet loss in the network. Furthermore, it improves the opponent node's detection and minimizes the false negative ratio in the WSN.

Published in: 2023 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE)

Date of Conference: 27-28 January 2023	INSPEC Accession Number: 22931564
Date Added to IEEE Xplore: 10 April 2023	DOI: 10.1109/IITCEE57236.2023.10090966

Crypto Analysis with Modified Diffie–Hellman Key Exchange based Sensor Node Security Improvement in Wireless Sensor Networks

Publisher: IEEE

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PDF

J. Rangarajan ; K Suriyakrishnaan ; V. Meenakshi ; M. Tholkapiyan [All Authors](#)

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Abstract

Document Sections

I. Introduction

II. Related Works

III. Proposed Method

IV. Simulation Results

V. Conclusion

Authors

Figures

References

Keywords

Metrics

Abstract:

Sensor nodes sense ecological situations, for example, strain, temperature, humidity, vibration, sound, and location. Because of the transportable information through the logically showing wireless channel, there is a considerable risk to the data security of wireless sensor networks (WSN). Since WSNs are decentralized across their whole structure, man-in-the-middle attacks, also known as MIM attacks, are more susceptible to becoming successful. This article presents a method for the protection of data that requires less time for both calculation and response. The Diffie–Hellman has been strengthened so that it can better withstand attacks by having it produce a hash of each value sent over the network. This approach proposes Cryptanalysis with Modified Diffie–Hellman key exchange (CMDH) based Sensor node Security improvement in Wireless Sensor Networks. This approach uses a modified version of the Diffie–Hellman algorithm to produce a key; the sender encrypts the data and sends the receiver the information in an encrypted form. Finally, the recipient sensor node decrypted the data. This approach is separated into two parts: generating key and data encryption. Every value is hashed, and the resulting hash is sent via the WSN. This approach is mainly used for military applications in the WSN. The simulation analysis shows that the CMDH method executes better performance.

Published in: 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS)**Date of Conference:** 02-04 February 2023**INSPEC Accession Number:** 22882013**Date Added to IEEE Xplore:** 27 March 2023**DOI:** [10.1109/ICAIS56108.2023.10073749](https://doi.org/10.1109/ICAIS56108.2023.10073749)

Blockchain based Reliable Electronic Voting Technology

Publisher: IEEE Cite This PDF

V. Vijeya Kaveri ; V. Meenakshi ; Ananth S ; Akshayavarshini P ; KavyaShree B All Authors

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1. Introduction
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3. Literature Review
4. Existing System
5. Proposed System
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Abstract:
In this digital era, developing a secure as well as democratically responsible vote casting system is becoming an increasingly challenging task. This research study attempts to integrate the blockchain technology to develop a secured and distributed electronic voting system. The primary objective of this research study is to develop a decentralized voting system, which can easily support an open, rational, and easily verifiable democratic plan. The obtain results prove that the proposed smart and reliable electronic voting machine is beneficial for the current and future democratic framework by implementing an essential E-vote casting features along with a provision to allow the citizens to change/update their vote within the given time slot.

Published in: 2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC)

Date of Conference: 17-19 August 2022	INSPEC Accession Number: 22068086
Date Added to IEEE Xplore: 19 September 2022	DOI: 10.1109/ICESC54411.2022.9885278
► ISBN Information:	Publisher: IEEE
	Conference Location: Coimbatore, India



Arnold Chiari Malformations- A Short Review

Voleti Vijaya Kumar ; R. E. Ugandar ; Y. Ismail ; N. Delhiraj ; P. Shanmuga Pandiyan ; M. Ravi ; D. Chinababu ; B. Hari Kiran ; N. Jawad Hussain ; K. Sai Shanmukha Sharma

Research Highlights in Disease and Health Research Vol. 3, 1 March 2023, Page 19-31

<https://doi.org/10.9734/bpi/rhdhr/v3/4517C>

Published: 2023-03-01

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Abstract

Chiari Malformation (Arnold-Chiari)-is a serious neurological disorder characterized by downward displacement the parts of cerebellum, where the bottom part of the brain, the cerebellum, fourth ventricle, pons and medulla oblongata into the spinal canal and putting pressure on both the brain and spine causing many symptoms. This is one of the causative factors of death in neonates and infants. Chiari malformations involve both skeletal and neural structures. Earlier it was estimated that the occurrence of chiari malformation is 1 in 1000 births but the occurrence of this condition was increased with the increased use of imaging techniques such as CT scans and MR imaging. However, it is very difficult to estimate the exact rate of occurrence as some of cases as asymptomatic or do not develop symptoms till adulthood. This review mainly focuses on thorough understanding of the direct and indirect sonographic findings, which are necessary for diagnosis of chiari II malformation in the developing fetus. The role of prenatal sonography in recognition of the malformation and prognostic value of these features are discussed.

Keywords: Neurological disorder; MR imaging; prenatal sonography; prognostic value

Current Overview on Pharmaceutical Science

Vol. 9

Edited by Dr. Barkat Ali Khan



B P International

Study on Formulation and *In-vitro* Characterization of Floating Microspheres of Lamivudine

**Voleti Vijaya Kumar^{a++}, Kommu Pradeep^b,
R. Niranjana Kumar^{c#}, K. Ravikumar Kota^{c#},
Sadhu Nelson Kumar^{d†}, C. Rajaram^{d‡}, B. Narasimha Rao^{e‡},
Y. Ismail^f and P. Shanmuga Pandiyan^{a^}**

DOI: 10.9734/bpi/cops/v9/4640C

ABSTRACT

The current study was concerned with the formulation and in vitro evaluation of floating microspheres of lamivudine by inclusion of different concentrations of HPMC K 100M, to increase the gastric residence time of lamivudine and reduced dosage frequency. Floating drug delivery system is one of the methods to increase the gastric residence time. Preformulation studies performed to confirm the purity of drug and to find the drug excipient interactions with FTIR studies. The ionotropic gelation process was used to create the gastro retentive floating microspheres. For SEM analysis, in-vitro buoyancy studies, and in-vitro dissolving studies, the produced microspheres were assessed. By using FTIR and DSC analysis, the compatibility of the medicine and excipient was verified. According to in-vitro drug release studies, formulation F5, which contains HPMC K100M as a release retardant polymer at a concentration of 1:2 to the drug, was able to sustain drug release for up to 14 hours. The Korsmeyer equation and

^a School of Pharmacy, Sathyabama Institute of Science and Technology, Kamaraj Nagar, Semmancheri, Chennai, Tamil Nadu-600119, India.

^b BA&KR College of Pharmacy, NH-7, Ongole, Prakasam District, Andhra Pradesh, India.

^c Santhiram College of Pharmacy, NH-18, Nandyal, Nandyal dist, Andhra Pradesh-518501, India.

^d Department of Pharmacology, P Ramireddy Memorial College of Pharmacy, Kadapa, Andhra Pradesh, India.

^e Department of Pharmaceutics, P Ramireddy Memorial College of Pharmacy, Kadapa, Andhra Pradesh, India.

^f Crescent School of Pharmacy, B.S. Abdur Rahman Crescent Institute of Science & Technology, Vandalur, Chennai, Tamil Nadu-600119, India.

⁺⁺ Assistant Professor;

[#] Associate Professor;

[†] Principal & Professor;

[‡] Professor & HoD;

[^] Dean;

*Corresponding author: E-mail: vijay66vbk@gmail.com;

ADVANCES IN SCIENCE AND TECHNOLOGY VOLUME II

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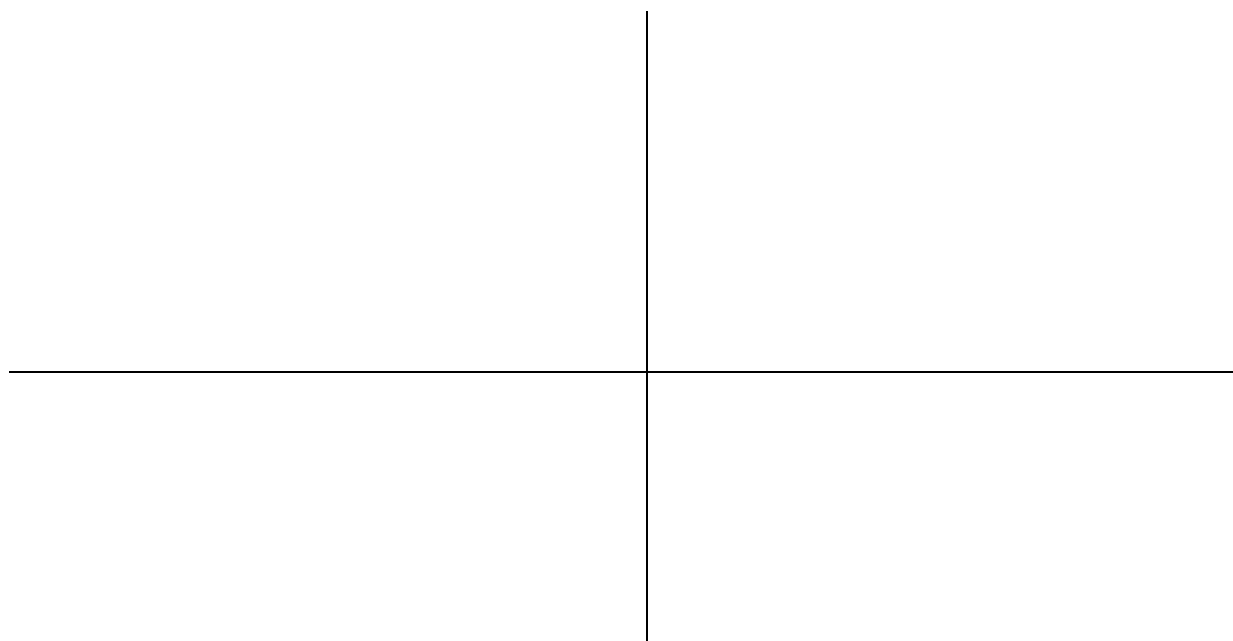


First Edition: 2023

Advances in Science and Technology Volume II

(ISBN: 978-93-91768-88-1)

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Bhumi Publishing

2023

First Edition: April, 2023

ISBN: 978-93-91768-88-1



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Bhumi Publishing,

Nigave Khalasa, Kolhapur 416207, Maharashtra, India

Website: www.bhumipublishing.com

E-mail: bhumipublishing@gmail.com

Book Available online at:

<https://www.bhumipublishing.com/book/>



PREFACE

Science and technology have been integral to human progress since the dawn of civilization. From the development of basic tools to the advanced technologies we use today, science and technology have enabled us to explore new frontiers and make incredible advancements in our understanding of the world around us.

*The purpose of this book, *Advances in Science and Technology*, is to showcase some of the latest research and innovations in the field. We have gathered contributions from experts in various scientific and technological disciplines to provide a comprehensive overview of the most recent developments.*

The topics covered in this book are diverse, ranging from advances in artificial intelligence and robotics, to breakthroughs in medical research and environmental sustainability. The research presented here is at the cutting edge of their respective fields and demonstrates the potential for further advancements in the years to come.

We hope that this book will inspire new ideas and encourage collaboration among researchers and innovators. Our goal is to promote the continued growth and development of science and technology, as we believe that they are essential for addressing the challenges facing our world today.

We would like to thank all the contributors who have shared their expertise and insights in this book. We would also like to thank the editors, reviewers, and everyone else involved in bringing this project to fruition.

We hope that readers will find this book informative and thought-provoking, and we look forward to seeing the impact of the research presented here on the future of science and technology.

Editors

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VIABILITY ASSAY OF RAT PERITONEAL MACROPHAGES BY ARSENIC TRIOXIDE (ATO): THE POSSIBLE FUTURE PROSPECTS OF NANOMEDICINE DELIVERING ARSENIC TRIOXIDE (ATO) FOR DISEASE THERAPY

**Srikanta Guria*¹, Ohidul Middya¹, Debrina Saha¹,
Asik Billa Hossain¹ and Samar Chattopadhyay²**

¹Post Graduate Department of Zoology,

²Post Graduate Department of Physics,

Barasat Govt. College, Barasat, Kolkata-700124, West Bengal, India

*Corresponding author E-mail: guriasrikanta@gmail.com, srikantaguria81@gmail.com

Abstract:

Exposure of humans to arsenic is associated with various adverse health effects including immunotoxicity. Arsenic toxicity toward macrophages is complex. In the present study we investigated viability assay of peritoneal macrophages isolated from rat exposed for 2 weeks to Arsenic Trioxide (ATO) in water at 0.5, 5, and 50 mg As/l. Normal saline (0.9% NaCl) was injected into rat peritoneum and the aspirate was taken for macrophage study. Peritoneal fluid was smeared on glass slides. The adherent macrophages were stained by Giemsa. Cells were treated with 50 μ l of 0.25 % trypan blue dye solution for 5 minutes and observed under light microscope. Significant number of treated peritoneal macrophages (5 and 50 mg As/l) showed trypan blue (TB) positive response. Arsenic treatment at 0.5mg As/l dose increased cell aggregation. These inorganic arsenicals mainly caused necrotic cell death with partially apoptotic cell death; about 80% of dead cells were necrotic, and 20% were apoptotic. Hence, the arsenic trioxide (ATO) has capacity to kill the cells, it can be used as nano medicine to treat cancer. Different studies reported the role of arsenic trioxide in the implementation of nanotechnology for arsenic trioxide delivery to solid cancer cells. So, arsenic is both poisonous and therapeutically useful. But further study is needed to better understand the relationship between As exposure and macrophage immunotoxicity and therapeutic approaches.

Keywords: Arsenic Trioxide, Macrophages, Immunotoxicity, Nano medicine

Introduction:

Although extensive research has focused on investigating arsenic (As) carcinogenicity, growing evidence indicates that As also has deleterious effects on the immune system (Selgrade, 2007; Vahter, 2008). The specific effects of As on immune function remain poorly understood. Here, we summarize the known toxicological effects of As on macrophage function. Arsenic exposure in animals suppresses macrophage production of NO⁻ and/or O₂⁻, release of TNF- α and phagocytosis (Sengupta and Bishayi,

2002). Arsenic can also induce apoptosis in macrophages, as seen in 3-fold increased DNA fragmentation in splenic macrophages from As III-exposed mice (Sengupta and Bishayi, 2002). Lemarie *et al.*, 2006 stated As exposure disrupted monocyte/macrophage survival, development and function in vitro. As₂O₃-exposed human blood monocytes and U937 promonocytic cells underwent marked apoptosis during macrophagic differentiation, through inhibition of NF- κ B-related survival pathways (Lemarie *et al.*, 2006 a & b).

Further, As reversed macrophage specific features, and impaired phagocytosis leading to macrophagic “de-differentiation” (Sakurai *et al.*, 2006).

Hence the arsenic trioxide (ATO) has capacity to kill the cells, it can be used as nano medicine to treat cancer. Different studies reported the role of arsenic trioxide in the implementation of nanotechnology for arsenic trioxide delivery to solid cancer cells.

Materials and Methods:

In the present study we investigated viability assay of peritoneal macrophages isolated from rat exposed for 2 weeks to Arsenic Trioxide (ATO) in water at 0.5, 5, and 50 mg As/l.

Normal saline (0.9% NaCl) was injected into rat peritoneum and the aspirate was taken for macrophage study. Peritoneal fluid was smeared directly on sterilized glass slides and incubated at 37°C in a humid chamber for 3 hours. The adherent macrophages were fixed by methanol and stained by Giemsa and observed under light microscope. Cells were treated with 50 μ l of 0.25 % trypan blue dye solution for 5 minutes. Cells that have taken up the dye are dead, since the dye is normally excluded by the membranes which maintain their semi permeability intact and therefore, the percentage of blue-stained cells represents a mortality index.

Result:

Dead macrophages were blue in colour whereas the viable cells of controls were white. Mean mortality index was significantly increased in treated group. The result showed, arsenic treatment at 0.5mg As/l dose increased cell aggregation (picture not shown). Significant number of treated peritoneal macrophages (5 and 50 mg As/l) showed trypan blue (TB) positive response (Fig.1, 2, 3 and 4).

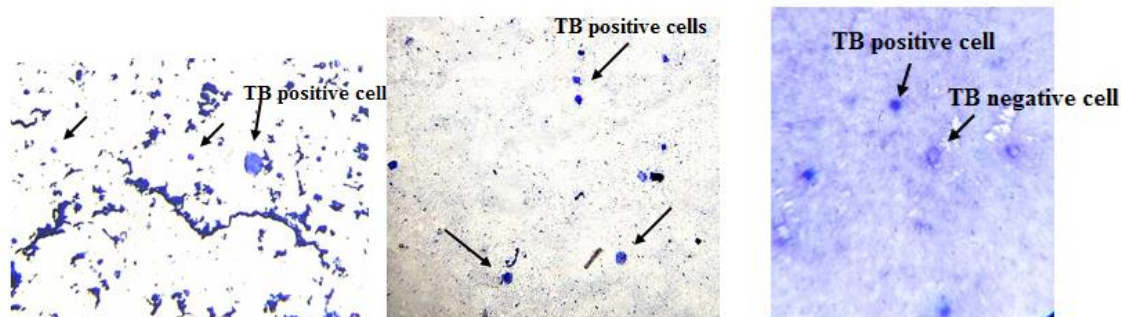


Figure 1: Trypan blue (TB) positive peritoneal macrophages isolated from rat exposed to Arsenic Trioxide in water at 5 mg As/l. (indicated by arrow) (x100)

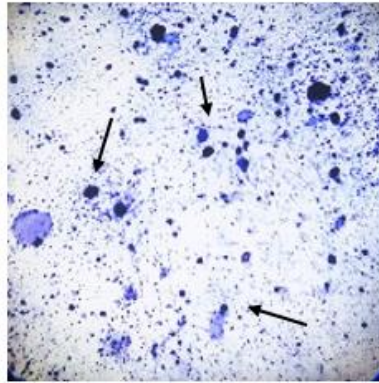


Figure 2: Trypan blue (TB) positive peritoneal macrophages isolated from rat exposed to Arsenic Trioxide in water at 50 mg As/l. (indicated by arrow) (x100)

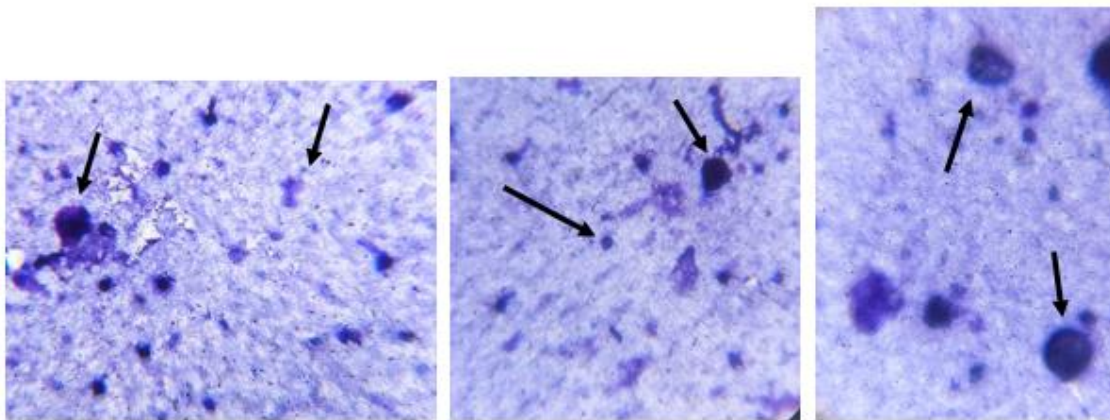


Figure 3: Trypan blue (TB) positive peritoneal macrophages isolated from rat exposed to Arsenic Trioxide in water at 50 mg As/l. (indicated by arrow) (x 400)

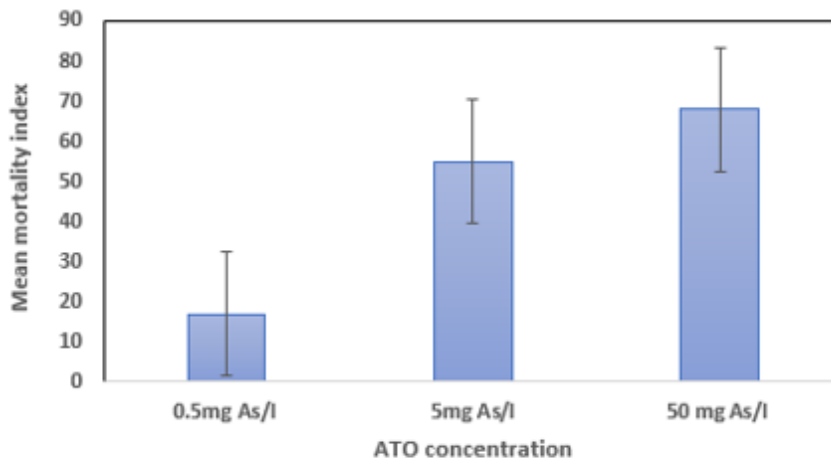


Fig.4

Figure 4: Mean mortality index in peritoneal macrophages isolated from rat exposed to Arsenic Trioxide (ATO) in water at 0.5, 5, and 50 mg As/l. Values are expressed as Mean $\pm$ SEM.

Discussion:

Guria *et al.*, 2012 reported clearly that arsenic toxicity adversely affected peritoneal macrophages and spleen cell function. Significant number of peritoneal macrophages and spleen cells were found to be pyknotic and reduced in number. Arsenic treated cells showed membrane blebbing and fragmentation. The cellular death was also confirmed by Trypan blue staining. An increased rate of macrophage death causes a decrease of immune function in arsenic poisoning (Guria *et al.*, 2012; Gardner, 1984; Bustamante *et al.*, 1997). The inorganic arsenicals mainly caused necrotic cell death with partially apoptotic cell death; about 80% of dead cells were necrotic, and 20% were apoptotic.

The present result revealed significant number of treated peritoneal macrophages (5 and 50 mg As/l) showed trypan blue (TB) positive response (Fig.1, 2, 3 and 4).

Hence the arsenic trioxide (ATO) has capacity to kill the cells, it can be used as nano medicine to treat cancer. Different studies reported the role of arsenic trioxide in the implementation of nanotechnology for arsenic trioxide delivery to solid cancer cells. Anti-cancer activity of free ATO has been tested on a variety of solid tumor cell lines. Zhao and co-workers (Zhao *et al.*, 2008) administered direct intra-tumoral injections of ATO to human esophageal carcinoma xenografts in mice. Tumor growth inhibition was observed. Arsenic trioxide has been used alone and in combination as drug therapy for acute promyelocytic leukemia (Teran *et al.*, 2019). The efficacy and mechanism of arsenic trioxide nanoparticles in the treatment of Hepatocellular carcinoma (HCC) were reported by Jian Hu *et al.*, 2019. Arsenic trioxide alone and arsenic trioxide nanoparticles were conveniently administered to mice intratumorally using a needle. Compared with As₂O₃, As₂O₃ nanoparticles (As₂O₃-NPs) showed pyroptosis, a type of programmed necrosis in vitro (Jian Hu *et al.*, 2019). Moon *et al.*, 2002 showed Arsenic trioxide (As₂O₃) to be an effective inducer of apoptosis in patients with relapsed acute promyelocytic leukemia (APL). As₂O₃ was able to induce the apoptotic activity in K562 cells (Human chronic myelogenous leukemia cells), and its apoptotic mechanism was associated with activation of caspase-3 (Moon *et al.*, 2002). So, arsenic is both poisonous and therapeutically useful. But further study is needed to better understand the relationship between As (arsenic) exposure, macrophage immunotoxicity and therapeutic approaches.

Acknowledgement:

The corresponding author is thankful to Head, Post Graduate Department of Zoology and Principal, Barasat Govt. College for necessary support.

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THEORETICAL INTERPRETATION OF EXCESS VISCOSITY OF POLAR LIQUID MIXTURES FROM 298.15-318.15K

Naveen Awasthi

Department of Chemistry,

Janta College Bakewar (206124), Etawah, India

Corresponding author E-mail: nvn_awsthi@rediffmail.com

Abstract:

Excess volume and Excess viscosity are two important physico-chemical properties for the analysis of molecular interactions present in various liquid mixtures. Excess volume and Excess viscosity were computed for two polar binary liquid mixtures Benzyl alcohol + 2- Propenol, 2-Phenyl ethanol over the entire range of concentration from 298.15-318.15K temperatures and atmospheric pressure from statistical model of Flory. Results were compared and tested with literature values and represented in terms of molecular interactions.

Keywords: Excess viscosity, Binary mixture, Excess Volume, Statistical model

Introduction:

In past few years the knowledge of physico-chemical properties such as density, viscosity, surface tension and refractive index of liquid mixtures has wide range of interest in many pharmaceutical and technological areas. Among these physico-chemical properties, viscosity data play a significant role in process simulations, equipment design and molecular dynamics Wang *et al.* (2005) and Mchaweheh *et al.* (2004) and prediction of molecular interaction between the binary liquid system Shukla *et al.* (2011). In the continuation of previously published work Awasthi *et al.* (2017), this paper is concerned with the theoretical evaluation of Excess viscosity for Benzyl alcohol +2-Propenol and Benzyl alcohol+2 -Phenyl ethanol over the entire range of concentration from 298.15-318.15K from the experimental work of Ching-Ta and Chein-Hsiun Tu Ching Ta *et al.* (2007). Flory statistical liquid state model Flory *et al.* (1965) was used for theoretical evaluation of Excess viscosity at three different temperatures. Excess volume Awasthi *et al.* (2019) computed from Flory statistical model for both the binary liquids at different temperatures were used to analyze the extent of molecular interaction between the binary liquid mixtures. The main purpose of this work to analyze the effect of temperatures on intermolecular interactions between polar binary liquid mixtures.

Modeling

1. Flory liquid state model

Flory proposed a model Flory *et al.* (1965) based on non-association concept and the behavior of liquids are additive during the determination of mixing properties. Viscosity of liquid mixtures were computed by the following equation:

$$\begin{aligned} \ln \eta = & x_1 \ln \eta_1 + x_2 \ln \eta_2 - [x_1 P_1^* v_1^* \left\{ \frac{1}{\tilde{v}_1} - \frac{1}{\tilde{v}} \right\} + 3\tilde{T}_1 \ln\{ \\ & (v_1^{-1/3} - 1)/(V^{-1/3} - 1)\} + x_2 P_2^* v_2^* \{(1/\tilde{v}_2) - (1/\tilde{v})\} \\ & + 3\tilde{T}_2 \ln\{(v_2^{-1/3} - 1)/(\tilde{v}^{-1/3} - 1)\} + x_1 v_1^* \theta_2 X_{12}/\tilde{V}_1]/RT \\ & + 1/(\tilde{v}-1) - x_1/(\tilde{v}_1-1) - x_2/(\tilde{v}_2-1) \end{aligned} \quad (1)$$

Where P^* , v^* , $\tilde{v}$, $\tilde{T}$, θ and X_{12} are the characteristic pressure, characteristic volume, reduced volume, reduced temperature, site fraction and interaction parameters respectively. Which are calculated by the following equations:

Reduced volume can be calculated by the help of following expression

$$\tilde{v} = \frac{V}{x_1 v_1^* + x_2 v_2^*} \quad (2)$$

$$V = \frac{M_1 x_1 + M_2 x_2}{\rho_{mix}} \quad (3)$$

Where ρ_{mix} is the density of binary liquid mixture.

Characteristic. temperature of binary liquid mixture can be calculated from the following expression.

$$T^* = \frac{P^*}{\frac{\Psi_1 P_1^*}{T_1} + \frac{\Psi_2 P_2^*}{T_2}} \quad (4)$$

Where P^* is the characteristic pressure of binary liquid mixtures.

$$P^* = [\Psi_1 P_1^* + \Psi_2 P_2^* - (\Psi_1 \theta_2 X_{12})] \quad (5)$$

Where ψ_1 and ψ_2 is segment fraction, θ_2 is the site fraction of component 2 and X_{12} is the interaction parameters.

$$\begin{aligned} \psi_2 &= \frac{X_2}{X_2 + X_1(V_1^*/V_2^*)} \\ \psi_1 &= 1 - \psi_2 \end{aligned} \quad (6)$$

site fraction is given by the following expression

$$\theta_2 = \frac{\psi_2}{\psi_2 + \psi_1(V_2^*/V_1^*)^{1/3}} \quad (7)$$

$$\theta_1 = 1 - \theta_2 \quad (8)$$

The interaction parameter X_{12} is obtained by adopting familiar Berthelot relationship $\eta_{ij} = (\eta_{ii}\eta_{jj})^{1/2}$ can be expressed as

$$X_{12} = P_1^* [1 - (P_2^* / P_1^*)^{1/2} (v_2^* / v_1^*)^{1/6}]^2 \quad (9)$$

Result and Discussion:

Table1 represent the density, experimental and theoretical values of Molar volume, Viscosity, Excess viscosity, and Excess volume computed for binary liquid mixture of Benzyl alcohol +2-Propenol by Flory liquid state model from 298.18-318.15K over the entire range of concentration and atmospheric pressure. Whereas Table2 represent the density, experimental and theoretical values of Molar volume, Viscosity, Excess viscosity, and Excess volume computed for binary liquid mixture of Benzyl alcohol +

$$\eta^E = \eta_{\text{Flory}} - (X_1\eta_1 + X_2\eta_2) \quad (10)$$

2-Phenyl ethanol by Flory liquid state model from 298.18-318.15K over the entire range of concentration and atmospheric pressure. A perusal of table 1 reveals that the density of binary liquid mixture decreases with increase in temperature whereas the Molar volume increases with increase in temperature. Which means that the molecular interactions become weak as we increase the temperature. Excess viscosity computed from Flory model firstly decreases as molar concentration increases up to certain limit than increases.

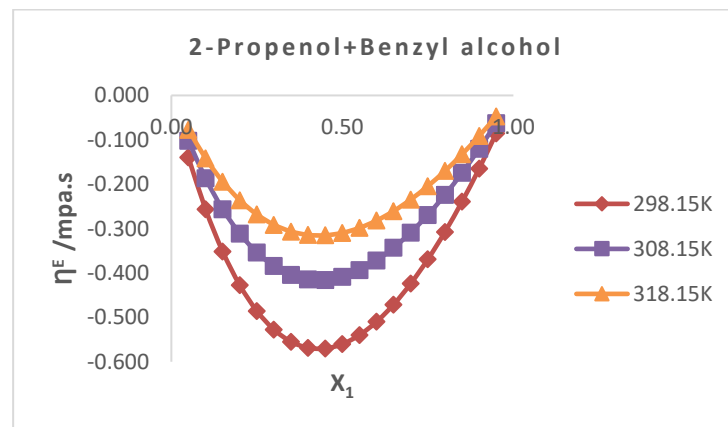


Figure 1: Variation of Excess viscosity from 298.15-318.15K

Similar trends were observed for all the temperatures as shown in Fig. (1). The values of Excess viscosity computed for Benzyl alcohol +2-Propenol decreases with increase in temperature. Which clearly confirm that intermolecular association decreases with increase in temperature Awasthi (2022). A careful observation of table2 reveals that the density of binary liquid mixture Benzyl alcohol+2 -Phenyl ethanol increases with molar concentration while decreases with increase in temperature. Molar volume also increase

with temperature, which indicate that molecular association (dipolar-dipolar) becomes weak and spacing between the components of binary liquid mixture becomes large.

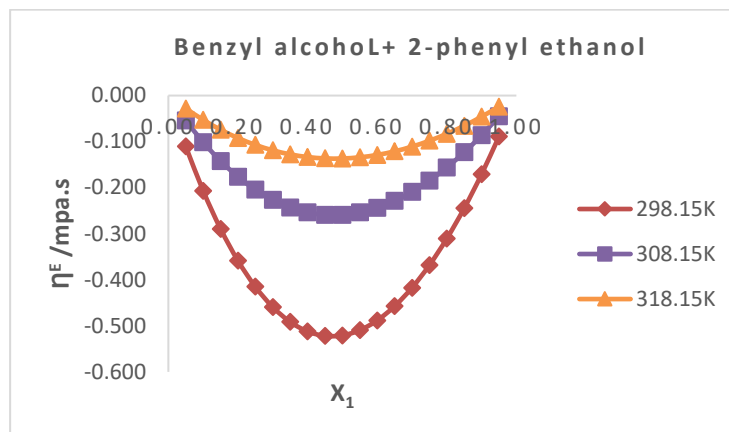


Figure 2: Variation of Excess viscosity from 298.15-318.15K

Excess viscosity decreases in magnitude as temperature increases from 298.15-318.15K as shown in figure 2. Trends are almost similar for all the three temperatures.

Table 1: Excess thermodynamic properties of 2- Propanol +Benzyl alcohol from 298.15-318.15k

X_1	ρ^{MIX}	V_M	η^{EXP}	$V^{\text{E}}_{\text{Exp}}$	$V^{\text{E}}_{\text{Theo}}$	$\eta^{\text{E}}_{\text{Exp}}$	$\eta^{\text{E}}_{\text{Theo}}$
T=298.15K							
0.05	1.03	102.38	5.299	-0.118	-0.118	-0.082	-0.140
0.10	1.02	100.94	5.053	-0.211	-0.211	-0.155	-0.256
0.15	1.01	99.51	4.799	-0.291	-0.291	-0.235	-0.351
0.20	1.00	98.10	4.559	-0.359	-0.358	-0.301	-0.427
0.25	0.99	96.69	4.332	-0.426	-0.426	-0.355	-0.485
0.30	0.98	95.29	4.116	-0.482	-0.481	-0.397	-0.528
0.35	0.97	93.89	3.911	-0.529	-0.529	-0.428	-0.555
0.40	0.96	92.51	3.714	-0.565	-0.565	-0.452	-0.569
0.45	0.95	91.14	3.523	-0.596	-0.596	-0.469	-0.570
0.50	0.94	89.77	3.335	-0.614	-0.614	-0.484	-0.560
0.55	0.92	88.42	3.169	-0.624	-0.623	-0.476	-0.540
0.60	0.91	87.08	3.010	-0.617	-0.616	-0.461	-0.510
0.65	0.90	85.75	2.858	-0.598	-0.598	-0.440	-0.471
0.70	0.88	84.44	2.715	-0.659	-0.568	-0.409	-0.424
0.75	0.87	83.14	2.580	-0.521	-0.521	-0.370	-0.369
0.80	0.85	81.86	2.460	-0.456	-0.455	-0.317	-0.307
0.85	0.84	80.59	2.346	-0.376	-0.376	-0.257	-0.239
0.90	0.82	79.35	2.251	-0.277	-0.277	-0.178	-0.165
0.95	0.80	78.12	2.148	-0.154	-0.154	-0.108	-0.085

T=308.15K

0.05	1.03	103.16	3.910	-0.126	-0.126	-0.056	-0.102
0.10	1.02	101.72	3.730	-0.224	-0.224	-0.109	-0.187
0.15	1.01	100.29	3.558	-0.308	-0.308	-0.154	-0.256
0.20	1.00	98.88	3.389	-0.381	-0.381	-0.195	-0.311
0.25	0.99	97.47	3.230	-0.448	-0.448	-0.227	-0.354
0.30	0.98	96.07	3.076	-0.503	-0.503	-0.254	-0.384
0.35	0.96	94.68	2.921	-0.553	-0.553	-0.282	-0.404
0.40	0.95	93.30	2.772	-0.592	-0.591	-0.304	-0.414
0.45	0.94	91.93	2.631	-0.624	-0.623	-0.318	-0.415
0.50	0.93	90.57	2.490	-0.641	-0.641	-0.332	-0.408
0.55	0.92	89.22	2.370	-0.650	-0.650	-0.324	-0.393
0.60	0.90	87.88	2.256	-0.642	-0.641	-0.311	-0.371
0.65	0.89	86.56	2.145	0.623	-0.623	-0.295	-0.343
0.70	0.87	85.25	2.042	-0.593	-0.592	-0.271	-0.309
0.75	0.86	83.95	1.946	-0.548	-0.548	-0.240	-0.269
0.80	0.84	82.68	1.851	-0.481	-0.481	-0.208	-0.224
0.85	0.83	81.42	1.761	-0.393	-0.393	-0.170	-0.174
0.90	0.81	80.18	1.675	-0.290	-0.290	-0.129	-0.120
0.95	0.79	78.97	1.602	-0.166	-0.166	-0.075	-0.062

T=318.15K

0.05	1.02	103.96	2.989	-0.131	-0.131	-0.034	-0.077
0.10	1.01	102.52	2.864	-0.237	-0.237	-0.062	-0.141
0.15	1.00	101.10	2.745	-0.324	-0.323	-0.084	-0.194
0.20	0.99	99.68	2.628	-0.400	-0.400	-0.104	-0.236
0.25	0.98	98.28	2.513	-0.469	-0.468	-0.122	-0.268
0.30	0.97	96.89	2.400	-0.527	-0.526	-0.138	-0.291
0.35	0.96	95.50	2.285	-0.578	-0.578	-0.156	-0.307
0.40	0.94	94.12	2.172	-0.618	-0.618	-0.172	-0.314
0.45	0.93	92.75	2.059	-0.651	-0.651	-0.188	-0.315
0.50	0.92	91.40	1.953	-0.668	-0.668	-0.198	-0.310
0.55	0.91	90.06	1.858	-0.674	-0.674	-0.196	-0.298
0.60	0.89	88.73	1.769	-0.666	-0.665	-0.188	-0.282
0.65	0.88	87.42	1.680	-0.646	-0.646	-0.180	-0.260
0.70	0.87	86.11	1.594	-0.619	-0.619	-0.169	-0.234
0.75	0.85	84.81	1.511	-0.577	-0.576	-0.155	-0.204

0.80	0.83	83.55	1.434	-0.503	-0.503	-0.135	-0.170
0.85	0.82	82.30	1.359	-0.415	-0.415	-0.113	-0.132
0.90	0.80	81.07	1.295	-0.306	-0.306	-0.080	-0.091
0.95	0.78	79.87	1.228	-0.171	-0.171	-0.050	-0.047

Table 2: Excess thermodynamic properties of 2-Phenyl ethanol +Benzyl alcohol from 298.15-318.15k

X_1	ρ^{MIX}	V_M	η^{EXP}	V^{EExp}	V^{ETheo}	η^{EExp}	η^{ETheo}
T=298.15K							
0.05	1.02	119.30	11.068	-0.095	-0.095	-0.045	-0.111
0.10	1.02	118.37	10.734	-0.201	-0.201	-0.086	-0.207
0.15	1.02	117.43	10.406	-0.322	-0.322	-0.122	-0.289
0.20	1.02	116.51	10.082	-0.431	-0.431	-0.153	-0.359
0.25	1.03	115.59	9.759	-0.535	-0.535	-0.184	-0.415
0.30	1.03	114.68	9.440	-0.618	-0.618	-0.210	-0.459
0.35	1.03	113.80	9.125	-0.682	-0.682	-0.233	-0.491
0.40	1.03	112.93	8.816	-0.738	-0.738	-0.249	-0.512
0.45	1.03	112.06	8.506	-0.782	-0.782	-0.267	-0.522
0.50	1.04	111.23	8.203	-0.798	-0.798	-0.277	-0.521
0.55	1.04	110.44	7.913	-0.771	-0.771	-0.275	-0.510
0.60	1.04	109.66	7.628	-0.734	-0.734	-0.267	-0.488
0.65	1.04	108.91	7.351	-0.664	-0.664	-0.252	-0.457
0.70	1.04	108.17	7.081	-0.584	-0.584	-0.229	-0.417
0.75	1.04	107.45	6.813	-0.486	-0.486	-0.205	-0.368
0.80	1.04	106.74	6.554	-0.380	-0.380	-0.171	-0.311
0.85	1.04	106.03	6.296	-0.265	-0.265	-0.137	-0.245
0.90	1.04	105.33	6.036	-0.149	-0.149	-0.104	-0.171
0.95	1.04	104.60	5.787	-0.064	-0.064	-0.061	-0.089
T=308.15K							
0.05	1.01	120.16	7.322	-0.133	-0.133	-0.025	-0.054
0.10	1.01	119.20	7.132	-0.270	-0.270	-0.044	-0.101
0.15	1.02	118.25	6.940	-0.396	-0.396	-0.064	-0.142
0.20	1.02	117.31	6.752	-0.504	-0.504	-0.081	-0.176
0.25	1.02	116.38	6.564	-0.609	-0.609	-0.098	-0.205
0.30	1.02	115.48	6.372	-0.690	-0.690	-0.119	-0.227
0.35	1.02	114.59	6.186	-0.755	-0.754	-0.133	-0.243
0.40	1.02	113.71	5.999	-0.804	-0.804	-0.149	-0.254

0.45	1.03	112.85	5.815	-0.846	-0.846	-0.162	-0.259
0.50	1.03	112.01	5.636	-0.863	-0.863	-0.170	-0.259
0.55	1.03	111.21	5.467	-0.839	-0.839	-0.167	-0.254
0.60	1.03	110.42	5.302	-0.799	-0.799	-0.161	-0.244
0.65	1.03	109.66	5.140	-0.737	-0.737	-0.152	-0.229
0.70	1.03	108.91	4.979	-0.663	-0.663	-0.142	-0.209
0.75	1.03	108.19	4.821	-0.554	-0.554	-0.128	-0.185
0.80	1.03	107.48	4.666	-0.443	-0.443	-0.112	-0.156
0.85	1.03	106.78	4.519	-0.319	-0.319	-0.088	-0.123
0.90	1.03	106.08	4.374	-0.195	-0.195	-0.062	-0.086
0.95	1.03	105.36	4.232	-0.091	-0.091	-0.032	-0.045

T=318.15K

0.05	1.00	121.05	5.116	-0.165	-0.165	-0.010	-0.028
0.10	1.01	120.04	5.000	-0.339	-0.339	-0.021	-0.053
0.15	1.01	119.08	4.883	-0.472	-0.472	-0.032	-0.074
0.20	1.01	118.13	4.770	-0.586	-0.586	-0.040	-0.092
0.25	1.01	117.20	4.655	-0.687	-0.687	-0.049	-0.107
0.30	1.01	116.30	4.542	-0.760	-0.760	-0.056	-0.119
0.35	1.02	115.41	4.430	-0.819	-0.819	-0.063	-0.128
0.40	1.02	114.53	4.320	-0.865	-0.865	-0.067	-0.133
0.45	1.02	113.66	4.210	-0.905	-0.905	-0.072	-0.136
0.50	1.02	112.81	4.101	-0.924	-0.924	-0.075	-0.137
0.55	1.02	112.00	3.997	-0.904	-0.904	-0.073	-0.134
0.60	1.02	111.21	3.897	-0.865	-0.865	-0.068	-0.129
0.65	1.02	110.44	3.797	-0.805	-0.805	-0.062	-0.121
0.70	1.02	109.69	3.697	-0.727	-0.727	-0.057	-0.111
0.75	1.02	108.96	3.599	-0.620	-0.620	-0.049	-0.098
0.80	1.02	108.25	3.500	-0.498	-0.498	-0.042	-0.083
0.85	1.02	107.56	3.402	-0.365	-0.365	-0.035	-0.066
0.90	1.03	106.85	3.306	-0.238	-0.238	-0.025	-0.046
0.95	1.03	106.14	3.213	-0.117	-0.117	-0.013	-0.024

Conclusion:

Excess viscosity computed from statistical approach of Flory for two concerned liquid mixtures: Benzyl alcohol +2- Propanol and 2-Phenyl ethanol over the entire range of concentration from 298.15-318.15K temperatures and atmospheric pressure deals a faire agreement with experimental findings at higher temperature up to certain extent because liquid under consideration is polar in nature while Flory model is based on non-associative

γ -meric spherical liquid system. Negative sign of excess viscosity indicates the intermolecular association between the binary components where as its magnitude indicate the extent of interactions between them.

Acknowledgement:

Author is very thankful to department of chemistry, Janta college Bakewar Etawah for their support and motivation.

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AUGMENTED REALITY AND AR CODE USING AI TECHNIQUE

P. Anusha and H. Parveen Begum

Department of Software Engineering,
Periyar Maniammai Institute of Science and Technology,
Vallam, Thanjavur, Tamil Nadu

Introduction:

Science is the Latin word “Scientia” which literally means “know something” about anything. Invention and Discovery are the children of science. Technology is adopted from the Greek words techne and logos, techne means some skill of arts or anything and logos means expressing that skill to others. Every invention or discovery is the milestone of science development. Most of the people accept that iron is the first discovery of man. The latest inventions are Augmented Reality, anything possible in the development of science and technology. In this chapter, I assured you that you will get a clear perception of augmented reality especially about AR code.

Augmented Reality:

Augmented Reality is the broaden view of Virtual Reality. The AR user can sense the virtual and real environment concurrently. For example, filters used in Instagram video call is the suitable example for augmented reality which mean you can change the background, you can add the face mask or you can wear some ornaments etc. Like VR user the AR user does not fully immerse in the Virtual world. AR user can feel the real world too. The android phones, tablets, Laptops and smart glasses are the hardware tools used to feel AR

Adobe aero is a contemporary augmented reality tool released by adobe for developing, outlook and give out the instinctive tale-telling. In our childhood we read tale books that contain text and some 2D images to narrate stories, later we watch movies in theatres and tv shows which casted by actors. Nowadays augmented reality gives an opportunity to bring the story book alive around us. It is more helpful for kids to visualize and immerge into the moral stories. In our childhood we first read and then imagine the characters, now the children come across with the story lively.

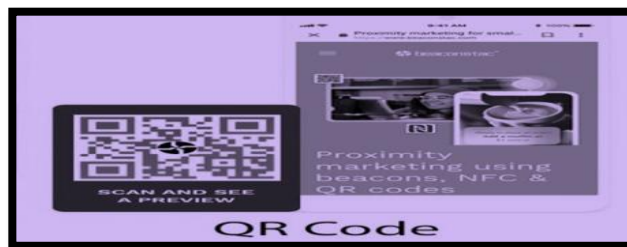


AR Code – Evolution of Code

We all have basic idea about Uniform Product Code (UPC) which is the machine-readable code that contains some hidden information. Generally designed for denoting some description and price of any product. Initially in 1954, Norman Joseph Woodland developed barcode. It was developed in 1-Dimension and 2-Dimension.



A QR code, or Quick Response code, is also a 2Dimension barcode that encodes data in black and white or contrasting dark and light, cells arranged in a grid format. Like other 2Dimension codes, QR codes are unidirectional meaning that they can be read from any side. The QR code was developed in 1994, by the Denso Corporation of Japan. It reduces the procedural steps of the expecting process, normally when we scan QR code the control took us to corresponding website link for further procedure. But in AR code we can able to do what we need at once. For example if we want to pay money using AR code can directly pay the money without moving to third party website for payment.



AR(Augmented Reality) code is the expandable variation of QR code usually by Scanning QR code our device directed us to the denoted website. But , the when we scan the AR code the 3Dimensional visuals will be displayed on the device. AR code merge both the physical and virtual world together.

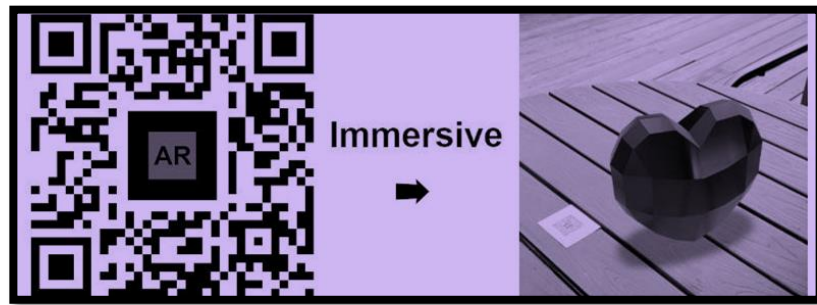


“There are many AR SDKs out there, but ARKit and ARCore are the go-to choices precisely because they are native to market-leading Apple and Google products. However, some of the other tools in the ecosystem can harvest the power of both, depending on the device they’re running on”. - Pawel Nikiel - 3D Software Engineering Lead, CGTrader.

Types of AR code

Immersive AR code:

When you scan the AR code with your device camera, you can see one or more 3D animated images on your screen.



Social media AR code:

Used to change your appearance and background in social media post.



Fly-over AR code:

This type of AR code generates voucher, discounts or any money transaction related features.



Artificial Intelligence:

Artificial Intelligence is the vast researchable area which comprises of many areas like machine learning, deep learning, neural network, Robotics and many more. Basic concept of AI is to make the machine to act like a human being in all occasions. Everyone handles several situation either it is “normal or critical” in different ways; intelligent people handle the situation in a smarter and unique way.

The difference between automation and intelligence like, automation is a routine task which happens periodically either mechanically or electronically. For example, an automatic train signal gate closes and opens periodically, plus red signal also glow in the signal tower on seeing this, the train driver has to stop the train it is normal situation in case when the train is not in control then it will not stop in the gate and it damaged the

gate, as we seen in many movies chasing scene hero's car hit the gate and the gate broken into many pieces.

Here we need an intelligent task to save from getting damage, is that if the gate found that the train is not getting slower at a particular distance then the gate has to open immediately to defend itself. This is the difference between automation and intelligence. Human has ability of "intelligence growth" by birth, human always read something on his experience, but the machine need artificial intelligence to handle the different situations in different manner.

The literal meaning of Heuristic is self-learning that is not learning from previous strategies. Discovering new techniques from the determination of assumption. This is the search to resolve calculations and makes discernment fastly and skilfully. It is the cognitive search of gaining knowledge from thinking and sensing current situation. Heuristic search might not provide best solution every time but it surely helps to find better solution in a negotiable time.

Machine Learning:

Machine Learning is the arm of Artificial Intelligence, It is the study of prediction or classification of data and algorithm in the view of how human will learn and also for improving accuracy of learning. There are many machine learning algorithms are their some of them are

Linear regression:

Linear regression is the mathematical function for predicting data using set of previously available data.

$$Y = a + bX$$

$$b = \frac{N \sum XY - (\sum X)(\sum Y)}{N \sum X^2 - (\sum X)^2} \quad a = \frac{\sum Y - b \sum X}{N}$$

Where ,

N – is the number of observations

X – is the independent variable

Y – is the dependent variable

For a Sample of 8 employees, a personnel director has collected the following data on ownership of company stock y, versus years in the firm of x . For an employee who has been with the firm 10 years, what is the predicted no of shares of stock owned?

X	6	12	14	6	9	13	15	9
Y	300	408	560	252	288	650	630	522

$$Y = a + bX$$

$$b = \frac{N\sum XY - (\sum X)(\sum Y)}{N\sum X^2 - (\sum X)^2} \quad a = \frac{\sum Y - b\sum X}{N}$$

X	Y	XY	X²
6	300	1800	36
12	408	4896	144
14	560	7840	196
6	252	1512	36
9	288	2592	81
13	650	8450	169
15	630	9450	225
9	522	4698	81
84	3610	41238	968

$$b = \frac{8 \times 41238 - 84 \times 3610}{8 \times 968 - 84^2} = 38.75, \quad a = \frac{3610 - 38.75 \times 84}{8} = 44.375$$

Substitute x=10,

$$Y = a + bX$$

$$= 44.375 + 38.75 \times 10 = 431.875 = 432$$

When x is 10 years and stock will be 432.

Linear regression algorithm:

Step 1 collect all dataset

Step 2 initialize parameters

Step 3 predict the variable of dependent variable by given independent variable

Step 4 calculate the error predictions to all data sets

Step 5 calculate the partial derivative with respect to a0 and a1

Step 6 calculate cost for each number and add them

Step 7 update the values of a0 and a1

Step 8 repeat the steps until for all data set

Logistic regression

Logistical regression is the analysis of past binary data to predict future binary outcomes. For example to determine a person is affected by some disease based on getting

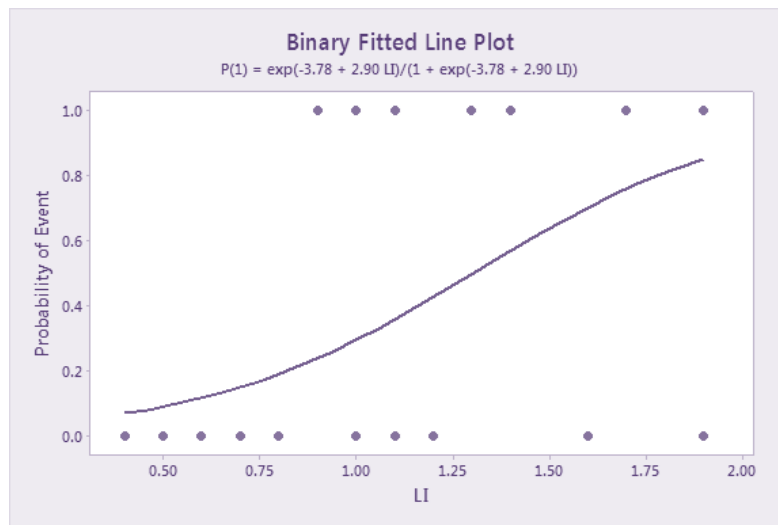
binary(yes / no) type answers from him, like whether he is having headache – yes / no, cough – yes / no, fever – yes / no etc.

$$\ln\left(\frac{P}{1-P}\right) = a + bX$$

$$\frac{P}{1-P} = e^{a+bX}$$

$$P = \frac{e^{a+bX}}{1 + e^{a+bX}}$$

Where P is the probability of event “Y” occurs



Robotics:

Robotics is one of the arm of AI, which involves locomotors, manipulators, Programming, sensors and act as many more. Robotics is the inter disciplinary of computer science and AI which is the programmable machine that can finish given task and also take decision for further implementation. Unless like in movies or in serials they built a toy that can walk and talk, robot is the coded machine for automation. If arm like structure that invented for cleaning vessels regularly or whenever needed is a robot. Playing arms, drawing arms are also robots.



Conclusion:

The proliferation of android phones and other mobile devices drive forward the invention to next level. The immersive and interactive situations allow the students to be active more in the class. It enriches the employability and reduces the dangerous conditions on learning; it avoids the accidents happening on lab during practical session. It reduces the teaching, understanding and practicing time. The ability of visualization of interface reduces the dangerous of real class. The spread of affordable technology will impact the education as more entertained and leisure. On mastering in this technology will open a new door to a new universe. AI, Machine Learning, Robotics are the well growing areas.

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STRENGTHENING THE POWER OF BIOINFORMATICS WITH THE HELP OF ARTIFICIAL INTELLIGENCE

Manoj Patidar

Department of Zoology,

Govt. College Manawar, Dhar, Madhya Pradesh, India

Corresponding author E-mail: manoj1patidar@gmail.com

Abstract:

The combination of biological fields like molecular biology & genetics with computer science, mathematics, and statistics to predict the molecular structures or model the mechanism is known as bioinformatics. Collecting information on biological processes, database development, computational modeling, and testing are the major steps of bioinformatics. On the other side, the correlation of various human thinking patterns with the help of computers to predict human behavior is the base of artificial intelligence. Both bioinformatics and artificial intelligence is tremendously used by researchers as well as common people for their various purposes. Bioinformatics has generated huge data and it is become difficult to analyze such big data, and hence here, artificial intelligence can be useful. A combinational strategy of utilizing the techniques of artificial intelligence with bioinformatics might provide better insights from the huge amount of data for human benefits. This approach can be utilized for novel modeling of protein structure classification, sequencing, retrieving the true information from the databases, and computer-aided drug design.

Keywords: Bioinformatics, Artificial Intelligence, Prediction

Introduction:

Advancement in the fields of computational biology and bioinformatics is well known. These both are interdisciplinary protocols of life sciences and utilized the algorithms of computers, physics, and mathematics. The application of bioinformatics ranges from molecular to personalized medicine, and genome to climate prediction. Computational biology deals with the modeling of molecular medicine, and the analysis of genetics. Both these fields generate huge data and it is out of our mind capacity to understand, analyze and retrieve the wanted information from it. Artificial intelligence is emerging very fast and reached the common people. The power of bioinformatics can be strengthened by the appropriate incorporation of artificial intelligence (1, 2, 3).

✚ Artificial intelligence can improve the prediction efficiency of bioinformatics such as the prediction of RNA-binding proteins, transcription factors, classifying protein structures, mutations, and localization. Analysis of big genomic data, relation extraction, and entity recognition are a few more examples. With the help of these two

approaches nowadays it becomes easier to sequence the whole human genome in a day (1).

- ✚ DeepVariant is a cloud-based tool useful for the comparison and analysis of complex genomics data sets (4).
- ✚ Gene editing including CRISPR is attracting researchers worldwide and artificial intelligence can make this process more efficacious, economical, and fast. The prediction of amino acid residues involved in the interaction of Cas9 (genome-editing protein) with the target DNA is a complex and time taking procedure. But artificial intelligence makes it time-saving by reducing the screening burden by around 95% (2).
- ✚ Computational biology in association with mass-spectrometry enables proteomics to analyze several proteins. Adding artificial intelligence in proteomics might be useful for protein identification. For example, the Prosit tool is useful for error-free protein pattern recognition.
- ✚ In proteomics convolutional neural networks can achieve 84% accuracy in positioning the proteins' amino acids into alpha-sheet, beta-helix, and coil. One more example of the combination of bioinformatics and artificial intelligence is the use of feature vectors for scoring the protein model for prediction accuracy (5).
- ✚ Artificial intelligence can enable microarray techniques to read a thousand interactions at a time for a complex experiment. Neural Designer is useful in complex pattern identification and relation retrieval. Understating the gene patterns, mutations, and future stages of a particular gene is useful in disease monitoring, early diagnosis, and modeling preventive medicine (6).
- ✚ Text mining is a very useful tool of artificial intelligence. This can be utilized to analyze the thousand research papers to obtain desired data efficiently. One example of text mining is retrieving the protein model scoring from various publications from PubMed. This includes protein-protein dockings data from protein-protein interactions and identification of constrain in time-saving, economic, and laborless processes (7).
- ✚ Modern drug discovery processes are entirely dependent on bioinformatics. It can achieve more precision with the inclusion of artificial intelligence. Some of the research and development technologies used precision medicine and next-generation sequencing. They have proven to find alternative options for multifactorial disease therapy (2).
- ✚ The field of medicine highly depends on imaginative technologies. Artificial intelligence is making these procedures easy and sensitive. Microsoft's InnerEye tool is utilized for deeper analysis of 3D medical images. Similarly, the prediction of individual behavior can make the process of personalized medicine more effective. This can remove the limitations of specific procedures of diagnosis. Artificial intelligence can analyze the historical data of a single patient and can provide a wide range of treatment options (8).

- ✚ Now it is not difficult to treat different neurological disorders as the combined strategy of bioinformatics and artificial intelligence is helping in the prediction, analysis, diagnosis, and treatment of such complicated issues (9).
- ✚ Tools based on 3D Conventional Neural Networks and Support Vector Machines are useful in predicting motor deficits in stroke patients. This makes it possible to treat Acute Ischemic Stroke in a simple manner (10).
- ✚ By using the Atomwise tool, one can build 3D pixels from molecules to understand the 3D structure of proteins with maintaining the atomic attributes. This algorithm is useful in drug discovery as it can determine the interactions of molecules with specific proteins (11).
- ✚ CellProfiler makes it possible to imagine and measure various parameters in several samples simultaneously instead of measuring a single parameter of similar types of images by old biological image tools (12).
- ✚ These tools also increase the power of microscopes. For example, in fluorescence microscopy, artificial intelligence can figure out numerous cell attributes in a single run, and analysis of such parameters is also feasible. It also can make a model from various sets of data (13).
- ✚ The approaches including machine learning in bioinformatics algorithms like decision trees, support vector machines, and neural networks are being tested for the prediction and classification of cancer types. The Cancer Genome Atlas project deployed the RNA sequence and found 95.8% accuracy in cancer classification by using a linear support vector machine. Similarly, breast cancer is also classified into triple-negative breast cancer and non-triple-negative by machine learning (14).
- ✚ Apart from cancers, various other complicated disorders like coronary artery disease are also being predicted by machine learning-powered bioinformatics tools. Machine learning and Tree-based Pipeline Optimization tools can successfully identify single nucleotide polymorphisms (SNPs) related to coronary artery disease (15).
- ✚ Discovery of novel therapeutic is very challenging, time-consuming, costly and laborious. Therefore it is a good idea to find new roles for existing drugs and this concept is known as drug repurposing (reprofiling). Many scientists are exploring currently available databases like DrugBank and BindingDB with the help of artificial intelligence for the novel potential of reported drugs. There are several strategies are being adopted such as finding the binding ability of a particular drug with the target protein, drug-drug interactions, and identification of allosteric sites for protein-protein interactions (3, 16, 17).

Conclusion and future perspective:

Although the combination of bioinformatics and artificial intelligence is attracting researchers worldwide, there are many difficulties in adapting the combination of bioinformatics and artificial intelligence:

- The combination of bioinformatics and artificial intelligence makes the process very costly as it requires high-speed computer facilities, internet access, and software.
- Creation and maintenance of a huge database are also costly, and time-consuming, and receiving the correct information is also challenging.
- Recruitment of trained staff or giving them such training to operate various tools is also a very complicated process.
- The algorithm might vary from disease to disease. A different algorithm should be built for rare diseases, where lack of information might be the challenge. Also, it is difficult to believe in software where human life is concerned. Therefore testing and coincidence levels should be high.
- Adaptation of these technologies among researchers, practitioners, and common people is a serious issue.

Acknowledgment:

The author acknowledges the Department of Higher Education, Govt. of Madhya Pradesh, and Principal, IQAC head, Govt. College Manawar.

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ROLE OF GREEN CHEMISTRY IN ENVIRONMENT SUSTAINABILITY

Meenakshi

Department of Chemistry,

University of Rajasthan, Jaipur, India. 302004.

Corresponding author E-mail: meenakshialwaraj@gmail.com

Abstract:

Chemistry plays a key role in our day to day life. World cannot imagine without chemistry. Medicines, food, cloths, construction materials etc. are prepared by chemical substances. During manufacturing of these materials, all the reactants never be 100% converted into products, therefore loss in yield due to formation of by products, which pollute environment. The world is now focusing on green chemistry, also known as sustainable chemistry, which refers to minimizing or reversing environmental damage. Therefore, green chemistry could involve anything from cutting down on waste to properly disposing of it. Utilizing renewable food supplies is another strategy to promote sustainable chemistry and protect the environment. Another smart option is to substitute catalysts for stoichiometric reagents in chemical experiments. Chemical derivatives should be avoided wherever feasible because they frequently turn out to be dangerous. The environment and other living things shall not be harmed in any way during the disposal of any chemical waste. In this chapter, the role of green chemistry and its applications in environment sustainability are briefly discussed.

Keywords: Green chemistry, environment, sustainable development, etc.

Introduction:

In order to provide alternative vision for sustainable development, Green Chemistry must address a wide range of chemical and technological concerns. Meeting current requirements without sacrificing the capacity of future generations to meet their own needs is known as sustainable development. In both goods and processes, green chemistry efficiently uses renewable raw materials, reduces waste, and eliminates the use of harmful or potentially dangerous solvents and reagents. There are two main points to green chemistry. It begins by addressing the issue of effective raw material usage and the corresponding reduction of waste (Dhage and Shisodiya, 2013). Second, it addresses the environmental, health, and safety concerns related to the production, use, and recycling of chemicals. One of the most essential and effective instruments to use on the way to sustainability is green chemistry. In reality, without green chemistry and green engineering, there is no way to sustainability.

Paul T. Anastas and John C. Warner developed the "Twelve Principles of Green Chemistry" in 1991. The two categories (A & B) that best describe these guidelines are "Reducing Risk" and "Minimizing the Environmental Footprint." Some chemical businesses

have left a legacy of risk in the past. New chemical goods were linked to risks of environmental contamination and human exposure to hazardous chemicals, which gave synthetic chemical materials a negative reputation. The climatic problem, energy use, and the depletion of natural resources are more important factors in the environmental footprint.

Green chemical approach focuses on:

A. Green chemistry aims to reduce risk in the laboratory: Use Safer Chemicals, Design Less Hazardous Synthesis Methods, Use Safer Solvents and Reaction Conditions, Accident Prevention (minimize the potential for explosions, fires, etc.).

B. Minimizing the environmental footprint:

- i. Waste minimization and prevention – Use of catalysts instead of stoichiometric quantities, Reduce the use of chemical derivatives, Synthetic efficiency (Atom Economy), Taking advantage of chemicals designed for degradation.
- ii. Establishment of In Process Controls for Pollution Prevention – Use of renewable feedstock, encourage energy efficiency.

The 12 principles of Green chemistry and their applications to basic and applied research are briefly described below (Anastas and Warner, 1998):

- 1) **Prevention:** This is a key principle. Preventing an issue is preferable to cleaning or treating one afterwards (waste or pollution). The majority of chemical reactions and synthetic pathways result in waste and hazardous byproducts. By designing the feed stocks and chemical processes in advance and with novel modifications, green chemistry can reduce waste and hazardous byproducts (Namienik & Wardencki, 2000).
- 2) **Maximize synthetic methods (Atom economy):** This concept delves into the chemistry of how items are actually manufactured. To date, all synthetic processes have been wasteful, with yields ranging from 70 to 90 percent. According to green chemistry, it is possible to plan synthetic processes in advance to maximize the incorporation of all reagents employed in the chemical process into the finished product, obviating the need to recycle the byproducts. It is more effective and minimizes waste to select transformations that use the majority of the raw materials.
- 3) **Less hazardous chemical synthesis:** Green Chemistry must make every effort to create less hazardous compounds and synthesis products, as well as safer synthetic procedures whenever possible (Sato *et al.*, 1998). Substances with little to no toxicity toward the environment and human health should be used and produced via synthetic techniques. For a green technology, some hazardous chemicals are swapped out for less harmful ones.
- 4) **Designing safer chemicals:** To affect the desired function and features of the

chemical product while minimizing their toxicity to humans and the environment, design must become a core goal of green chemists. Huge number of chemical products and materials are available on the market right now. The majority of these chemicals have been classified according to their physiochemical characteristics and toxicities; however the majority of them lack ecotoxicological data.

- 5) **Safer solvents and auxiliary substances:** It is necessary to switch out or reduce the amount of harmful compounds employed as solvents, separation agents, and auxiliary chemicals in synthetic chemistry. In a solvent, numerous chemical processes take place (Bardley *et al.*, 2000). Additionally, many of the chemical solvents that have been utilized historically have risks and are quite hazardous. Most syntheses make heavy use of solvents. Toxic and flammable substances like alcohol, benzene (known to cause cancer), CCl_4 , CHCl_3 , perchloroethylene, and CH_2Cl_2 are frequently utilized as solvents in syntheses. Large amounts of solvents are also used in the purification process (such as in chromatography), which increases pollution and poses a serious risk to human health. The advent of "green chemistry" has altered what a solvent is: A perfect green solvent should be inexpensive, readily available, natural, and harmless. This idea focuses on designing goods to make use of less dangerous solvents. Water is undoubtedly the least cheapest and environmentally friendly solvent.
- 6) **Design for energy efficiency:** Renewable energy sources and energy efficiency are currently in the spotlight. We use energy to power our homes and businesses, as well as for transportation. Traditional energy production techniques have been shown to contribute to global environmental issues like global warming, and the energy consumed can be expensive as well (Romano & Garbassi, 2000). This philosophy emphasizes extremely efficient product and material production while lowering costs and pollution risks. Chemists must acknowledge that until recently, energy requirements in chemical synthetic chemical processes were given very little consideration. Creating more effective processes is essential, and whenever it is feasible, synthetic methods should be carried out at room temperature and pressure to minimize energy requirements.
- 7) **Use of renewable raw materials and feed stocks:** Petrochemical compounds and refined products make up the majority of the initial raw materials for synthetic processes (Nicholas *et al.*, 2002). Raw materials must be very non-toxic and, if at all feasible, renewable as opposed to decreasing. Locating renewable raw materials presents a number of real-world challenges. Green chemists must find renewable compounds to alter the production process. Development that uses up natural resources is a drawback of economic expansion.

- 8) **Reduce intermediate derivatives:** In order to reduce needless derivatization in the synthetic routes, chemists must apply blocking groups, protection/deprotection strategies, and temporary modifications of physical and chemical processes. These derivatizations consume resources, generate a lot of trash, and require extra reagents (Stashenko *et al.*, 2000). The principle serves as a reminder to chemists to update their outdated processes for making compounds by incorporating more chemical steps and new materials. It is desirable to create novel chemical synthesis pathways.
- 9) **Catalytic reagents:** It is well known that the use of catalysts can significantly alter both the yield of products and the efficiency of chemical reactions (Acardi *et al.*, 2003). Stoichiometric reagents may not always be preferable to highly selective catalytic reagents. Another advantage of employing a catalyst is that it typically only takes modest amounts to have an impact. Additionally, if the catalyst is truly "green," it won't produce any toxins throughout the reaction. Wonderful catalysts include enzymes. The fact that biocatalyzed reactions take place in aqueous media makes them beneficial. The future of green chemistry techniques is in the development of new catalysts and a greater focus on catalytic processes.
- 10) **Design products which degrade easily:** The majority of chemical products and everyday items don't decay very quickly, which is bad for the environment. Green chemistry strives to create products that decompose into harmless materials at the end of their useful lives. Many consumer goods have a negative environmental impact due to their persistence (such as plastic products), however this can be changed by developing goods that decompose quickly. This approach aims to create goods that serve the purpose for which they were created.
- 11) **Real time analysis for pollution prevention:** To enable real-time, in-process monitoring and control before the creation of hazardous chemicals, analytical methods must be further developed. Everyone is aware that pollution control is preferable to pollution prevention since the former is better than the latter. Utilizing products, procedures, or activities that cut down on or get rid of wastes or pollution at the source is known as pollution prevention.
- 12) **Inherently safer chemistry for accident prevention:** Raw materials and chemical substances utilized in chemical reactions should be intrinsically safe, meaning that neither their qualities nor the byproducts of their degradation should be harmful or hazardous (e.g. to explode, to be flammable, allergic to humans, cause burns to skin, etc). For the sake of the health and safety of consumers and employees, green chemistry tries to eliminate the usage of hazardous compounds. When creating a product, it is preferable to employ substances and chemicals that won't blow up, catch fire, or ignite in the air.

These principles are obviously very difficult to apply immediately for many chemical processes. After many years of Green Chemistry initiatives and industrial applications it is amazing to see many creative innovations at various scientific and industrial processes. The cooperation of chemists, engineers, material scientists, bio scientists and technologists has achieved interesting results. The interdisciplinary approach has expanded the fields of green chemistry and produced some excellent non-toxic materials and feedstock savings in chemical industries.

For many chemical processes, it is obviously quite challenging to instantly apply these concepts. It is great to witness so many inventive discoveries in different scientific and commercial processes after 20 years of Green chemistry projects and industrial applications. Interactions between chemists, engineers, material scientists, biologists, and technologists have produced some intriguing outcomes. The application of an interdisciplinary approach has broadened the scope of green chemistry, led to the development of top-notch non-toxic materials, and reduced feedstock costs in the chemical industry.

Applications of green chemistry:

- Use of solar energy: Sun is an inexhaustible source of energy. If we fulfill most of energy demand of us by using solar energy then it will be a green and environment friendly approach. The best known example of green technology would be the solar cell (photovoltaic cell). A solar cell directly converts the energy in light into electrical energy through the process of photovoltaics. Generating electricity from solar energy means less consumption of fossil fuels, reducing pollution and greenhouse gas emissions.
- Oxidation reagent and catalysis: historically, many of the oxidation reagents and catalysts have been comprised of toxic substances such as heavy metals. Since these substances were often used in extremely large volumes required to convert millions of pounds of petrochemicals, there was a significant legacy of these metals being released to the environment and having substantial negative effect on human health and environment. It can be changed by the use of benign substances. Now many researches are focused on alternative ways of less chemical uses.
- Metal free synthesis: Many organic and inorganic compounds are synthesized with the help of metal catalyst. The excess use of metal very harmful to life of humans, animals and environment. Bioaccumulation of metals pose a big risk to life for many decades (Minamata disaster).
- Use of green chemical solvents in chemical reactions: Many inorganic and organic compounds are toxic in nature and adversely affect environment. Water is as environment friendly material, hence use of it in many reactions as solvent pose to no risk to environment.

- Proliferation of solvent less reactions: one of the 'solvent alternatives' that is being developed in green chemistry is that of solvent less reaction system. The carrying of manufacturing process in solvent-less condition utilizes some non-traditional conditions. This helps in development of product isolation, separation and purification that will be solvent-less as well in order to maximize the benefits.
- Find alternative rules of increasing yield of chemical reactions. As the yield percentage increases, amount of byproduct formation decreases, therefore wastage of chemical also decreases.
- Use of green binder: Application of green binder reduces environmental pollution. Sodium silicate is a very good inorganic binder for wood industry instead of harmful organic compounds. In construction industry, Portland cement is widely used. The formation process of Portland cement emits CO₂ in large amount, and also require a large amount of energy. Use of eco-friendly Magnesia cement in place of Portland and other cements is a green route of construction industry.
- Supramolecular chemistry: Research is currently ongoing in the area of supramolecular chemistry to develop reactions which can proceed in the solid state without the use of solvents. The cycloaddition of trans-1,2-bis(4-pyridyl)ethylene is directed by resorcinol in the solid state. This solid-state reaction proceeds in the presence of UV light in 100% yield.
- Super critical fluids: the use of CO₂ as a substitute for organic solvents already represents a tool of waste reduction in chemical industry. Of the wide range of supercritical Carbon dioxide reactions that have been explored, one class of reaction has shown exceptional promise; it was found that asymmetric catalytic reactions, particularly hydrogenation and hydrogen transfer reactions can be carried out in supercritical carbon dioxide with selectivity compared or superior to those observed in conventional solvents.
- Immobilized solvents: With solvents being of extremely high volume and very broad breadth of applicability, their potential for negative impact on human health and the environment is very large. Therefore, the immobilization of such solvents helps in reduction of hazards. Immobilized solvents or solvent molecules tethered to a polymeric backbone follow the same logic as the ionic liquids. By creating a system where a known solvent, e.g., THF, is tethered properly, it can still maintain its solvency but is incapable of manifesting any hazard by exposing humans or the environment. These types of solvents are expensive and difficult to handle.
- Degradable material : Formation of biodegradable material in minimum amount is now the main focus of green chemistry.

- Biometric multifunctional reagents: while synthetic catalysis and reagents for the most part have centered on carrying out one discrete transformation. The manipulations may include activation, conformational adjustments, and one or several actual transformations and derivitizations.
- Halide free synthesis of aromatic amines: Traditional synthesis of aromatic amines involves chlorination of benzene followed by nitration and nucleophilic displacement of the chlorine with a new substituting group. The synthesis of 4-amino-diphenylamine illustrates this process. Monsanto has developed a new synthesis of 4-aminodiphenylamine that utilizes nucleophilic substitution for hydrogen. The process avoids the use of halogenation intermediates. In this process nitrobenzene and aniline are heated in presence of tetramethyl ammonium hydroxides to give tetramethyl-ammonium salts of the condensation products.

Conclusions:

Each industry's main objective is to make money using readily available raw materials and basic capital while engaging in sustainable industrial operations. Chemical processes must use raw materials, water, and energy in a way that does not harm the environment and be commercially viable if they are to be considered sustainable industrial activities, which means that they must meet the needs of the present without endangering the needs of future generations. Through the implementation of a green chemistry method, whose goal is to create chemical processes and products that are safe for both human health and the environment, a balance can be established between the use of natural resources, economic growth, and environmental conservation. The use of the idea of "green chemistry," which brings chemical safety, entails sufficient legal backing through the legislative control of specific processes and activities that are essential for the execution of such a concept. The twelve principles that make up the notion of "green chemistry" speak of minimizing or removing hazardous or dangerous compounds from the synthesis, manufacture, and application of chemical products and, as a result, the use of substances that are detrimental to human health and the environment. While it is impossible to implement all twelve of the process's principles simultaneously while building a green chemistry method, it makes an effort to do so at certain points in the synthesis. Green chemistry works in a number of key ways to fulfill its objectives of economic growth and environmental conservation. These include new photo catalytic processes as well as biocatalysis and catalysis, the use of renewable raw materials (such as biomass), alternative reaction mediums (such as water, ionic liquids, and supercritical fluids), and different reaction conditions (such as microwave activation). With new catalytic reactions and catalyst types, catalysis, the cornerstone of green chemistry, offers a range of advantages in terms of process utilization, selectivity, energy savings, and the use of alternative reaction media. Biocatalysts hold a leading position in the "green" agenda due

to the enormous potential of microorganisms and enzymes in the selective transformation of synthetic compounds. Green chemistry and the creation of circumstances for sustainability are both facilitated by photo catalytic reactions, which represent novel techniques for purifying contaminated air and water.

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EVOLUTION OF HEALTHCARE SERVICES IN WORLD

Swarnima Pandey^{*1} and Pragya Chaudhary²

¹Apex college of Pharmacy, Bilaspur, Rampur 244943 Uttar Pradesh, India .

²Sai institute of Medical Sciences, Jaspur, Uttarakhand, 244712 India

*Corresponding author E-mail: drswarnimat@gmail.com

The early ages of the seventeenth and eighteenth- century witnessed the emergence of colorful pandemics and conditions. There was a great trouble from the public to cover the citizens from contagious conditions at this stage. The 19th century saw a great advancement in the field of public health. There was a huge development in the part of the public in financing public health care during the late 1970s. During the same period, the public sector share of this sum rose from 25 percent to 37 percent. Although health requirements and health services haven't lowered, political and social values of this time encouraged financial constraint. The values during this period emphasized state responsibility for utmost health and weal programs.

The 20th century saw the expansion of the Government's part in public health. During this period. The expansion of state conditioning in health matched the growth in civil conditioning. numerous of the changes on the civil position stimulated or supported state programs. In 2000 the World Health Organization (WHO) performed a ranking to compare the performance of the health systems of the member countries. Since also other health system rankings have been performed and it came an issue of public discussion. By the morning of the 21st century, every existent's access to health care has come to be regarded as an introductory mortal right.

The history of the public health system is a history of bringing knowledge and values together in the public arena to shape an approach to health problems. The task of the public health agency has been not only to define objects for the healthcare system grounded on data about illness and health but also to find means to apply health pretensions within a social structure.

Healthcare services around the world

All health systems are different due to the different combinations of factors they can consider.

USA

Utmost Americans are served by a blend of intimately and intimately funded programs and healthcare systems. Overall, the US healthcare system allows providers to inflate prices and precious services but inadequately compensates for essential services similar as primary care and behavioral advice.

UK

The UK healthcare system covers the whole population via the National Health System (NHS). The UK has public, private profit, and nonprofit hospitals.

European Union

Each country in the EU has its healthcare system. still, EU members generally partake the same thing as the UK model. All healthcare systems in Europe automatically include all citizens irrespective of paying capacity. Secondly, all are substantially funded by levies paid by the employer and by the public. Healthcare is free, except for some optional and specialist services.

Asia

Asian healthcare systems are a mélange of public and intimately managed programs.

Australia

Australia has a duty- funded universal free public health insurance program, called Medicare. All citizens get free care from the public and numerous croaker services and medicines at public hospitals.

Africa

Utmost Africans that are moreover low or middle- income turn to the public health system or traditional healers. Only a many can go high- quality private care, but out- of- fund expenditures are bound to be high in this two- league system.

An introduction to healthcare systems

A Healthcare system is a method of planning, organizing, financing, and delivering health-related facilities to the population. The goal of a health care system is to enhance the health of the population efficiently by proper utilization of the available resources.

Existing health systems all over the world are different due to the different combinations of components that can be considered for their establishment. The extent and form of a specific system are influenced by a variety of factors, including the unique culture and history of a population or country's level of development and social values. Some populations emphasize the prevention of disease, whereas others only care for or cure particular illnesses. Another major factor that influences the health care system of a country is the level of economic resources available.

As the complexity of the healthcare system increases, patients now have an incredible array of choices while choosing to receive care. The choice is often left to decide which kind of health care facility to be available. But this type of facility will widely vary in each country.

Classification of healthcare facilities

Healthcare facilities are classified as primary health care units, secondary health care units and tertiary care units. There are also district units and basic units. The main objective behind establishing these units is to grant access to health care services to patients.

Basic organizational structure

Healthcare organizations not only vary from country to country but also vary within each country as they address access, cost, and quality which are in turn influenced by

social, economic, and political factors. Healthcare organizations are complex and dynamic. The nature of the organizations require that managers provide leadership, as well as supervision and coordination of employees.

Definition

A Healthcare organization is generally defined as “ A formal system of interaction and coordination that links the tasks of individuals and groups to achieve organizational goals.

Purpose

The purpose of having a proper organizational structure is generally to

- Channel Information to Managers
- Create Distribution of Authority
- Maintain interrelationships among different units

The organizational design classification

Organizational designs take as many forms as needed to address the uniqueness of a dynamic organization. The designs are usually reflected in an organizational chart that describes the relations, authority, responsibilities, and interactions of the different units and individuals.

- **Functional Design**

They are characterized by a strict chain of command and line of operation. It is advantageous as it provides clear lines of reporting and accountability.

- **Divisional Design**

In this structure, specific service lines, responsibility and accountability staffing, budgeting, and financial control are allocated under an array of service lines. This kind of structural design has proven to be effective in certain cases as they are cost-effective and quality-driven.

- **Matrix Design**

The other organizational structure is the matrix structure which is a combination of the functional and divisional structures. It believes that a strictly functional structure may reduce the flexibility of an organization and a divisional structure is required continually. Here a Functional staff is at times required to perform divisional-specific responsibilities. The advantages of this structure are lateral communication and coordination of services.

The most common organizational structure for a healthcare system is the functional organizational structure, whose key characteristic is a pyramid-shaped hierarchy. The size and complexity of the healthcare system will dictate the structure. Larger organizations like academic medical centers and community hospitals having a vast array of administration support will have deep vertical structures.

Definition of hospital

Hospitals are healthcare institutions primarily offering patient treatment and specialized medical care with the help of nursing staff and medical equipment. Though the

healthcare system and services vary from country to country they can be classified into the following types.

- Based on Services
- Based on Bed Numbers
- Based on Location
- Based on Ownership

Based on services:

Based on the services provided, hospitals are generally classified as:

- **General:** General Hospitals are designed to care for medical and surgical patients with acute illness and injury. Usually, they are of limited capacity and devoid of super-specialist medical care.
- **Specialty:** These hospitals limit their services to treat a particular condition. For example, orthopedics, maternity, pediatrics, geriatrics, oncology, etc.
- **Teaching cum Research:** College is attached for medical/nursing/dental/pharmacy education. The main objective is to provide medical care/teaching and research is secondary.

Based on bed numbers:

Based on the bed numbers available, hospitals are divided into three further categories.

- **Small:** The capacity of small bedded hospitals is usually up to 100 beds.
- **Medium:** Medium-sized hospitals consist of 100 to 499 beds.
- **Large:** Large hospitals are usually those with more than 500 beds.

Based on Location:

Hospitals can further be identified based on the location, but this may vary in each country depending on the way they are structured.

- **Rural Hospitals:** Rural hospitals are those that are located in rural areas with fewer beds and function in smaller units. They lack advanced technology for providing higher medical support.
- **Urban Level:** These are mostly community hospitals serving in the cosmopolitan areas. They operate on larger budgets and are well-equipped to treat all sorts of illnesses. The number of beds usually varies from 100 to 500.

Some countries have District level hospitals that provide health facilities to specific localities and Regional hospitals that serve a larger area.

Based on Ownership:

Hospitals are usually owned by governments, individuals, or groups of people. This ownership usually decides the cost of medical services provided by that hospital. The basic types of ownership are:

- **Public / Government Hospitals:** They are owned/administered and controlled by the government. They usually come under the health ministry and are funded by the

federal government. They usually provide free-of-cost service to the citizens or have a nominal fee for treatment.

- Private Hospitals: They are usually owned by an individual or group of individuals. They are run mostly for-profit and they try to recover their funds through patient fees. They provide world-class amenities and ensure a better doctor-patient ratio.
- Trust Hospitals: They are run by a group of people or trust and offer services at subsidized rates. They are usually preferred by middle-class people.
- Charity Hospitals: These hospitals provide treatment to poor people who cannot afford treatment. They do not charge for the treatment and provide free medical services.

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GRAPHENE BASED INVASIVE AND NON-INVASIVE SENSORS FOR HEALTH CARE MONITORING SYSTEM

Babita*¹, Swati¹ and Hempal Singh²

¹Department of Physics, Baba Mastnath University Rohtak

²Department of Physics, IIT, Roorkee

*Corresponding author E-mail: babitaphy@gmail.com

Abstract:

Graphene as an atom-thick, the two-dimensional, honeycomb-structured material due to its distinctive physicochemical characteristics, has been widely exploited in the sensor detecting industry. These properties include large surface to volume ratio, outstanding mechanical strength, high electrical conductivity, high thermal conductivity, excellent carrier mobility, ability to generate electricity by exposure to sunlight, adjustable optical properties and makes it an ideal candidate for sensing applications. Graphene has been used in various forms including nanoparticles and oxide forms to fabricate various types of sensors. These sensors have incredibly alluring qualities like low cost, great sensitivity, robustness, user friendliness, and quick results. This book chapter gives a detailed overview on preparation and properties of graphene, sensing mechanisms, technological innovations in development and fabrication of sensors and their applications in health monitoring devices. Both invasive and non-invasive graphene based sensors will be discussed in the chapter. In diagnostics field, graphene based invasive sensors can be used for diagnosis of various ailments by detecting viruses, bacteria, disease biomarkers, immune bodies, etc. Non-invasive (Wearable sensors and implantable devices) can measure body temperature, heart rate, pulse oxygenation, respiration rate, blood pressure, blood glucose, electrocardiogram, electromyogram, and electroencephalogram signals in real time have been reported as examples of graphene-based sensors used for human health monitoring. This chapter also provides a brief explanation of the difficulties now experienced by graphene-based sensors, along with some potential remedies and potential future applications.

Introduction:

As the worldwide population is developing quickly and the life anticipation of people is expanding [1] the healthcare framework is confronting expanding costs and burdens, which requires that governments should discover feasible arrangements to render satisfactory restorative care without expanding healthcare costs [2]. Preventive and personalized medical approaches [3], which alter the wellbeing status, can be identified and analyzed early. Disease-risk can moreover be anticipated, and utilized to overcome challenges by expanding the remedy rate and survivability of on-risk population, while minimizing large treatment costs [4,5]. By intermittently or ceaselessly following basic

signs and biomarkers, health checking frameworks are able of comprehensively surveying wellbeing conditions which can amazingly advantage the conclusion and infections treatment together with postoperative restoration, which can altogether decrease the burden of restorative frameworks and make strides quality of life [6] and one need good sensors to do the job. It may be a well-established truth that graphene based biosensors are one of the foremost candidate. Graphene a honey comb like structure formed with single thick planer carbon sheet or a two-dimensional (2D) nanomaterial has made a major role within the sensor and electronic industry. Its properties are comparable to those of semi-metals and are found to be steady beneath appropriate conditions [7]. Graphene has been utilized in biosensors because of its various interesting traits which incorporate a large electron exchange rate, large surface to volume ratio, its capacity to immobilize atoms and expanded electrical conductivity [8]. The bigger surface zone advances dynamic destinations for charge-biomolecular interactions which assists in legitimate functionalization/immobilization [9] which leads to detection of the target particle. Additionally graphene is effortlessly accessible and cost-effective as well. Nanomaterials made up of graphene and its derivatives have contributed to the fabrication of different types of advanced biosensors. Here in this chapter we will discuss about characteristics and fabrication of graphene and its derivatives and various invasive and non invasive graphene based sensors. We will also discuss difficulties experienced by graphene-based sensors, along with some potential remedies and potential future applications.

Properties of Graphene

The extraordinary properties of graphene make it an interesting option for a variety of applications. It is the perfect material for usage in various industries, including electronics, energy, and biomedical engineering, due to its great mechanical strength, electrical and thermal conductivity, flexibility, transparency, chemical stability, and high surface area.

1. High mechanical strength: The strongest substance ever found is graphene. Its tensile strength (130 GPa) makes it roughly 100 times stronger than steel. It can be stretched up to 20% of its original length without breaking and is also incredibly flexible. It is the perfect material for high-stress applications because it can sustain pressures of up to 1 terapascal (TPa) [10,11].
2. High electrical conductivity: A good electrochemical conductor is graphene. Its conductivity is approximately 100 times better than that of copper, the common component of electrical wiring. Due to this characteristic, it is the perfect material to be used in electronics, especially in the creation of high-speed and high-frequency transistors. The unique band structure of graphene is what gives it its electrical conductivity. Moreover, the material has a very high electron mobility, which enables

electrons to travel through it quickly and makes it perfect for use in high-speed electronics.

3. High thermal conductivity: As a heat conductor, graphene performs admirably. More than any other known material, it has a thermal conductivity of roughly 3000 W/mK [12]. It is the perfect material for thermal management applications, such as heat sinks and electronic cooling systems, because of its characteristic.
4. Flexible and lightweight: Thin and malleable graphene may be folded, twisted, and bent without breaking. With a density of only 2.3 grams per cubic centimetre (g/cm³) [13], it is also extraordinarily light, making it the perfect material for thin and flexible electronics.
5. Optical properties: With a visible spectrum absorption rate of about 2.3%, graphene is almost transparent [14]. Also, because to graphene's extremely high refractive index, light passing through it is bent at an acute angle. These characteristics make it the perfect substance for optoelectronic components like solar cells and light-emitting diodes.
6. Chemical stability: A wide variety of substances, including acids, bases, and organic solvents, can be exposed to graphene without harming it because it is chemically inert. Due to this characteristic, it is the perfect material for use in abrasive conditions and in processes requiring high levels of chemical resistance, such as the manufacture of chemical sensors and water filtration systems.
7. High surface area: Due to its large surface area, graphene can be used in a variety of processes, including catalysis, sensing, and energy storage [15].
8. Biological properties: It has been proven that graphene is biocompatible, which means that it does not affect live cells. Due to this characteristic, it is the perfect material for biomedical applications, including the creation of implanted devices and drug delivery systems. One of the most promising applications for graphene based invasive sensors is in biomedical sensing [16]. These sensors can be used to monitor vital signs such as blood pressure, heart rate, and oxygen levels in real time providing valuable data for health care professionals [17-19]. Additionally, graphene based sensors can be used to detect biomolecules such as glucose which is critical for monitoring conditions such as diabetes. Graphene based invasive sensors can also be used for environmental monitoring such as detecting pollutants in water or air. The high sensitivity of graphene based sensors allows for the detection of even low concentrations of pollutants, making them an ideal tool for monitoring environmental conditions [20-25].

Methods of fabrication of graphene and it's derivatives

The methods listed below can be used to produce graphene derivatives like graphene oxide and reduced graphene oxide. Because graphene oxide may be

functionalized with different chemical groups, it can be used in a wide range of products, including composite materials, energy storage, and sensors. While reduced graphene oxide shares many characteristics with graphene, it is less conductive because of imperfections and functional groups that include oxygen. Top-down and bottom-up approaches are two broad categories that can be used to group together a variety of graphene synthesis techniques.

Top-Down Methods

The process by which graphite, the substance from which graphene is generated, is exfoliated mechanically or chemically is known as the top-down technique. By using these techniques, graphene is created by dissolving the layers of graphite.

- a. **Mechanical Exfoliation:** This method was first demonstrated by Andre Geim and Konstantin Novoselov in 2004, for which they won the Nobel Prize in Physics in 2010. In this method, a piece of graphite is repeatedly peeled with a piece of adhesive tape until the desired thickness is obtained [26]. This process produces small amounts of high-quality graphene but is time-consuming and not suitable for large-scale production.
- b. **Chemical Exfoliation:** Andre Geim and Konstantin Novoselov first presented this technique in 2004, for which they were awarded the 2010 Nobel Prize in Physics. This technique involves continuously peeling a piece of graphite using an adhesive tape until the appropriate thickness is achieved. Little amounts of high-quality graphene are produced using this method, but it takes a lot of time and is not appropriate for mass manufacturing.

Bottom-Up Methods

The bottom-up strategy consists of creating graphene from atomic or molecular building blocks. By using these techniques, the graphene structure is constructed atom by atom.

a. Chemical Vapor Deposition (CVD): The most popular technique for producing significant amounts of graphene is CVD. Over a metallic substrate, such as copper, nickel, or platinum, hydrocarbon gases are catalytically decomposed. In most cases, the substrate is heated to high temperatures (about 1000°C) while being exposed to a carbon source, like methane or ethylene. The carbon atoms then come together to create a layer of graphene on the support. Several techniques, such as wet transfer or dry transfer, can be used to transfer the resultant graphene to a different substrate. The process of large-scale graphene synthesis known as CVD produces high-quality graphene that is simple to transfer to other surfaces.

b. Epitaxial Growth: By this technique, graphene is grown on a material, such as silicon carbide, that has a crystal structure that is comparable to that of graphene. Following the deposition of carbon atoms onto the substrate, the lattice structure of the emerging

graphene is aligned with that of the substrate. High-quality graphene is produced by epitaxial growth, although it is only possible on certain substrates.

c. Chemical Synthesis: This technique uses chemical reactions to create graphene from molecular building blocks. One of these techniques is the reduction of graphene oxide with hydrazine, which yields reduced graphene oxide. Another technique entails reducing graphene oxide with other reducing substances, like sodium borohydride or ascorbic acid.

Graphene based invasive and non-invasive sensors:

Graphene based invasive sensors refer to sensors that are implanted inside the body to monitor various physiological parameters and detect potential diseases. High electrical conductivity, great tensile strength, and exceptional thermal conductivity are just a few of graphene's special qualities. With the ability to detect a variety of analytes, such as gases, liquids, and biological compounds, graphene is an appealing material for sensing applications [27]. Graphene's electrical conductivity, which may be altered by a change in the immediate surroundings, serves as the basis for its sensing mechanism. Target analytes that come into contact with the graphene surface alter the local charge density, which in turn alters the electrical conductivity of the material. Many methods, including resistance measurements, field-effect transistor (FET) measurements, or impedance spectroscopy, can be used to gauge this change in conductivity.

Non-invasive sensors are sensors that do not require penetration of the skin or other body tissues to measure physiological parameters, making them safe, painless, and easy to use [28].

Graphene-based non-invasive sensors have unique properties, such as high sensitivity, fast response time, low power consumption, and high durability, making them an attractive option for various applications, including healthcare, environmental monitoring, and industrial sensing. These sensors can be used to monitor various parameters such as temperature, strain, gas concentration, and biological molecules, without the need for invasive procedures. These sensors have the potential to revolutionize various fields, such as healthcare, by providing patients with real-time monitoring of their health parameters. These sensors can also be used for environmental monitoring and pollution control, as well as for industrial sensing, improving the efficiency and safety of various industrial processes.

Graphene's high surface-to-volume ratio, which enables a high degree of sensitivity to minor changes in the immediate surroundings, is one of the key benefits of employing it as a sensing material. Moreover, graphene is a fantastic material for quick and precise sensing due to its special electrical features, such as its high carrier mobility. There are many uses for graphene-based sensors, including gas detection, biosensing, and environmental monitoring. For instance, graphene-based gas sensors have been created to detect several gases with great sensitivity and selectivity, such as nitrogen dioxide,

ammonia, and carbon dioxide. The local charge density and electrical conductivity change as a result of the interaction between the gas molecules and the graphene surface, which serves as the sensing mechanism. Similar to this, biosensors based on graphene have been created to detect biomolecules like DNA, proteins, and glucose [29]. The biomolecule is immobilised on the graphene surface as part of the sensing mechanism, changing the local charge density and electrical conductivity in the process. Graphene-based biosensors are desirable for a variety of medical and diagnostic applications due to their excellent sensitivity and selectivity. Graphene-based sensors have been created for environmental monitoring applications, such as the detection of contaminants in water and the air, in addition to gas and biosensing. The target pollutant interacts with the graphene surface to modify the local charge density, which in turn changes the electrical conductivity. This interaction is the basis for the sensing process. When it comes to the detection of different pollutants, such as heavy metals, pesticides, and organic chemicals, graphene-based sensors have demonstrated great efficacy [30]. In conclusion, the electrical conductivity of graphene serves as the basis for its sensing mechanism, which can be affected by changes in the immediate surroundings. For a variety of sensing applications, such as gas sensing, biosensing, and environmental monitoring, graphene-based sensors have demonstrated exceptional performance. The high sensitivity, selectivity, and quick response times of graphene-based sensors make them desirable for a variety of applications, including medical diagnostics, environmental monitoring, and industrial process control.

Graphene-based sensors are perfect for wearable health monitoring devices since they can track a variety of physiological variables, such as heart rate, blood pressure, and respiration rate. Due to its great sensitivity and precision, graphene-based sensors can gather and analyse data in real time while continuously monitoring a variety of physiological indicators. Also, because to graphene's exceptional electrical conductivity and flexibility, wearable sensors that can adapt to the surface of the body and provide the highest level of comfort and accuracy are easily developed [31].

Graphene-based sensors have also demonstrated considerable promise for the creation of implantable medical technology. For long-term health monitoring, graphene-based sensors can be included into medical implants like pacemakers and defibrillators to monitor a variety of physiological factors like temperature, pressure, and pH. Graphene's biocompatibility also makes it a desirable material for implantable medical devices because it doesn't trigger an immune reaction or harm tissue. The great stability and sensitivity of graphene-based sensors make them perfect for long-term health monitoring and data collection. Systems for targeted medicine delivery based on graphene have also been created. Graphene is a desirable material for creating drug delivery systems that can precisely and effectively target particular body regions due to its high surface area and strong drug-loading capability. The outstanding biocompatibility, stability, and controlled-

release characteristics of graphene-based drug delivery systems make them the best choice for a variety of medicinal applications [32]. For instance, graphene-based drug delivery systems have been created for the treatment of cancer, allowing for highly precise and effective targeting of cancer cells with the least amount of harm to healthy cells. Graphene scaffolds have also been developed for tissue engineering applications. Graphene's remarkable biocompatibility and mechanical properties make it the ideal material for promoting cell growth and differentiation. Graphene-based scaffolds can aid in the growth and differentiation of several cell types, including those that make up bone, cartilage, and muscles. The greatest option for a range of tissue engineering applications is graphene-based scaffolds due to their better biocompatibility, strength, and conductivity [33].

By providing continuous and accurate monitoring of multiple physiological parameters, targeted drug delivery, and tissue engineering applications, graphene-based health monitoring systems have the potential to revolutionize the healthcare industry. By allowing for early disease detection, real-time data gathering and analysis, and targeted and individualized treatment, these devices have the potential to enhance patient outcomes. Due to its special qualities, graphene is a desirable material for creating health monitoring devices that can be used to a variety of medical conditions, such as cancer, neurological illnesses, and cardiovascular disease. By offering continuous and accurate monitoring of multiple physiological parameters, targeted drug delivery, and tissue engineering applications, graphene-based health monitoring systems have the potential to revolutionize the healthcare industry [34-35]. Due to its special characteristics, graphene is a desirable material for creating health monitoring devices that may be applied in a variety of medical settings. Graphene-based health monitoring devices will be a key tool for enhancing patient outcomes and developing the healthcare industry with sustained research and development.

Graphene based invasive sensor for neural sensing

Graphene-based neural sensing techniques, which include analyzing the electrical impulses of neurons in the brain, are a fast-emerging field of study. Because of graphene's unusual features, such as its high electrical conductivity, biocompatibility, and flexibility, these approaches have received a lot of interest in recent years. These methods have the potential to change the way we identify and treat neurological illnesses including epilepsy, Parkinson's disease, and Alzheimer's disease. Graphene-based electrodes that can be inserted into the brain to monitor neuronal activity are being developed. Because of their great sensitivity and ability to offer real-time information on brain activity, these electrodes are valuable for detecting and treating neurological problems [36].

Traditional neural sensing techniques offer significant benefits over graphene-based neural sensing systems. They are biocompatible, which means they do not harm brain cells, and they have excellent sensitivity and resolution, which allows for more exact

measurements of neural activity. Furthermore, because graphene-based devices are flexible and can adjust to the contour of the brain, they are more pleasant for the patient. We may anticipate to see more improved graphene-based devices that can deliver even more accurate and exact measures of cerebral activity in the future. Neural sensing methods based on graphene have the potential to change neuroscience by giving new tools for understanding the brain and generating novel therapies for neurological illnesses. These methods make use of graphene-based materials such as electrodes, FETs, nanomaterials, and MEAs, which offer unique qualities like high conductivity, biocompatibility, and flexibility [37-40]. Although these approaches are still in their infancy, they show immense potential for enhancing our knowledge of the brain and finding novel therapies for neurological illnesses.

Graphene-based electrodes can be created by depositing a thin layer of graphene onto a flexible substrate like polyimide and then patterning the graphene into the desired shape. The graphene layer is then designed to form an array of biocompatible electrodes with excellent conductivity that may be implanted into the brain or other neural tissue. These electrodes can generate high-quality electrical impulses and be used to either stimulate or record brain activity. Graphene-based transistors are made up of a small sheet of graphene sandwiched between two electrodes. The graphene layer serves as a route for electrical impulses. These transistors may be used to measure the electrical activity of nerve cells by altering the electrical characteristics of the graphene layer [41]. Graphene-based optoelectronic devices combine the electrical and optical capabilities of graphene to provide a revolutionary neural sensing approach. A tiny layer of graphene is put onto a substrate, such as a silicon wafer, to create these devices. The graphene sheet is then designed to form an array of electrodes capable of stimulating or recording brain activity. Moreover, the graphene layer may be utilized to transform light into electrical impulses, enabling for visual stimulation or cerebral activity recording [42].

Field-effect transistors (FETs) built on graphene may detect changes in ion concentration near neurons, which are a sign of brain activity. A graphene channel is sandwiched between two electrodes, with the gate electrode isolated from the graphene by a thin insulating layer. As neurons discharge ions, the electrical characteristics of the insulating layer change, which may be sensed by the FET. FETs based on graphene have a high sensitivity and can detect changes in ion concentration in real time. Neuronal activity may be detected and monitored using graphene-based nanomaterials such as graphene oxide and reduced graphene oxide. These nanoparticles have a large surface area and can interact with neurons, causing their electrical characteristics to alter. Graphene-based nanomaterials may be placed onto substrates like glass or silicon before being functionalized with chemicals that interact with neurons. The sensors developed as a result can detect changes in cerebral activity in real time.

Graphene-based microelectrode arrays (MEAs) can detect and record electrical impulses from numerous neurons at the same time. These MEAs are made up of a grid of electrodes, each of which is attached to a single neuron. Graphene is used to make the electrodes, which gives great conductivity and biocompatibility. The generated MEAs can offer a high-resolution map of brain activity, which can aid in the study of neural circuits and the development of innovative therapies for neurological illnesses.

Graphene based invasive sensor for temperature sensing

Graphene-based invasive sensors can also be used to measure temperature inside the body. Graphene-based temperature sensor can be implanted into the body to monitor body temperature. The sensor consists of a thin layer of graphene coated with a polymer that can detect temperature changes. This allows for accurate and continuous monitoring of body temperature, which is important for diagnosing and treating various conditions.

Temperature sensors based on graphene are used to determine the absolute temperature of sample or surroundings. They are made up of a graphene layer placed onto a substrate, such as a silicon wafer, that changes electrical characteristics when subjected to temperature variations. The change in electrical characteristics that results may be observed and used to compute the temperature. Temperature sensors based on graphene have a high sensitivity and can monitor temperatures with great precision. The usage of graphene-based materials, such as thermocouples, temperature sensors, resistance temperature detectors (RTDs), and thermal transistors, with unique qualities such as high thermal conductivity, sensitivity, and adaptability, is one of these fields. Although these approaches are still in the early phases of research, they show considerable potential for a wide range of applications such as temperature sensing in electrical devices, industrial processes, and environmental monitoring. Thermocouples made of graphene are used to monitor temperature variations between two sites. They are made up of two graphene electrodes, each coupled to a different metal, and when subjected to a temperature differential, they create a voltage difference. The voltage that results may be used to compute the temperature difference between the two sites. Graphene-based thermocouples have a high sensitivity and can accurately sense temperature variations.

Graphene-based RTDs detect variations in the resistance of a graphene layer to monitor temperature changes. They are made up of a graphene layer that is put onto a substrate, such as a glass slide, that changes resistance when subjected to temperature variations. The consequent resistance change may be monitored and used to compute temperature. RTDs made of graphene have a high sensitivity and can monitor temperatures accurately [43]. Graphene-based resistive sensors vary their electrical resistance in response to temperature variations. Since graphene has a negative temperature coefficient of resistance, its resistance lowers as temperature rises. Temperature may be estimated by monitoring the change in resistance of a graphene-based sensor. Resistive sensors based

on graphene have a high sensitivity and can function across a wide temperature range. Graphene-based FETs can detect temperature changes by measuring the electrical conductivity of the graphene channel. The electrical conductivity of the graphene channel changes as the temperature changes, which may be monitored by the FET. FETs based on graphene have a high sensitivity and can function across a wide temperature range. Temperature variations are measured using graphene-based fiber optic sensors that detect changes in the refractive index of a graphene-coated fiber optic cable. A tiny coating of graphene is placed onto the surface of a fiber optic cable to form these sensors. The refractive index of graphene changes with temperature, which may be observed by measuring the change in the light signal carried through the cable.

High-sensitivity graphene-based fiber optic sensors may be employed in difficult settings such as high temperatures and radiation. Graphene-based thermistors detect changes in electrical resistance to monitor temperature changes. These thermistors are made out of a thin layer of graphene that has been placed on a substrate and shaped into a certain form. The resistance of graphene changes with temperature, which may be observed by monitoring the electrical current running through the device. Thermistors based on graphene offer excellent sensitivity, rapid reaction times, and can operate at high temperatures. Temperature changes are measured using graphene-based thin film sensors that detect changes in the electrical characteristics of a graphene-coated thin film. These sensors are made up of a thin layer of graphene that has been placed onto a substrate like silicon or glass and shaped into a precise form. The electrical characteristics of graphene vary as the temperature varies, which may be measured by measuring the electrical current passing through the device [44]. Graphene-based thin film sensors offer excellent sensitivity and may be employed in a variety of applications, including temperature mapping of electrical devices and chemical reaction monitoring. Thermal transistors based on graphene are used to measure temperature changes by sensing changes in the electrical current passing through a graphene layer. They are made up of a graphene layer that is placed onto a substrate and a gate electrode that is separated from the graphene by a thin insulating layer. When the temperature varies, the electrical conductivity of the graphene layer changes, which the transistor detects. Thermal transistors based on graphene have a high sensitivity and can sense temperature changes in real time.

Graphene based invasive sensor for pressure sensing

Pressure sensing techniques based on graphene have the potential to transform the sector by giving new instruments for detecting pressure with high accuracy and sensitivity across a large pressure range. These approaches make use of graphene-based materials such as piezoresistive sensors, piezoelectric sensors, capacitive sensors, SAW sensors, FETs, and optical sensors, which have unique qualities like high sensitivity, mechanical flexibility, and electrical conductivity. Although these techniques are still in the early stages of

development, they hold great promise for improving our ability to measure pressure and developing new technologies for a variety of applications such as medical diagnostics, automotive, biomedical engineering, aerospace, and environmental monitoring.

A graphene-based pressure sensor that may be implanted into the bladder to assess urine flow pressure. The sensor is made up of a thin sheet of graphene covered with a pressure-detecting polymer. This enables reliable and continuous monitoring of bladder function, which is critical for detecting and treating problems like urine incontinence. Graphene-based pressure sensing methods employ graphene-based materials to detect pressure changes. Piezoresistive sensors adjust their electrical resistance in response to mechanical stress or pressure changes. Graphene has a negative piezoresistive coefficient, which indicates that when subjected to mechanical stress or pressure, its resistance lowers. The pressure may be calculated by detecting the change in resistance of a graphene-based sensor. Piezoresistive sensors based on graphene offer excellent sensitivity, short reaction times, and can work across a wide pressure range. Piezoelectric sensors are mechanically deformed devices that create an electrical charge. Doping graphene with impurities such as nitrogen or boron creates flaws in the graphene lattice that can behave as piezoelectric materials, resulting in graphene-based piezoelectric sensors. As pressure is applied to the sensor, the graphene lattice deforms, resulting in a piezoelectric action that produces an electrical charge that can be detected to calculate the pressure. Because of its high electrical conductivity and vast surface area, graphene may be utilized as one of the components in a capacitive sensor [45]. The resultant graphene-based capacitive sensors can sense pressure accurately throughout a wide pressure range.

Graphene may be embedded into fiber optic sensors to detect pressure changes. Graphene may be placed on the surface of an optical fiber and used to analyze changes in the fiber's refractive index as pressure varies. The intensity of the light passed through the fiber can be used to detect this change in refractive index. Fiber optic sensors based on graphene offer excellent sensitivity, rapid reaction times, and can function across a wide pressure range. Graphene may be used into optical sensors to detect pressure changes. Graphene may be placed on the surface of an optical fiber and used to analyze changes in the fiber's refractive index as pressure varies. The intensity of the light passed through the fiber can be used to detect this change in refractive index. Graphene-based optical sensors are very sensitive and can function across a large pressure range. By monitoring the electrical conductivity of the graphene channel, graphene-based FETs can detect pressure changes [46]. The FET detects variations in the electrical conductivity of the graphene channel as pressure varies. FETs based on graphene offer excellent sensitivity, quick reaction times, and can function across a wide pressure range. Because of its enormous surface area and mechanical qualities, graphene may be employed as a sensing material in surface acoustic wave (SAW) sensors. Graphene is placed on a piezoelectric substrate, and

the variations in surface acoustic waves caused by applied pressure are monitored. They have a high sensitivity, a quick reaction time, and can work in a wide pressure range.

Graphene based invasive sensor for Glucose Monitoring

Graphene-based sensors can also be used to monitor glucose levels in diabetics. Graphene-based sensor that can be implanted beneath the skin and measures glucose levels in real time. The sensor is made up of a thin film of graphene covered with enzymes that can convert glucose into hydrogen peroxide, which the graphene layer detects. This enables for precise and continuous glucose monitoring without the need for unpleasant finger pricks. Graphene-based glucose sensing systems employ graphene-based materials to detect glucose in biological fluids such as blood, saliva, and urine. Diabetes, a chronic condition that affects millions of individuals worldwide, necessitates glucose monitoring. Graphene-based electrochemical sensors detect glucose in biological fluids by using the electrochemical characteristics of graphene. When glucose is present in biological fluid, it combines with an enzyme called glucose oxidase, resulting in the production of hydrogen peroxide. The hydrogen peroxide then interacts with the graphene-based electrode, producing a measurable current. The glucose concentration may be estimated by monitoring the current [47]. Electrochemical sensors based on graphene have a high sensitivity and can function across a wide range of glucose concentrations. Graphene-based FET sensors can detect changes in graphene's electrical conductance when exposed to glucose. When glucose is present in biological fluid, it interacts with the graphene surface, causing the graphene's electrical characteristics to alter. The FET sensor can monitor this change in electrical conductance, allowing glucose detection. Graphene-based FET sensors are very sensitive and can work across a wide range of glucose concentrations [48]. Surface-enhanced Raman spectroscopy (SERS) sensors based on graphene leverage the unique optical features of graphene to detect glucose in biological fluids. When glucose is present in biological fluid, it reacts with a metal nanoparticle bonded to the graphene surface, producing a Raman signal that a spectrometer can detect. The glucose concentration may be estimated by monitoring the Raman signal. SERS sensors based on graphene have a high sensitivity and can function across a wide range of glucose concentrations [49].

Impedance based graphene sensors employ graphene and its derivatives to assess electrical impedance changes induced by glucose levels in biological fluids. The sensors are made up of a graphene working electrode that is functionalized with glucose oxidase enzymes that react with glucose to create a change in electrical impedance. The glucose levels are then determined by measuring the change in impedance [50]. Graphene-based impedance sensors offer great sensitivity, selectivity, and stability and may be used to monitor glucose levels in real time. Graphene-based optical sensors can detect changes in graphene optical characteristics when exposed to glucose. When glucose is present in

biological fluid, it interacts with the graphene surface, causing the graphene's refractive index to alter. This change in refractive index may be monitored by the optical sensor, allowing glucose to be detected. Graphene-based optical sensors are very sensitive and can work over a wide range of glucose concentrations. Graphene-based glucose monitoring sensing methods have the potential to transform the area of glucose monitoring by giving new instruments for detecting glucose with high accuracy and sensitivity over a wide range of glucose concentrations. These approaches make use of graphene-based materials such as electrochemical sensors, FET sensors, SERS sensors, and optical sensors, which offer unique qualities like high sensitivity, selectivity, and biocompatibility [51]. Although these approaches are still in their infancy, they show considerable potential for enhancing our capacity to monitor glucose levels and developing new technologies for the management of diabetes and other glucose-related disorders.

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METAL OXIDES BASED H₂ GAS SENSORS: A REVIEW

S. V. Patil

Department of Physics,

Shri Pancham Khemraj Mahavidyalaya, Sawantwadi

Corresponding author E-mail: spkphysics.svp@gmail.com

Abstract:

A sensor is a device that receives a physical, chemical or biological signal and converts it into an electric signal. The sensing mechanism of metals oxide sensor is the change in the metal oxide properties, when the oxidizing or reducing gas comes in contact with metal oxide either at room temperature or at high temperature. The good sensor should have fast response and recovery time. Among the different types of sensor materials, metal oxide based gas sensors are of recent attraction and many researchers are exploring the response of many gases for different metal oxides and other type of materials. Among H₂ gas detection techniques must also be focused with the increased use of H₂ gas in industries. Ready and accurate detection can minimize the risk of a small leak becoming a huge hazard risk. In this book chapter focus is on recent advances in sensing of H₂ gas by different type of metal oxides and their responses.

Introduction:

In Today's era, because of the technological advances, there are many automated systems which makes use of different gas for various purposes. In recent years, several types of gases have been used in different areas of industries. In order to avoid the accidental damages, it is now essential to constantly monitor these gases emitted which developed the need for gas sensors. The various uses of gas sensors vary across a wide range from industries to home applications. The leakage of these gases may cause damage to property and human life.

Among different gases the H₂ gas is highly hazardous because it is odorless and colorless [1]. The lower explosion limit is 4% concentration level of H₂ gas above this limit it is highly explosive and dangerous [2]. H₂ gas molecules are smaller in size that's why they can leak through small holes very easily. Therefore there is need to detect H₂ at lower concentrations to ensure the safety. Many techniques are used by the researchers to monitor H₂ gas. Different types of instruments have been used for the monitoring of trace hydrogen concentrations such as ultraviolet (UV) adsorption spectroscope and gas chromatography columns [3-5].

The use of metal oxides materials for fabrication of H₂ gas sensors with high sensitivity and selectivity is attracting attention of researchers because of their easy synthesis and fascinating tunable electrical and optical properties [6, 7].

Different metal oxides for detection of H₂ gas

1. SnO₂ based thin films

Among the various materials used for detection of H₂ gas, the widely explored metal oxide is SnO₂. Ansari et.al. studied gas response of SnO₂ thin and thick films deposited using various deposition techniques. He found that the thick film SnO₂ along with lead borosilicate glass is more sensitive than others [8]. H₂ gas sensing properties were studied by Md. Shahabuddin et.al. of Pt anchored SnO₂ sensor prepared by sputtering technique and found highly promising for H₂ sensing application [9]. Wu et.al. reviewed the response of SnO₂ nanosensors to H₂, CO, NO₂, and ethanol gas for different ppm levels at various temperatures [10]. The gas sensing properties of SnO₂ varies depending upon its morphology, surface area, grain size and other surface properties [11]. The doping of Pd to SnO₂ improves the H₂ gas sensitivity, Y. Shen et.al. studied the performance of undoped and doped SnO₂ nanowires synthesized by thermal evaporation of tin at 900 °C and found that Pd-doped SnO₂ shows more sensitivity than undoped SnO₂ nanowires [12]. Another efficient approaches to increase the selectivity and sensitivity of sensors is to use a filtering membrane, X. Meng et.al. studied the effect of thickness of the SiO₂ filtering membrane on sensitivities and selectivity of gas sensors [13]. Polyaniline (PANI)/SnO₂ composite gas sensor were prepared using electrospinning technique by H. J. Sharma for hydrogen (H₂) and carbon monoxide (CO) gas with fast response and recovery times. So, SnO₂ based thin film or thick film sensors is a potential candidate for H₂ as well as other types of gases. The main disadvantage of these sensors is operating temperatures.

2. Graphene based Materials

Most of the metal oxides shows gas response at very high temperatures. The high operating temperature over 200 °C for the detection leads to high power consumption. Along with this metal oxides show low selectivity. Over the last couple of years, Graphene Oxide (GO), with its fascinating properties has been reported to advantageously exhibit room temperature gas sensing. M. Shabana et.al. deposited nanoporous GO sensor using spray pyrolysis technique and studied the gas response for CO₂, H₂ and C₂H₂ at room temperature. Nanoporous GO thin films were more sensitive to CO₂ as compared with H₂ and less sensitive to C₂H₂ at room temperatures [15]. Due to high chemical and physical properties nanomaterials such as graphene and graphene oxide have emerged as potential candidates for the design and fabrication of selective gas membranes. Reinaldo et.al. prepared an efficient H₂-sensor by the hydrothermal microwave exfoliation method with highly-exfoliated-graphene layers by means of palladium nanoparticles [16]. Along with use of graphene/graphene oxide as a membrane, composite materials were also explored by different research groups to sense different gases. K. Anand et.al. prepared nanocomposite of graphene/ZnO through reduction method during refluxing and confirmed that the electron transfer and electrical conductivity is due to the existence of graphene in the composites [17]. Pandey et.al. reported a silicon based gold electrode

coated by graphene oxide then with the help of spin coating. later the graphene oxide was reduced and then Pd sputter coated. The sensors showed selectivity towards the hydrogen even at 50 p.p.m. level [18]. Different deposition techniques with a lot of metal oxide material have been studied and explored as a H₂ gas sensor. P. A. Russo et al reported the performance of hydrogen sensor based on reduced graphene oxide (RGO), tin oxide, and platinum prepared by microwave-assisted methods [19].

3. TiO₂ based Sensors

TiO₂ exists in nature with its three forms generally known as rutile, anatase, and brookite. Rutile and anatase are tetragonal and brookite exist in orthorhombic form. Out of these three first two (rutile and anatase) shows gas sensitivity. The TiO₂ gas sensors can be classified into different types based upon the other elements present alongwith TiO₂. they can be classified as

3.1. Pure TiO₂:

Pure TiO₂ may be in thin or thick form shows gas response at some operating temperature. They show low sensitivity also they responds to the stimulus at particular temperatures. A. Hazra [20] et al. prepared nanocrystalline TiO₂ thin film by sol-gel methods. As-prepared p-type TiO₂ chemiresistor sensor showed a very excellent response for H₂ in air at 100 °C with a response time of 1.3 s. A well-designed pristine TiO₂ can be a potential candidate as a high quality hydrogen gas sensor working at room temperature. The sensitivity can be increased with decreasing in the operating temperature by radiating the TiO₂ under the light of specific wavelength. A UV irradiation-assisted room temperature hydrogen gas sensor is reported by X.Y. Peng [21] *et al.*, which exhibited a compact structure composed of uniform TiO₂ microspheres.

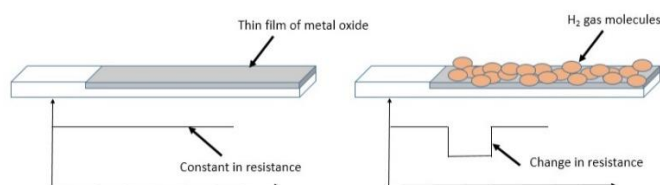
3.2 Doped TiO₂:

Further the sensitivity of the TiO₂ thin films can be increased by doping of different metals. Doping causes surface sensitization, they surface properties gets altered due to doping. P. Gwizdz et.al. reported the response of Cr-doped TiO₂ sensor from 0 to 10 % doping [22]. Patil [23] et.al. deposited Pt-doped TiO₂ thin films by chemical spray pyrolysis and response of H₂ gas. The low level detection is possible with these films also the response and recovery time of Pt-doped TiO₂ thin films is very fast near about 14 s.

Gas sensing Mechanism

For most of the metal oxides either in a pure form or doped with other elements, the gas response is at higher temperatures. The basic principle is the surface reactions at high temperature. The adsorbed gas molecules changes the surface properties. The oxidizing or reducing gases either accepts or donates electrons resulting into change in the resistance of the thin film. When reducing gas donates electrons the resistance of the film decreases. The change in the resistance of the thin film indicates the presence of the gas molecules. In order to observe the change temperature may be raised upto 600 °C. The room temperature H₂ sensors shows the change in the physical properties at room temperatures.

Srivastava et.al. deposited pure PANI and TiO₂/PANI composite thin films based chemiresistor H₂ gas sensor. The resistance of all composite films decreases rapidly upon introduction of H₂ gas [24].



Gas sensing mechanism

Conclusion:

The SnO₂ thin films shows the gas response towards H₂ gas but detection needs high temperatures in order to show change in the electric properties of sensor film. Graphene oxides in various forms or doped with various metals showed better gas response even at room temperatures. TiO₂ is also a potential candidate for the H₂ detection.

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GLIMPSE ON THE RISE AND FALL OF MUMBAI DABBAWALA

Abhijeet Deepak Yadav

Department of Mathematics,

Khare Dhere Bhosale College Guhagar, Dist. Ratnagiri,

Mumbai University, (415703)

Corresponding author E-mail: yadav.abhijeet50@gmail.com

Abstract:

Every successful business has a foundation of vision, leadership, management, marketing and money. Mumbai Dabbawala, an army of 5000 people runs a 130 years old tiffin delivery business. Feeding Mumbai's middlemen and contributing to the economy of Mumbai. People from the same community, religion and culture handle nearly 4 crores transactions per day. Every member has an equal share in profit. Due to error free transactions, Mumbai Dabbawala is now Management Guru. Many high profile personalities, prestigious universities, students willing to visit and learn management. Always their priority is to their customers, as they consider customers as Maharaja. They assume that, Technology is to support business and Business is not there to support technology. Natural disasters, calamities do not stop dabbawala from doing their duty. But, the wave of Covid 19 in India, destroyed Dabbawala's business. In this chapter, glimpse on the success story of dabbawala, their ethics in business and fall of their system.

Keywords: Dabbawala, Management Gurus, NMTBSA, Entrepreneur

Introduction:

Mumbai is the Financial Capital of India. Three things play an important role, first Mumbai's Local Train, Second Bollywood, and Third Mumbai's largest and Oldest Linked Chain Business "Dabbawala". Many people believe that Dabbawalla and Caterers are the same. But this is not true, because tiffin and the food contained in tiffin are both yours. Dabbawalla handles only the logistics. In English "dabbawalla" means "one who carries a box"[1]. They deliver your tiffin from your home to your workplace and the same in a reverse manner. In one day, they are organizing two deliveries. As we all know, in Mumbai servicemen use local trains for their travelling and they can't carry their tiffin with them while leaving from home for two reasons. First, local trains are very crowded, so they can't carry their luggage and tiffin box at a time and secondly, servicemen start their journey early in the morning around 06.00 a.m., so it is not possible for housewives to wake up and cook by around 05.00 a.m. So here enters Mumbai Dabbawala to solve the problem of servicemen. As everyone wants hygienic food, the only choice in front of every serviceman is home-cooked food. Now, who is this Mumbai Dabbawala and what is their background?

History:

A Parsi Banker employed a person to bring Homemade Food to the site of work. His office friends also liked this innovative idea and started availing of this service. Hon. Mahadu Havaji Bachhe takes this innovative idea and started working on this [2]. Around 1890, with 100 people he started the service of Dabbawala¹. His descendant, Mr. Raghunath Medge is the first professional Dabbawala in Mumbai. He is the President of Nutan Mumbai Tiffin Box Suppliers Association (NMTBSA), a Charitable Trust registered in 1956. Once he said, "People study management books and then practice. But we practiced first and have now we become a subject of case studies". He trusts in Memory more than in Technology. He builds this empire with 5000 employees, who regularly wear white kurta and Gandhi topi [3].

NMTBSA:

There is a 3 tier system in the association. 13 permanent members are at the highest level of NMTBSA, responsible for fine-tuning among dabbawala and the overall transport system. President- Raghunath Medge, Vice President- Sopan Mare, General Secretary, Treasurer, and Directors (9). The second-tier system consists of 800 Mukadams, the group leader of 5-10 dabbawala, and mostly the highest age members in a group. Everyone gets an equal salary, as everyone is a partner in this business, not the employees. The rest are nearly around 5000. Every group tries to find new customers and try to compete with another group. An executive committee of 13 members is elected every five years. Monthly meetings are held to discuss problems in the line of operations. 9 Directors are spread over Mumbai; their workplace is defined by the railway station. When someone started working with dabbawala, he was not a member. He has to buy a tiffin line only if some previous member wants to sell his tiffin line for reasons, then the highest bidder gets this tiffin line and finally, he becomes a member. The price of the tiffin line is not based on the number of tiffins, but on the length of the route for the delivery. The value of the bid depends upon how much the tiffin line earns every month. Mainly there are three routes, first is Virar to Churchgate, Secondly Kalyan/Dombivli to CST, and lastly Panvel to CST. Each Tiffin Basket/Crate weighs 60-65 kgs. They had to carry this much weight on their heads and had to walk a few kilometres. There is no fixed retirement age.

On Average, all 5000 Dabbawalas delivered 2,00,000 tiffins per day and charged nearly Rs. 1000-2000 per month [4]. It means each dabbawala delivers 40 tiffins a day. If we assume the cost of tiffin delivery is Rs. 1500 per month, the monthly average revenue of Dabbawalas is nearly Rs. 30 crores which leads to a 360-crore turnover of this business per year. Each dabbawala could earn Rs. 10,000-15,000 per person per month depending upon a few parameters. Also, they get one month's salary as a Diwali bonus from the customers. There are still some default expenses (in percentage) for each dabbawala such as monthly

urban railway pass (3%), maintenance of bicycles and pushcart (2%), compulsory contribution to the NMTBSCT (1%), and contribution for Puja in railway station (1%) [5].

Some key features of Dabbawalas are as follows:

1. They memorize the names and addresses of 30-40 customers in their minds, so don't require any technological backup [6].
2. Since 1890, there has been no strike and no police/court case on dabbawala. No organization/ industry in the world has such a record.
3. All dabbawala wear white Gandhi topi, and white kurta, and must carry their Identity card.
4. Everyone believes in "Work is Worship"
5. This business runs on zero % of the investment, disputes, fuel, modern technology, 99.99% performance, and 100% customer care and satisfaction .

Everyone follows the Code of Conduct declared by NMTBSA:

1. No alcohol Drinking/Smoking during Business Hours.
2. No, leave Without Prior Notice.
3. Different types of fines, for disobeying the code of conduct
 - i. Rs. 500 for Drinking on Duty,
 - ii. Rs. 100 Smoking on Duty,
 - iii. Rs. 25 Not Wearing White Cap, ID Card,
 - iv. Rs. 1000 Leave without Intimation,
 - v. sacked if repeated in 2-3 instances

Service Process Structure:

A) Colour Coding system:

When Dabbawallas deliver 2,00,000 Tiffins across Mumbai without an error, it is mandatory to have some unique identification over every tiffin box. But as most of the Dabbawalas are illiterate, there was the only option to use colours, basic numbers, and some short forms. By the end of the 19th century to the mid-20th century, colored threads were used for identification. From the Mid-20th century till the early 1970's colored cloth tags were in practice [7]. But as the population of Mumbai expanded exponentially, this system was not that useful. So, they introduced the Devanagari alphabet, religious allegories, or just geometrical symbols and started to use oil paint on the top of every tiffin box, instead of colored threads and tags [8].

Mainly four codes use in Colour Coding System:

1. Resident Station Pick Up Group Code (1 Digit Alphabet),
2. Resident Station Code (2/3 Digit Alphabets),
3. Destination Station Code (1 Digit Number))

4. Destination Pickup Group Code (1 Digit Number), Destination Address Code (2 Digit Alphabet), Final Destination (Details Specification of Floor/Office/Person Name) (2 Digit Numbers)

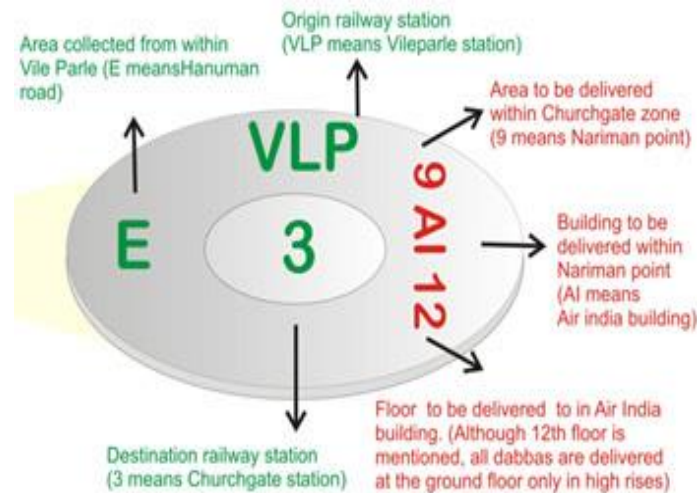


Figure 1: Details of a coding system

B) Distribution Flow:

Whole Day of Dabbawalas: (Nearly 08 hours of work per day)

09.00 a.m. to 10.30 a.m._ Pickup_ Dabba from Residence/ Caterer and Bring it to the nearest stations.

10.30 a.m. to 11.30 a.m._ Journey via Local Train_ This period is travelling time. Dabbawalas load wooden crates filled with Tiffins onto the luggage or goods compartment in the train. Generally, they choose to occupy the last compartment of the train.

11.30 a.m. to 12 p.m._ Downloading and Sorting_ The Dabbas is downloaded from the trains and Sorting is done as per the destination codes.

12.00 p.m. to 01.00 p.m._ Final Delivery_ Tiffins are delivered at the destination address.

01.00 p.m. to 01.30 p.m._ Lunch Time_ Dabbawalas carry their food with them, area wise they sit together and have lunch. Small meetings were also carried out.

01.30 p.m. to 02.30 p.m._ Collection Process_ Dabbawalas have to pick up the Tiffins from the offices where they had delivered almost an hour ago.

02.30 p.m. to 04.00 p.m._ Reverse Journey_ Reverse Travelling by train taking the empty dabbas.

04.00 p.m. to 04.30 p.m._ Sorting at Source Station_ segregation as per the destination suburb and Tea Time.

04.00 p.m. to 06.00 p.m._ Returning Dabba to Residence/ Caterer. At this stage dispatch takes place. Empty dabbas are delivered to the respective residence.

Achievements/ Notable Events:

1. Six Sigma Certification (In 1998): Due to the error rate of one in 16 million transactions. Forbes Global magazine conducted a quality assurance study on Dabbawala and gave it a Six Sigma efficiency rating of 99.999999. No one in the world gets this Certification without an Application [14].
2. Visit of Prince Charles (04 November 2003): Prince Charles III, King of the United Kingdom, visited Dabbawala during his visit to India. Dabbawalas requested King to adjust his schedule according to them, so King had to adjust his visit with them according to their suitable time and Place. The meeting of both was held on the Footpath of ChurchGate Station, from around 11.20 a.m. to 11.40 a.m. [14].
3. Hon. Shri Richard Branson, Chairman of Virgin Atlantic Airways (01 April 2005): Mr. Richard Branson not only visits Dabbawalla but spends his whole day working as a Dabbawalla and also travelling with them on a local train from Andheri to Churchgate [14].
4. Invitation to the Wedding of Prince Charles and Camilla Parker Bowles (09 April 2005): For this Royal wedding only three special guests from India were invited, namely Raghunath Medge (President of NMTBSA), Sopan More (another dabbawala from Mumbai) and Maharani Padmini Devi (From the Royal family in Rajasthan). Dabbawalas sent a nine-yard sari for Camilla and a Maharashtrian Puneri turban for Prince Charles [13].
5. Indian Institution of Ahmedabad (In 2005): IIM Ahmedabad published a case study on the management perspective of logistics of the Mumbai Dabbawala [14].
6. Received ISO 9001:2000 Certificate (29 July 2007): Certified by the Joint Accreditation System of Australia and New Zealand [14].
7. The New York Times (In 2007) Published one report on Dabbawalla that, this industry grows at a rate of 5-10% per year [14].
8. Visit of Gary Locke, U.S. Secretary of Commerce (12 February 2011): During this visit, he tries to understand the colour-coding system and its efficient management model [13].
9. Guinness Book of World Records (21 March 2011): Prakash Baly Bachche carried out 3 crates of tiffin on his head at one time. [13]
10. In 2011, Dabbawalas support Anna Hazare as a part of the Indian Anti-Corruption [13].
11. Certification by World Records India (27 April 2013): For the invention of a unique and effective, 0.999999% errorless Tiffin Delivery system [14].
12. IPSA 2019 (31 May 2019): International Product and Service Award presented to Mumbai Dabbawala for India's Best Tiffin Services Provider of the Year 2019 [14].
13. Recognition from Ripley's "Believe it or not" from the American Franchise [13]

14. Included among DNA's top 50 entrepreneur list of India [13]
15. There are some documentaries by well-known broadcasting channels like BBC, UTV, MTV, and ZEE TV and also the special episode in the British TV Series "Top Gear: India Special" [14]
16. Delivers talks and speeches in various prestigious Universities, in front of well-known personalities all over the world like the Prime Minister of the Netherlands, Prime Minister of Belgium, Mercedes Benz, British Telecom and Oxford University London, Latin America Columbia University, Massachusetts Institute of Technology (USA), Cognizant Technology Solutions (Wharton), Wharton Business School (Pennsylvania), Tuck School of Business (Dartmouth) and all the well-known business schools in India and Asia. [13]

Fundamentals of Dabbawala:

1. Discipline: - If some customer is late by 1 minute only, during pickup time, they walk away as it disturbs their time management and refuses to collect unusual shaped tiffin boxes as it imbalances their crate [9].
2. Internal Promotion: After completing 10 years, Dabbawalas was promoted to Supervisor (supervises a group of 25 people),
3. Ownership: Everyone is a partner in the profit after the completion of 06 months of the probation period [10].
4. Similarity: Most of the Dabbawalla is from Varakari Sampraday and near the villages of Pune. So, there is uniqueness in language, culture, food, and region. So, conflicts among them are negligible [11].
5. Coding System: illiterate people can also understand this system which leads to 0% error in delivery Collection and Distribution of Lunch Boxes with the care of customers is the motto of Dabbawalas.

Fall of System:

Terror attacks (2008), Bomb Blasts (1993, 2011), Communal riots (1992), Floods (2005) and so many other natural calamities did not stop Dabbawalas from their duty, but COVID-19 (March 2020) crushed this whole 130 years food industry [12]. The government started restrictions on travel by local train, a few months of curfew; industries started working online, and a rise of work-from-home culture, really destroyed Dabbawalas, as the demand for Dabbas declined. Most of the Dabbawalas returned to their hometown, and some of them who still live in Mumbai started another business for their two meals in a day. Currently, the 130 year old empire of 5000 employees drops down to 300-500 and serves around only 1000 deliveries a day [12]. Also, the main reason behind the fall of the Dabbawalas era is from the last 130 years, Dabbawalas had focused on only one type of service. They never tried to diversify their business models. As around 80% of Dabbawalas are illiterate, from the start they never tried the technology aspect of their business. Also,

their main focus was only restricted to Mumbai, and never tried to reach out to other towns in Maharashtra or India, so their functional area remained constant which resulted in a drop-down in industry growth.

Action Plan:

As we all know, “After every sunset there is a sunrise. So don’t lose hope”. Dabbawalas start to try new business ideas, running parallel to the previous food industry. There are some income sources for Dabbawalas by using their own established channels. A list of such business models is as follows:

1. In Mumbai, there are still lots of people who can’t get home-cooked food. If Dabbawalas start their catering service, through some cloud kitchens, they can certainly reach such people. This will help to grow their business vertically. Also, the Dabbawalas family will get involved in this business model due to catering services, which will result in an increment in monthly income [12].
2. As Dabbawalas cover all major parts of Mumbai, if they collaborate with advertising companies, there will be another source of income.
3. They can use their channel to implement courier services by increasing their workforce. If they start
4. art delivering tiffin boxes or food to the homes or apartments, just like Swiggy and Zomato, they should never have to turn back.

Conclusion:

There is one proverb, “Don’t put all your eggs in one single basket”, which means don’t put all your resources in one business because if that single business goes wrong due to some circumstances, you might lose everything. If your one business is well established, then start to spread your wings into other businesses. This story of Mumbai Dabbawalas gives a lesson that, no matter how old you are in your Business, how Successful and Safe in your business is, irrespective of all these things if you want to run your business for many years. Then you have to think about new ideas continuously till your last moment.

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NANOTECHNOLOGY – A SUSTAINABLE AGRICULTURAL DEVELOPMENT IN INDIA

Rahul Vasantrao Zade

Annasaheb Vartak College, Vasai Road (w),

Dist.-Palghar- 401202 (M.S.)-India

Corresponding author E-mail: ravzade87@gmail.com

Abstract:

Nanotechnology is the study and operation of extremely fragile effects, about 1 to 100 nanometers. Nanotechnology has subsidized the agrarian-grounded business region with a periodic excrescency rate of 25%. The Department of Science and Technology (DST) is the nodal division for enforcing the nano-charge. The Ministry of Agriculture released 'guidelines for evaluation of nano-grounded agri-input and food productions in India'. Nanotechnology in agriculture includes special operations like nano-diseases, nano-fungicides, and targeted use of inputs to boost productivity without decontamination of soil and water. Nanotechnology has immensely contributed to sustainable agriculture by enhancing crop products and repairing and perfecting soil quality. New parentage technologies are essential if global crop production is to redouble by 2050 to meet the rising food demand. Nanomaterials prepared by eco-friendly and verdant styles may boost agriculture eventuality for perfecting the fertilization process, factory excrescency controllers, fungicide quittance of active factors to the asked prey spots, treatment of wastewater and also enhancing the immersion of nutrients in the factory. Nanotechnology provides new quittance mechanisms and new agrochemical instrumentalities for perfecting crop productivity and promises the reduction of fungicide operations and better evolution in sustainable agriculture.

Keywords: Nanotechnology, sustainable agriculture, agrochemicals, nanomaterials.

Introduction:

The agrarian region is dealing with enormous expostulations similar as rapid-fire climatic changes, a drop in soil fertility, macro and micronutrient insufficiency, overuse of chemical diseases and fungicides, and heavy essence presence in the soil. (Planning Commission, 2011). Lately, the Union Minister of Agriculture and Farmers Welfare, grassed about the colourful enterprise taken by the government to espouse agriculture technology. In 2021, a discussion paper on the India Digital Ecosystem of Agriculture (IDEA) from the Ministry of Agriculture and Farmers' Welfare (MoA & FW) was released, which talks about a digital revolution in the agriculture region. The relinquishment of ultramodern technology depends on colourful procurators similar as socioeconomic conditions, geographical conditions, crop grown, irrigation installations etc. Significant advancements in crop gain will come from perfecting the effectiveness of the photosynthetic process.

(Sukirtha and Saranya, 2020). The editors of Nature estimated that any technology takes some 20 times to crop from the laboratory and be capitalized. (Nature, 2011).

Nutrient use effectiveness (NUE) is a measure of how well shops exercise the accessible mineral nutrients. (Sukirtha and Saranya, 2020). Crop complaint discovery nanotechnology bias and tools like nanocapsules, nanoparticles and viral capsids can be exercised for the discovery and treatment of conditions. Nanosensors can be exercised to identify fungicide remainders, excrescency, phytopathogens, and nonentity pest in the field. (Reddy and Chhabra, 2022). Quantum blotches and nanoparticles have substantiated to a natural marker associated with standing delicacy (Sharon *et al.*, 2010). Nutrient operation nanotechnology bias can be exercised for the improvement of nutrient immersion by shops, the quittance of active constituents to special spots and water treatment processes. The use of prey-special nanoparticles can reduce the damage to non-target facfactories the quantum of chemicals released into the terrain. Nanosensors are formed for covering factory fragments, soil and water in the agroecosystem. (Sukirtha and Saranya, 2020).

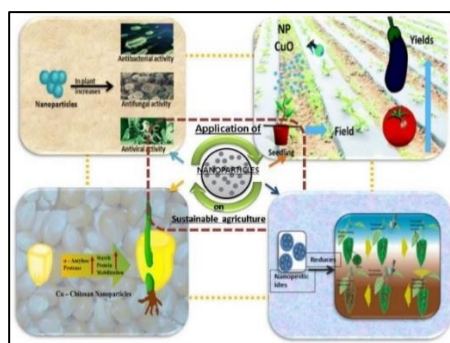


Fig. a) Application on sustainable agriculture.

(Source: <https://www.frontiersin.org/articles/10.3389/fmicb.2017.01014/full>)

Dr. S. Neethirajan developed a detector by integrating microelectronics and nanotechnology, this helps the planter in the covery of corruption of grain during storehouse, and this detector identifies the corruption of granules grounded on carbon copy dioxide attention and on the base of chemicals which discharge smell. The smell emitted by the organisms varies from species to species; the detector detects and sends signals to growers so that planter can control it as beforehand as practicable (Chen and Yada, 2011). Nanosensors are exercised in detecting fungicide remainders, for case multi-walled carbon copy nanotubes (MWCNT) were exercised to descry methyl parathion (Scognamiglio, 2013), nanogold grounded immunosensors were exercised to descry karnal bunt complaint in wheat (Dong *et al.*, 2013). Nanostructures with a special chemical, physical, and mechanical parcels like electrochemically active carbon copy nanotubes, nanofibers and fullerene can be exercised for soil dissection, ready bio-chemical seeing and control, water operation and quittance, fungicide and nutrient quittance.

As the climate revise is posing serious expostulations for agriculture, there is a want to switch to perfect agriculture. Nanotechnology holds the key for perfect agriculture.

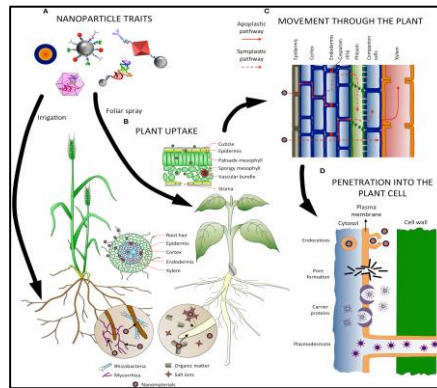


Fig. b) Factors influencing absorption, uptake, transport and penetration of nanoparticles in plants (Source: Alejandro, 2017).

Use Nanotechnology in Agriculture

The want for new parentage technologies is essential if global crop product is to redouble by 2050 to meet the rising food demand. Gain raises of 2.4% are needed to meet the demand without putting further land under civilization. The periodic product of cereals would need to go up by 50% to around three billion tonnes to give for the 2050 population demand. Use of nanoparticles like ZnO, TiO₂, MWCNTs, FeO, Zn, Fe, Cu- oxide, and hydroxyl fullerenes had swelled the crop excrescency and quality (Liu *et al.*, 2016; Joshi *et al.*, 2018; Dubey and Mailapalli, 2016). Perfecting the effectiveness of Rubisco (Amthor, 2007), modifying the chlorophyll antenna size of chloroplast photosystems (Melis, 2009), potentially allowed to wangle briskly growing shops and come the crucial procurator to design and develop artificial photosynthetic systems, an implicit source of clean dynamism (Giraldo *et al.*, 2014; Noji *et al.*, 2011).

Genome-edited crops had the eventuality to lower chemical toxin and fungicide use, reduce post-harvest losses while at the same time producing climate-flexible, nutrient-thick, and advanced-gain crops. Nanotechnology is an arising field of Indian agriculture. The use of nanotechnology for meliorated crop productivity can be a locally feasible program for growers, especially in extremities. The connected use of diseases with the carbon copy nanoparticles swelled the grain works in rice, spring sludge, soybean and downtime wheat (Li *et al.*, 2013). These technologies have inheritable substance to be appended, removed, or remodelled at personal locales in the genome. Its operations carry correcting inheritable blights, treating and precluding the spread of conditions and perfecting crops etc. CRISPR technology is one of the tools exercised in gene editing.

Nanotechnology in agriculture includes special operations like nano diseases, nano fungicides, and targeted use of inputs to boost productivity without decontamination of soil and water etc. Technology in agriculture can be exercised in nonidentical aspects of

agriculture similar as the operation of pesticides, fungicides, toxins, and bettered seed. Through technology, growers are in a situation to exhilarate every process for effectiveness and bettered product. Increases agriculture productivity. Prevents soil declination. Reduces chemical operation in crop products. Effective use of water coffers. Disseminates ultramodern ranch practices to ameliorate the quality, volume and downgraded cost of product. Changes the socio-profitable status of growers.

How can nanotechnology be applied to the field of agriculture?

- a. Nanoscale carriers can serve as ' magic pellets ', containing dressings, chemicals, or genes, which target personal factory corridor to release their content. Nano-capsules can enable operative penetration of dressings through cuticles and allow tardy and constant release of the active substances.
- b. Nanofabrication is the project and manufacture of bias with confines measured in nanometers. It can enable the study of factory regulation of hormones similar as auxin, which is responsible for root excrescency and seedling establishment. It helps understand how factory fountain heads acclimatize to their terrain, especially to borderline soils.
- c. Photocatalysis: It involves the response of catalyst (nanoparticles) with chemical composites in the presence of light. Through this process, nanoparticles can be exercised for the bioremediation of resistant or sluggishly degradable fungicides, as detergents and for wastewater treatment.
- d. Nano-barcode technology: Nanobarcodes have been exercised as ID markers for gene expression dissection. Nano patches to be employed in nanobarcodes are fluently encodable, engine-readable, durable, sub-micronsized taggant patches.
- e. Nanosensors: Through the use of nano-detectors and GPS with satellite imaging of fields, growers can ever descry crop pests or substantiation of pressure similar as failure. By utilizing electronic detectors, diseases can be placed exactly in the wettish belt, grounded on the spatial variability in native fertility.
- f. Smart Dust The 'smart dust' technology can be exercised for covering colourful parameters like temperature, moisture, and maybe nonentity and complaint infestation to produce allotted intelligence in vineyards and vineyards.
- g. Nano-accoutrements productions grounded on nano-accoutrements are being developed to absorb soil humidity when it is in redundant and release sluggishly to shops during dry ages.

Government in this instruction:

The government launched a National Nano Mission in 2007. The charge looks at the usages of nanotechnology for safe drinking water, accoutrements evolution, detectors evolution, medicine quittance, etc. The Department of Science and Technology (DST) is the nodal division for enforcing the nano charge.

- a. Guidelines apply to Nano-Agri-Input productions (NAIPs), Nano-Agri productions (NAPs) and nano mixes, detectors made from nanomaterials that bear direct connection with crops, food and feed for data accessions. They do not apply to usual productions or phrasings with the incidental presence of natural nanomaterials.
- b. Digital Agriculture Mission: This has been founded for 2021-2025 by the government for systems grounded on new technologies like artificial intelligence, block chain, remote seeing and Civilians technology, use of drones and robots etc.
- c. In 2007, the Government of India launched Nano Science and Technology Mission (NSTM) for exploration and creation. The Ministry of Agriculture released 'Guidelines for Evaluation of Nano-grounded Agri-input and food productions in India'.
- d. Unified Farmer Service Platform (UFSP) UFSP is a combination of Core structure, Data, operations and Tools that enable flawless interoperability of colourful public and private IT systems in the agriculture ecosystem across the country.
- e. Nationale-Governance Plan in Agriculture (NeGP-A) A Centrally Sponsored Scheme, it was originally launched in 2010-11, which aims to achieve rapid-fire evolution in India through use of ICT for timely access to agriculture-affiliated information to the growers. In 2014-15, the gambit was farther extended for all the remaining States and 2UTs.
- f. Sub-Mission on Agricultural robotization (SMAM) Under this Scheme, subventions are handed for clinch of colourful manners of agrarian outfit and ministry.
- g. Other Digital enterprise Kisan Call Centres, Kisan Suvidha App, Agri Market App, Soil Health Card (SHC) Portal, etc.

What are the affiliated challenges?

Education and Training Related Lack of knowledge shy chops Lack of advanced chops Technology and structure Poor structure, Lack of transport. Economic and Policy issues Lack of Money Access to credit, Lack of access to Bank Loans. Climate and Environmental Issues Poor soils, Soil fertility, Unreliable downfall, Natural disasters similar as cataracts, frost, hail storm. sickie-social issues Workers have no interest in agriculture, ranch workshops are not preferred overripelegeng systems (tone-reliance workshop), and Farm jobs are time consuming. Repeated and ferocious use of finagled nanoparticles will lead to the accumulation of these in the terrain, soils, water. This will make the soil physiochemical and natural parcels largely reactive (Nemmar *et al.*, 2001). Human coffers to be successful in the new arising field of agrarian nanotechnology, mortal coffers must be well trained to experiment, introduce, assess, interpret, and successfully assimilate the proposition, tools, and ways of nanotechnology for its operation in husbandry. Enterprises at colourful situations the enterprises related to the vacuity, conflation, position of toxin, health hazards, transportation challenges and contradiction of nonsupervisory structure

circumscribe the broad recognition and acceptance of espousing nanotechnology in husbandry. Lack of Risk Assessment The current exploration trends warrant realistic approach that fail to attain comprehensive knowledge of threat assessment factors and farther toxin of nanoparticles toward agroecosystem factors viz. factory, soil, soil microbiomes after their release into the terrain.

Way forward

The use of technology has defined the 21st century. As the world moves toward amount computing, AI, big data, and other new technologies, India has a tremendous occasion to reap the advantage of being an IT mammoth and revise the agriculture sector. While the green revolution led to an increase in agrarian products, the IT revolution in Indian agriculture must be the coming big step. There need to be immense sweat to ameliorate the capacities of the growers in India—at least until the educated youthful growers replace the being under-educated small and medium growers. Technology in agriculture has the implicit to truly lead India to be “Atmanirbhar Bharat” in all felicitations, and be less dependent on extraneous factors. IFFCO has also sought authorization from the Department of Diseases for the import of Nano Urea (Liquid) manufactured from its Nano Fertilizer Plant installation set up at Kalol, Gujarat.

At ICAR exploration on different crops were set up agronomically suitable indicating that nano nitrogen (Nano Urea) can enhance crop yields besides saving nitrogen to the extent of 50%. The occasion for the operation of nanotechnology in husbandry is fabulous. Nonetheless, as conventional agricultural practices come decreasingly shy, and requirements have exceeded the carrying capacity of the terrestrial ecosystem, we have little option but to explore nanotechnology in all sectors of agriculture.

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VOLUMETRIC ANALYSIS-COMMON INDICATORS AND APPLICATIONS

Rajeev Ramachandra Kolgi

Department of Chemistry and Biochemistry,
Government Science College Bengaluru-01. Karnataka, India
Corresponding author E-mail: rajeevkolgi@gmail.com

Abstract:

Analytical chemistry deals with the methods used in determining the composition of various materials. It can be divided into two main branches i.e. quantitative and qualitative analysis. Qualitative analysis is the process of detecting the various constituents of a substance or substances. Quantitative analysis consists of determining the proportion of each or any of the constituents present in the mixture. So to analyze any substance first it should be subjected to qualitative analysis then to quantitative estimation. The usual method which is followed is the volumetric analysis. In this the volume of a reagent of known concentration required to reduce or oxidize or neutralize the substance under investigation. This article explains the different types of indicators and their applications.

Keywords: Volumetric analysis, indicators, analytical chemistry.

Introduction:

Indicators are necessary to mark the endpoint of reactions in the titration of acids against bases. A proper choice of indicators is necessary to carry out the titration. Acid base indicators used in acidimetry and alkalimetry are either weak acids or weak bases. They show different colours in acid and alkaline medium. In other words, they change their colours with changes in the pH of the solution.

History

Volumetric analysis was first introduced by Jean Baptiste Andre Dumas, a French chemist. He used it to determine the proportion of nitrogen combined with other elements in organic compounds, Potassium hydrogencarbonate, which is still used for standardization in acid-base titrations, was introduced by Thomsen in 1860. Functional group determination of organic compounds can be done by volumetric analysis. The introductory titration in the vicinity was carried out by Vorlander, who, in 1903, resolved aniline by titration with hydrochloric acid in benzene.

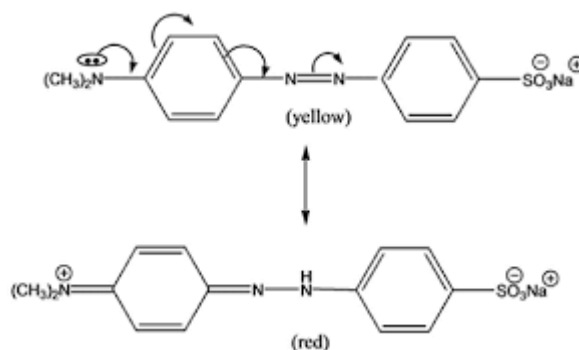
Factors influencing behaviour of indicators

The indicators just as any electrolyte will be ionized in solution. Each indicator dissociates to different extent in solutions, hence their indicator constants will also be different. That is every indicator changes their colour depending on its pH range. For example, methyl orange is yellow in acid medium and orange in alkaline medium. Usually the concentrations of indicator solutions used are 0.5 to 1 gm per litre of the solvent. The most successful of these methods is the titration of acids with bases using luminol, giving

precision of approximately 1 part per thousand. Ionic strength of the medium, nature of solvent, temperature, and formation of colloidal particles influences the behaviour of indicators.

The common indicators used in volumetric analysis are

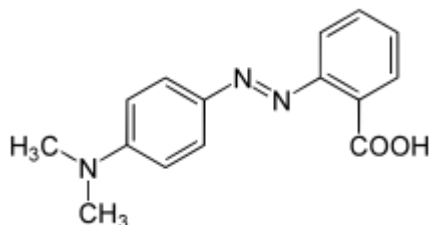
Methyl orange



pH range 3.1 to 4.4. This indicator is yellow in acid medium and red in alkaline medium. Since the colour change of methyl orange occurs at pH less than 5, hence cannot be used for weak acids such as boric acid, carbonic acid. It does not give sharp end points in the titrations of ammonia.

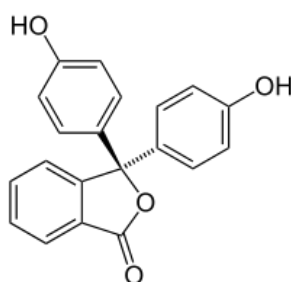
Methyl orange turns red in an acidic medium and yellow in a basic medium. It is routinely used in acid titration since it commutes colour at the pKa of a mid-strength acid. Methyl orange, unlike a universal indicator, does not have a complete spectrum of colour transition, but it does have a sharp end point.

Methyl red



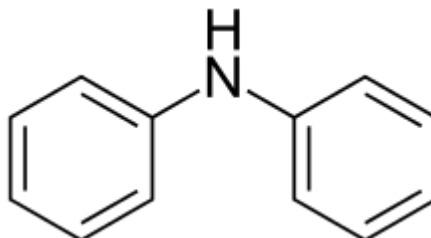
PH range is 4.2 to 6.2. This has red colour in acid medium and yellow in alkaline medium. This indicator can be used for the titrations of ammonium salts. Methyl Red has a unique role in cytogenetics for revealing acidic character of tissue and existence of life forms with acidic natured cell walls.

Phenolphthalein



PH range 8.2 to 10. The indicator is colorless in acids and pink coloured in alkalies. It is best indicator for the titrations of weak acids against strong bases. It is a component of universal indicator along with thymol blue methyl red and bromothymol blue

Diphenyl amine



The instigation of internal redox indicators has markedly broadened the field of oxidimetry by introducing new typical oxidizing agents and intensifying the accuracy of previous ones.

It has been used as an internal indicator in the dichromate titrations. Since it is sparingly soluble in water solution of the compound in sulphuric acid is used. Since diphenyl amine is not oxidized by ferrous ions it can be used as an internal indicator. A sharp colour change can be obtained at the end point by adding phosphoric acid, which lowers the oxidation potential of the ferric ferrous ion system by forming a complex.

A system of indicating the range of oxidation-reduction indicators other than that of the oxidation potential which is sometimes, although infrequently, used is that of sensitivity. When it is said that diphenylamine has a sensitivity of 4×10^{-6} to potassium permanganate in 1 N sulfuric acid, this means that as soon as the 1 N sulfuric acid containing the indicator becomes 4×10^{-6} N with respect to potassium permanganate the indicator becomes violet colored. As all oxidizing agents of the same normality lack the same oxidizing power

Starch

Used in iodometric titrations. Forms blue colour with the iodine. Iodine is trapped with the molecule of starch to form tri-iodide. Very sensitive, shows colour even at 2×10^{-7} M of iodine. Starch is decomposed by bacteria and oxygen, hence starch indicator should be freshly prepared. It can be used both in direct and indirect iodometric titrations.

Applications:

Several technical, medicinal, and naturally existing samples comprise acids or bases. If the acids or bases in the sample are quantitatively leached out into water or if the sample is soluble itself the acid or base content can be determined by titration with standard titrant. End-point detection can be by color indicator or one of several different instrumental techniques.

Industrial cleaning, paint removal, rust removal, and dip solutions, carbonate content of minerals and ores, HCO_3^- in antacid tablets such as acetic acid content of

vinegar, orthophosphoric acid in commercial orthophosphoric acid, boric acid and borax, and nitrogen analysis are typically determined by acid-base procedures.

Medical laboratories and hospitals use automated titration equipment for basically knowing the concentration of unknown substance. Beside these, the process has found ample use in analytical laboratories; and drug, food and petrochemical industries. For example, in biodiesel industry, it is used to determine the acidity of a sample of vegetable oil.

In the determination of hardness of water using Erichrome black T indicator and basic buffer. Determination of acidity of vinegar using standard oxalic acid solution. To determines total iron content in water.

Determination of 'Available chlorine' in bleaching powder. Used to determine magnesium and manganese content in a solution by using EDTA. A redox titration may be used to determine the amount of unsaturated fatty acids. Diphenylamine can be used as an indicator in the determination of cobalt by titration with standard potassium dichromate. One of the best methods of determining chromium and vanadium in alloy steels by titrating with ferrous sulfate solution makes use of diphenyl amine as the indicator. Ackermann reports using the indicator satisfactorily in the direct titration of used chrome liquor in the tanning of leather. Knop applied the indicator to the determination of chromium in steel. He found that accurate results could be obtained by dissolution of the sample in 1:1 sulfuric acid, oxidation with ammonium persulfate, removal of the manganese as the oxyhydroxide, reduction of the chromic acid so formed with standard ferrous sulfate solution, and back-titration with standard potassium dichromate.

Furman found the indicator useful in the determination of vanadium in ores or steels even in the presence of ferric iron, quinquivalent arsenic, and hexavalent uranium. He employed various methods and titrated with standard ferrous sulfate after oxidizing with potassium permanganate. Diphenylbenzidine can be used in ceric titrations of iron, even in the presence of arsenious acid; however, it is less satisfactory than diphenylamine. Diphenylbenzidine is also applicable to the determination of vanadium by titration with ceric sulfate.

Methyl red can be used as the indicator in the titration of trivalent antimony with ceric sulfate, and in determining hydroquinone by using ceric sulfate as the titrating agent. Apomorphine indicator is used for the determination of antimony with potassium bromate. Small quantities of the indicator in hydrochloric acid solution are colored rose by free bromine, and the solution is decolorized when potassium antimonyl tartrate is added. The reaction is reversible. The same color change is produced by an antimonite with the indicator and potassiumbromate. The results agree with potentiometric titrations.

Titration is frequently used in the food industry to keep the acid, base and salt content in the food. Some of the everyday food products where quantity is determined by titration are, acetic acid in vinegar, lactic acid in pickles and nitrogen content in proteins can be determined.

Pharmaceutical industry

Purity analysis of pharmaceutically active ingredients used to determine the content of active ingredients in pharmaceutical products. Vitamin C content in multivitamin tablets can be determined. Karl Fischer titration is common analytical method in Chemistry that helps in determining the water content in particular mixture. In Pharmaceutical industry water or moisture content of a product plays a important role as per the activity or storage life time of a product are concerned.

Medical diagnosis

Titration is one of the many practices that lab technicians often across while analyzing blood and urine samples from the patients. Titration can be used to measure glucose levels in the blood. Phenolphthalein and its derivatives structurally similar to 2-APB inhibit SOCE in platelets and other cells. Many phenolphthalein analogues inhibited the ability of thrombin and thapsigargin (a specific activator of SOCE) to increase $[Ca]_i$. Phenolphthalein has an IC_{50} approximately 10 μM to inhibit thrombin-induced $[Ca]_i$ elevation, its active analogues have a similar potency. Several phenolphthalein analogues also inhibited thrombin-induced intracellular Ca mobilization.

Conclusion:

Indicators help us to boost knowledge and comprehending distinct concepts. They deflate and renew facts so that it can be practiced to study different parameters. They are used in almost all fields particularly in all sciences for their particular purposes.

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REVIEW OF RESEARCH TYPES IN CONTEXT TO SCIENCE DISCIPLINE

Shailendra Bhalchandra Kolhe

Department of Physics,

Shivaji Arts, Commerce & Science College Kannad, Dist.-Aurangabad – 431103 (M.S.)

Corresponding author E-mail: kolhe_sb71@yahoo.com

Abstract:

Types of research has been discussed in this review paper. Specially emphasis has been given to science research types intended for research scholars of science stream such as mathematics, physics, chemistry, biology, and computer science etc. Examples have been cited while explaining types of research in this research paper. Specially stress is given to encourage young researchers while performing research work.

Keywords: Research methodology, Types of Research, Fundamental research, Qualitative research, Empirical research.

Introduction:

Research is the term used in searching for knowledge and truth. Here knowledge means information. It is a logical and systematic search for new and useful information on a particular topic. Research work is nothing but collection of data to answer the questions and finding solution to problems. In this paper the prime aim is to provide a brief review of research types. Research work is not only limited to science stream but it has same importance in humanities, social science, and other branches. The research in management and social science are concerned with human beings, whereas research in science and technology is related to experiments, observations. Research paves a way to overall development of human being. It brings prosperity in human life. We can make our life more efficient and faster using research. Research is carried out with the help of study, experiment, observation, analysis, comparison, and reasoning. For example, we know nutritious food and hygiene is very necessary for our health, consumption of alcoholic drink is injurious to our health, solar energy is useful source of non-conventional energy. How did we get all this information? We became aware of all these information only through research. It requires predictions of events, explanations, relationships, and theories for them.

Objectives of research

Objective of research is a sentence or question that summarizes the purpose of our study. The prime objectives or goals of research are to discover, verify and test important facts, to study an individual or situation or phenomenon to find the cause-and-effect relationship, to develop new scientific tools, models, concepts, and theories to diagnose scientific and nonscientific problems, to overcome problems occurring in our everyday life. For example, if you are on vacation and planning for tour, you will make list of your

objectives. You will first think of your budget, search for spots, hotels according to your budget and make time schedule. Like this while doing research we have to make objectives according to our hypothesis. If you want to measure volume of a rectangular solid block, your objective is to measure its length, breadth, and height.

Necessity of research

We know the proverb necessity is mother of invention. Nobody will go for research work unless there is need of it. For research there should be motivating factors. We do research for better position in job, for getting opportunity abroad. To solve unsolved problems, we do research. We go for research to get recognition of society. Some people do it for their curiosity, creativity to find out new things. It is better way to serve society by performing research. Research requires lot of hard work, commitment. Mere getting a degree of Ph.D. is not research. There should be interest in research. Research motivated minds can do miracles either in company field or educational institution or any other area. For example, we have noticed situation like pandemic corona. Because of pandemic, researchers got motivated to invent new vaccine. There was a need to invent vaccine to get rid of corona. Many issues like diseases, environmental disasters encouraged scientists to invent remedies.

Importance of research

Development of society depends on research. Scientists do hard work, make new inventions to serve society. Government makes policies based on the research activities in various fields. Research provides for predicting of prospects of the region. Research has special importance in relation to solving various problems of business and industries. Research has application in socio political sector in order to find out solution to social and political problem of the society. Research is fountain of knowledge to tackle various problems. Research leads to a new style of life and makes it enjoyable and splendid. It leads to the identification and characterization of new materials, new living things.

Research methodology and research method

Research method means all those methods or techniques that are used for conduction of research. Research methods refer to the methods used by researchers in performing research operations (Kothari and Garg, 2014). Research methods are used to collect the information; to establish the relationship between the information and the unknowns; and to evaluate the accuracy of the results obtained. Research methodology is a way to systematically solve the research problem. Research methodology is nothing but the procedures by which researchers do their work of describing, explaining, and predicting phenomena. It is a systematic way to solve a problem. It focuses on the significance of research, defining of research problem, formulation of hypothesis, selection of data collection method, and using of data collection techniques. The scope of research methodology is broader than research method.

Types of research

We will discuss various types of research here.

1. Fundamental research

It is the research carried out to invent new ideas, facts, basic principles for betterment and knowledge of human being. Fundamental research is based on experimentation and observation by following severe ethics and procedures to meet specific objective and ensure reliability of conclusions of research published into peer reviewed journals (Pawar, 2020). This kind of research examines data to find the unknown and fulfill a sense of curiosity. It involves "how," "what" and "why" questions to find out unknown and fulfil curiosity. Information gained from fundamental research often creates a basis for applied studies. For example, research to study what makes up a proton.

2. Applied research

Applied research is a type of research applied to find out practical solution for immediate problems faced by the society. This type uses methods such as experiments, to collect supplementary data in the area of research. Discoveries are applicable and usually applied upon completion of a study. It is a type of research method for applying natural sciences to real life to make human life enjoyable (Basic Research Vs. Applied Research: What's the Difference? 2021). Example, applied physics is the study of physics for a practical purpose, such as the development of electronics for advanced devices useful for society.

3. Descriptive research

This type of research includes surveys and fact-finding investigations of different kinds. In this research researcher has no control over the variables, he has only to report the findings. It does not answer questions about "how," "when," and "why". It addresses the question "what". For example, the periodic table categorizes the elements. Scientists use knowledge about the nature of electrons, protons, and neutrons to devise this categorical scheme. Over time the periodic table is a description of the elements allowed scientists to explain chemical reaction and make sound prediction when elements were combined. Hence, descriptive research cannot describe what caused a situation (Wikipedia contributors, 2023).

4. Analytical research

In this type of research, researcher uses information which is already existing and analyze it to make a critical evaluation of the material (Bhome *et al.*, 2013). Analytical research tells us why something is true. You need critical thinking skills and careful assessment of the facts. It gives new ideas about your data. Thus, it helps prove or disprove hypotheses. Analytical research answer "how" and "why" questions. For example, what makes hand hygiene so essential in hospitals?

5. Quantitative research

Quantitative research implies measurement of quantity or amount. Statistics is mostly used in quantitative research. At first data is collected based on hypothesis. This type of research includes the employment and investigation, analysis of numerical data using specific statistical methods to answer questions like “who,” “how much,” “what,” “where,” “when,” “how many,” and “how.” (Apuke, 2017). For example, a teacher wants to know, why some students perform better than other students in Physics test. The teacher may consider two variables, test marks and revision time.

6. Qualitative research

This type of research does not use numerical data. It is concerned with qualitative phenomenon involving quality that cannot be quantified. It intends to understand a complex reality and the meaning of actions in the context (Queirós *et al.*, 2017). Qualitative research applies reasoning. It is used to understand meaning of numbers obtained by quantitative research. It investigates why and how of the decision making. For example, we want to weigh a block, we need not worry about weighing pattern. We will just have to weigh that block.

7. Conceptual research

Conceptual research is conducted based on already present information and observation on topic of research. This type of research can be used in developing theories by abstract concepts and ideas. It does not include any practical experiments. Thinkers have long used conceptual research to develop new theories or interpret existing theories in a different light. In this research, we have to choose the topic, gather appropriate literature, find specific variables, make the outline (Pawar, 2020). For example, Sir Issac Newton observed his surroundings to conceptualize and develop theories about gravitation and motion.

8. Empirical research

Empirical research is research that is based on observation and measurement of phenomena, as directly experienced by the researcher. This type of research depends on experience and observations alone rather than theory or ideas. It is databased research. In this type of research, the researcher should first know the hypothesis to get probable results then he has to collect necessary data to verify or contradict his hypothesis. It is important to plan the steps to conduct the experiment and how to analyze it. This will enable the researcher to resolve complications which can occur during the experiment. Information gathered through empirical research is considered most powerful support for a given hypothesis (Bist, 2014). For example, listening to melodious songs improves mood of the person. The researcher needs to conduct experiment in this regard.

Conclusion:

Various researchers explored different types of research types while performing their research. Research is used for quest of knowledge and truth. Fundamental research is carried out to discover new things. Applied research provides practical solution for instant problems. Descriptive research employs investigative methods. In analytical research analyzes information which is already available. Quantitative research related to quantity or amount. Qualitative research is concerned with quality that cannot be enumerated. Conceptual research is conducted on already present information and observation. In empirical research results are based on real life experience.

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LANDSCAPE OF PERSIMMON FRUIT ON ANTI-OXIDANT ACTIVITY

Anamika P. K.*¹, Britika Pal², Shanthini Nachiyar³ and Keerthana Devi M⁴

¹Faculty of Pharmacy, Sri Balaji Medical College and Hospital campus,

Bharath Institute of Higher education and Research, Chennai

²College of Pharmaceutical Sciences, Dayanada Sagar University, Bangalore

³School of Pharmacy, Sathyabama Institute of Science and Technology, Chennai

⁴Department of Pharmaceutics, Apollo College of Pharmacy, Chennai

*Corresponding author E-mail: anamikapk2191@gmail.com

Abstract:

Persimmon belongs to the Ebanaceae family, and is widely consumed in Asia but it was only some years ago when it was introduced to the occident. As a consequence, persimmon has showed some interesting properties that could make it a very promising component of every diet. Persimmon has higher anti-oxidant activity as well as high level of bioactive compounds (like polyphenols, carotenoids, etc.)¹.

The anti-oxidant activity of persimmon fruit appears to be mainly due to its high-molecular-weight tannin content. Antioxidant activity is variety specific with some astringent varieties showing very high antioxidant activity, comparable to strawberry and blueberry. In vitro, and limited animal studies, have shown that condensed tannins in the fruit may reduce the risk of cardiovascular disease, hypertension, diabetes and a wide range of cancers. Persimmon has an unusual property in that it appears to alter and reduce the rate of alcohol absorption and metabolism and thus ameliorate the symptoms of a hangover. The health and medicinal benefits of persimmon are considerable and should be further researched and promoted by persimmon industries around the world.²

The phytochemical composition of persimmon peel (PP), a waste by product of dried persimmon, and its possible antidiabetic influence in streptozotocin-induced diabetic rats were examined. Dietary fibre was found to be the major component of PP, with a high content of 40.35% (w/w). PP also contains high levels of antioxidants including total carotenoids, vitamin C, and total phenolic. Dietary PP also restored the reduced plasma high-density lipoprotein (HDL) -cholesterol levels in diabetic rats. Although regression of the hypertrophies of liver and kidney was not observed in diabetic rats, dietary PP showed the partial or complete restoration of plasma aspartate amino transferase (AST), and creatinine levels, which serve as indicators of liver and renal dysfunctions, respectively. Therefore, PP containing high levels of dietary fibre and antioxidants with antidiabetic properties represents a potential dietary supplement for improving hyperglycemia and diabetic complications.³

Keywords: Persimmon, Dietary, Hyperglycemia

Rationale of the study:

Persimmon fruit are used as antioxidant, antioxidants are potent Anti-cancer agents. Cancer is a leading cause of death worldwide, accounting for nearly 10 million deaths in 2020, or nearly one in six deaths. The most common cancers are breast, lung, colon and rectum and prostate cancers. I have done this study to prioritize the anti-cancer property of Persimmon fruit which can be used for future studies.



Objectives:

The aim of the above study is to recognize the anti-oxidant property of the persimmon fruit which belongs to Ebanaceae family. Persimmon fruit also contains bioactive compound like polyphenols (regulates cell proliferation) which can also be used as anticancer agents. Here the study aimed at prioritizing the anti- neoplastic activity of Persimmon fruit which is less used currently. It also aims at ranking the use of Persimmon fruit as a potent cancer drug in the upcoming future.

Methodology:

The content of the total antioxidant activity and phenolic compounds from the fruits of the American persimmon (*Diospyros virginiana* L.) of six genotypes were compared. Antioxidant activity (AOA) was measured using three different photometric methods – DPPH (2, 2diphenyl-1-picrylhydrazyl), ABTS (2, 2-azino-bis-3-ethylbenzothiazoline-6-sulfonic acid) and FRAP (ferric-reducing antioxidant power). Total phenolic content (TPC) was evaluated using Folin-Ciocalteu reagent assay.

Results and Discussion:

The phytochemical composition of persimmon peel (PP), a waste by product of dried persimmon, and its possible antidiabetic influence in streptozotocin-induced diabetic rats were examined. Dietary fibre was found to be the major component of PP, with a high content of 40.35% (w/w). PP also contains high levels of antioxidants including total carotenoids, vitamin C, and total phenolic. Dietary PP also restored the reduced plasma high-density lipoprotein (HDL)-cholesterol levels in diabetic rats. Although regression of the hypertrophies of liver and kidney was not observed in diabetic rats, dietary PP showed the partial or complete restoration of plasma aspartate amino transferase (AST), and creatinine levels, which serve as indicators of liver and renal dysfunctions, respectively.

Therefore, PP containing high levels of dietary fibre and antioxidants with antidiabetic properties represents a potential dietary supplement for improving hyperglycemia and diabetic complications.



Conclusion:

The results showed that all fruit extracts exhibited strong antioxidant activities, which generally correlated positively with the total phenolic content. This study demonstrates the potential of the fruits of *Diospyros virginiana* L grown in Ukraine as a possible source of valuable polyphenol content, with high anti-oxidant activities and health-promoting properties. The high contents of phenolic compounds and significant linear correlation between the values of the concentration of phenolic compounds and antioxidant activity indicated that these compounds contributed to the strong antioxidant activity.

Other activities of persimmon fruit:

In vitro digestion studies of persimmon fruit include the study of gastrointestinal behavior of food in which food digestibility determination is conducted using the concepts like bioavailability, bio accessibility, and bioactivity of food components. Bioavailability involves the ingested fraction of a bio component that reaches the systemic circulation which is distributed to organs and tissues, is determined using in vivo studies. Bio accessibility is determined using in-vitro studies here, the ingested fraction of a bio component that becomes accessible for absorption through the epithelial layer of the gastrointestinal tract. The bioactivity represents the ability of a compound to manifest a biological effect.

In vivo studies of persimmon fruit include the complexity of organisms. The digestion studies included here are evaluating the beneficial effects on lipid metabolism, the regulation of glucose levels, and carcinogenic and anti-inflammatory effects.

The carotenoid and carotenoid ester profile in astringent persimmon (*Diospyros kaki* Thunb., var. Rojo Brillante) was composed by 13 free xanthophylls, 8 hydrocarbon carotenes and 17 carotenoid esters.

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UTILIZING DATA ANALYTICS TO UNDERSTAND THE NUTRITIONAL AND MEDICINAL PROPERTIES OF *MORINGA OLEIFERA*

K. Thiyagarajan*¹, T. Parkavi¹, U. Gomathi¹ and R. Kavitha²

¹Department Computer Science,

Periyar Maniammai Institute of Science & Technology, Vallam, Thanjavur

²Department Computer Applications,

Bharath College of Science & Management, Thanjavur-5

*Corresponding author E-mail: profktr@gmail.com

Abstract:

The *Moringa oleifera* plant, also known as drumstick plant, is a fast-growing tree known for its nutritional, medicinal, and economic benefits. It is grown widely in tropical and subtropical regions of the world. This paper focuses on the use of data analytics to study the medicinal properties of different parts of the Moringa tree and its major growing areas. The study involved the collection of samples from four districts in Tamil Nadu, India, throughout the year. Cluster analysis was used to group the samples based on their chemical composition, and the results were analyzed to identify the major compounds responsible for the medicinal properties of the plant. The study found that different parts of the tree, such as leaves, pods, seeds, and flowers, have different chemical compositions and therefore different medicinal properties. The study also found that the soil type, weather condition, and irrigation method used in different growing areas affect the chemical composition of the plant. The findings of this study can be used to guide the cultivation and harvesting of Moringa trees for optimal medicinal and economic benefits. The study demonstrates the potential of data analytics in agriculture and the use of cluster analysis to analyze large datasets of plant samples

Keywords: *Moringa oleifera*, Moringa tree, Drumstick trees agriculture, Data Analytics, Cluster Analysis, medicinal properties

Introduction:

The drumstick plant, also known as Moringa tree, is a fast-growing tree native to the Indian subcontinent. The drumstick is a vegetable plant farmed for its nutrient-dense delicate pods, leaves, and blossoms. Drumstick trees are softwood trees endemic to India. The trees are cultivated in tropical and subtropical climates all over the world. With its numerous properties, the drumstick tree is known by several English common names, including Moringa, drumstick tree, benzoin tree, and horseradish tree. The tree is a perennial vegetable tree that grows quickly and is drought-resistant. It is grown widely for its nutritious and medicinal properties. The plant can grow up to 10 meters tall and has delicate, fern-like leaves. The drumstick tree is grown in tropical and subtropical regions and can tolerate a wide range of soil conditions.

Key features of the drumstick plant

Nutritional Benefits: The drumstick plant is a rich source of vitamins, minerals, and amino acids. The leaves are high in vitamin C, vitamin A, and calcium, while the pods are a good source of dietary fiber, potassium, and vitamin B6.

Medicinal Properties: The drumstick plant has been used in traditional medicine for centuries to treat a wide range of ailments, including arthritis, digestive disorders, respiratory infections, and skin problems. Modern research has also found evidence of its potential in treating diabetes, hypertension, and cancer.

Culinary Uses: The tender leaves and pods of the drumstick plant are used in a variety of dishes in Indian cuisine. The leaves are often cooked with lentils or used to make soups and stews, while the pods are used in curries, pickles, and chutneys.

Easy to Grow: The drumstick plant is easy to grow and maintain. It can be propagated from seeds or cuttings and requires regular watering and fertilization. The plant can also be grown in containers and is suitable for small gardens.

The drumstick plant, also known as Moringa tree, is a fast-growing tree native to the Indian subcontinent. The drumstick is a vegetable plant farmed for its nutrient-dense delicate pods, leaves, and blossoms. Drumstick trees are softwood trees endemic to India. The trees are cultivated in tropical and subtropical climates all over the world. With its numerous properties, the drumstick tree is known by several English common names, including Moringa, drumstick tree, benzoil tree, and horseradish tree. The tree is a perennial vegetable tree that grows quickly and is drought-resistant. It is grown widely for its nutritious and medicinal properties. The plant can grow up to 10 meters tall and has delicate, fern-like leaves. The drumstick tree is grown in tropical and subtropical regions and can tolerate a wide range of soil conditions.



Medicinal properties

The drumstick plant (*Moringa oleifera*) is known for its various medicinal properties, and almost all parts of the plant are used for various medicinal purposes. Here are some of the medicinal properties of different parts of the drumstick plant:

1. Leaves: The leaves of the drumstick plant are a rich source of vitamins, minerals, and antioxidants. They are known to have anti-inflammatory, antimicrobial, and anticancer properties. The leaves are used in traditional medicine to treat a variety of ailments, including diabetes, hypertension, arthritis, and digestive disorders.
2. Pods: The pods of the drumstick plant are rich in fiber, vitamins, and minerals. They are known to have anti-inflammatory, antimicrobial, and antioxidant properties. The pods are used in traditional medicine to treat various ailments, including respiratory disorders, liver disorders, and skin problems.
3. Seeds: The seeds of the drumstick plant are rich in proteins, vitamins, and minerals. They are known to have antifungal, antibacterial, and anti-inflammatory properties. The seeds are used in traditional medicine to treat various ailments, including asthma, hypertension, and diabetes.
4. Flowers: The flowers of the drumstick plant are rich in vitamins and minerals and have antioxidant and anti-inflammatory properties. The flowers are used in traditional medicine to treat various ailments, including respiratory disorders, digestive disorders, and skin problems.

The *Moringa oleifera* plant is a versatile medicinal plant, and its various parts are used to treat a wide range of ailments. However, it is important to note that while traditional medicine has long used drumstick plant parts for medicinal purposes, more scientific research is needed to fully understand their efficacy and potential side effects.

Economical values

The drumstick plant (*Moringa oleifera*) has various economical values due to its multiple uses. Here are some of the economical values of the drumstick plant:

1. Food: The drumstick plant is widely used as a food source, and almost all parts of the plant are edible. The leaves, flowers, pods, and seeds of the drumstick plant are used in various dishes and cuisines worldwide. The plant is especially popular in South Asia, Africa, and the Caribbean.
2. Medicine: The drumstick plant is widely used in traditional medicine to treat various ailments, including diabetes, hypertension, arthritis, and digestive disorders. The plant's leaves, pods, and seeds are rich in vitamins, minerals, and antioxidants, which makes them beneficial for human health.
3. Cosmetics: The drumstick plant is also used in cosmetics due to its antioxidant and anti-inflammatory properties. It is used in various skin and hair care products to promote healthy skin and hair.
4. Animal feed: The drumstick plant is used as a feed for livestock, and the leaves and pods are especially popular among poultry and cattle farmers. The plant's high protein and mineral content make it a nutritious feed source for animals.

5. Biofuel: The drumstick plant is also being explored as a source of biofuel due to its high oil content. The plant's seeds contain up to 40% oil, which can be used to produce biodiesel.

Finally, the drumstick plant has various economical values, and its multiple uses make it an important plant for food, medicine, cosmetics, animal feed, and biofuel industries.

Pros of growing *Moringa oleifera* plant

1. Easy to grow: The drumstick plant is relatively easy to grow and does not require much maintenance.
2. Nutritious: The plant is highly nutritious, and almost all parts of the plant are edible.
3. High-yielding: The drumstick plant is a high-yielding crop, and a single plant can produce a significant number of pods.
4. Multiple uses: The plant has multiple uses, including food, medicine, cosmetics, and biofuel.
5. Sustainable: The drumstick plant is a sustainable crop that can be grown using organic farming methods.

Cons of growing *Moringa oleifera* plant

1. Susceptible to pests and diseases: The drumstick plant is susceptible to various pests and diseases, including aphids, caterpillars, and powdery mildew.
2. Requires warm climate: The plant requires a warm and humid climate to grow, which can limit its cultivation in certain regions.
3. Short shelf life: The pods of the drumstick plant have a short shelf life and need to be consumed or processed quickly.
4. Labour-intensive harvesting: The harvesting of the pods is labour-intensive, as the pods are attached to long stems and need to be cut off by hand.
5. Limited market: The market for drumstick plant products is limited in some regions, which can make it challenging for farmers to sell their crops.

The *Moringa oleifera* plant has several advantages as a crop, but it also has some drawbacks that farmers need to consider when deciding whether to grow it.

Environmental requirements

1. Soil requirements: The drumstick plant prefers well-drained soil that is slightly acidic with a pH range of 6.0 to 7.0. It also requires soil that is rich in organic matter.
2. Climate requirements: The drumstick plant requires a warm and humid climate to grow. It can tolerate temperatures up to 48°C, but temperatures below 10°C can damage the plant.
3. Planting and spacing: The drumstick plant can be grown from seeds or cuttings. The seeds should be soaked in water overnight before planting. The spacing between the plants should be around 8-10 feet.

4. Irrigation: The drumstick plant requires regular irrigation, especially during the dry season. The plant should be watered at least once a week, and more frequently during hot weather.
5. Fertilizers: The drumstick plant requires regular fertilization to promote growth and increase yield. Organic fertilizers such as cow dung, compost, and vermicompost are ideal for the plant.
6. Harvesting: The pods of the drumstick plant are ready for harvest 6-8 months after planting. The pods should be harvested before they turn yellow and start to dry out. The pods can be harvested every 10-15 days, depending on the yield.
7. Uses: The drumstick plant is used in a variety of dishes in Indian and Southeast Asian cuisine. The leaves, flowers, seeds, and roots of the plant are also used for medicinal purposes. The plant is also used in the production of cosmetics and biofuel.

The drumstick plant is a versatile crop that has many uses and benefits. With proper care and maintenance, it can be a profitable crop for farmers and a valuable addition to any garden.

Methodology

Moringa tree, also known as the miracle tree, is a plant that has been used for medicinal purposes for centuries. Different parts of the tree, such as leaves, pods, seeds, flowers, and roots, are rich in various nutrients and compounds that provide numerous health benefits.

Data Collection

To study the Tree of Moringa (*Moringa oleifera*), samples were collected throughout the year from December 2020 to December 2021. The samples were collected during summer, autumn, winter, and spring seasons. Two stages of regrowth, young and mature with 40 and 80 days, were also considered. The collection was done from four different districts in Tamil Nadu state, India, namely Theni (9.9330° N, 77.4702° E), Dindigul (10.4747° N, 77.8367° E), Karur (10.8855° N, 78.1564° E), and Thoothukkudi (8.9063° N, 78.0195° E).

District	Soil Types	Weather Condition	Irrigation
Theni	Red sandy loam soil	summers and mild winters 22°C to 34°C	Drip Irrigation
Dindugal	Red loamy soil	hot and humid summers and mild winters 21°C to 36°C	Sprinkler Irrigation
karur	Sandy loam soil	hot and humid summers and mild winters 23°C to 36°C	Drip Irrigation
Thoothukudi	Red loamy soil	hot and humid summers and mild winters 26°C to 34°C	Subsurface Irrigation

District	2019-20	acres	Average Productivity	price/kg
Theni	5.45	3424	26.23	36-40
Dindugal	5.3	2645	20.26	32-38
karur	5.25	2070	15.89	31-42
Thoothukudi	5	1465	11.26	30-48

Medicinal properties of moringa tree

Moringa leaves:

Moringa leaves are one of the most nutritious parts of the tree, packed with a variety of vitamins and minerals. They contain high levels of vitamin C, calcium, iron, and antioxidants. Some of the medicinal properties of moringa leaves include:

Anti-inflammatory: Moringa leaves contain compounds that can reduce inflammation in the body, which may help alleviate conditions like arthritis and other inflammatory diseases.

Cholesterol-lowering: Studies have shown that moringa leaves can help lower cholesterol levels in the blood, reducing the risk of heart disease.

Anti-diabetic: Moringa leaves have been shown to help regulate blood sugar levels, making them a useful supplement for people with diabetes.

Immune-boosting: The high vitamin C content in moringa leaves can help boost the immune system and fight off infections.

Moringa Pods:

Moringa pods are another part of the tree that is packed with nutrients. They are a good source of vitamin C, vitamin A, calcium, and potassium.

Some of the medicinal properties of moringa pods include:

Digestive aid: Moringa pods contain high levels of fiber, which can help regulate digestion and prevent constipation.

Anti-inflammatory: Similar to moringa leaves, the pods also contain compounds that can reduce inflammation and alleviate conditions like arthritis.

Anti-bacterial: Moringa pods have been shown to have antibacterial properties, which may help prevent the growth of harmful bacteria in the body.

Moringa Seeds:

Moringa seeds are rich in amino acids, healthy fats, and antioxidants. Some of the medicinal properties of moringa seeds include:

Anti-inflammatory: Moringa seeds contain compounds that can reduce inflammation in the body.

Antioxidant: The seeds are rich in antioxidants, which can help protect the body against damage from free radicals.

Liver-protecting: Studies have shown that moringa seeds can help protect the liver from damage caused by toxins.

Moringa flowers:

Moringa flowers are a good source of vitamin C and antioxidants. Some of the medicinal properties of moringa flowers include:

Anti-inflammatory: Moringa flowers contain compounds that can reduce inflammation in the body.

Respiratory health: The flowers have been shown to have respiratory benefits, making them a useful supplement for people with respiratory conditions like asthma.

Moringa roots:

Moringa roots are also rich in nutrients and contain compounds that provide various health benefits. Some of the medicinal properties of moringa roots include:

Anti-inflammatory: Moringa roots contain compounds that can reduce inflammation in the body.

Digestive aid: The roots have been shown to have digestive benefits, helping to regulate digestion and prevent constipation.

Cardiovascular health: Studies have shown that moringa roots can help improve cardiovascular health by reducing cholesterol levels and regulating blood pressure.

This tree is a versatile plant with various medicinal properties that can provide numerous health benefits. However, it's important to note that while Moringa may offer many health benefits, it should not be used as a replacement for medical treatment or advice from a healthcare professional.

S.No	Disease	Medicinal Properties	Type of Nutrient Content
1	Diabetes	Lowers blood sugar levels	Vitamins B1, B2, B3, B6, C, calcium, potassium
2	Anemia	Increases hemoglobin levels	Iron, vitamins B2, B6, C
3	High blood pressure	Lowers blood pressure	Potassium, calcium
4	Inflammation	Reduces inflammation	Vitamins A, C, E, beta-carotene, quercetin, chlorogenic acid
5	Digestive issues	Aids digestion and relieves constipation	Fiber, calcium, magnesium
6	Malnutrition	Provides essential nutrients	Vitamins A, C, calcium, iron, protein

Data analytics

The collected samples were analyzed using various techniques to determine their chemical composition. Cluster analysis was performed to group the samples based on their

chemical composition. The results were then analyzed to identify the major compounds responsible for the medicinal properties of the plant.

Data analytics for medicinal properties

The analysis of medicinal properties data of Moringa tree can be carried out using Python programming language. Python offers several powerful libraries such as Pandas, NumPy, Matplotlib, and Scikit-learn that can be used for data analysis and machine learning tasks. The first step in the analysis process would be to collect the necessary data on the medicinal properties of different parts of the Moringa tree. This data can be obtained from various sources, such as research articles, scientific journals, and online databases. Once the data is collected, it can be cleaned and pre-processed using Python libraries such as Pandas and NumPy. This involves removing any missing or duplicate values, converting the data into a suitable format, and performing any necessary data transformations. After cleaning and pre-processing the data, various analysis techniques can be applied using Python libraries such as Matplotlib and Scikit-learn. For example, we can perform statistical analysis to identify any patterns or correlations between different medicinal properties of the Moringa tree. We can also use machine learning algorithms to build predictive models that can help us identify the most effective parts of the Moringa tree for treating different diseases. Python provides a powerful platform for analyzing the medicinal properties data of Moringa tree. With its rich set of libraries and tools, Python can help researchers and healthcare professionals better understand the potential health benefits of different parts of the Moringa tree.

List the common medicinal properties of different parts of the Moringa tree:

Part of Moringa Tree	Common Medicinal Properties	Common Nutrient Content
Leaves	Anti-inflammatory, cholesterol-lowering, anti-diabetic, immune-boosting	Vitamin C, calcium, iron, antioxidants
Pods	Digestive aid, anti-inflammatory, anti-bacterial	Vitamin C, vitamin A, calcium, potassium
Seeds	Anti-inflammatory, antioxidant, liver-protecting	Amino acids, healthy fats, antioxidants
Flowers	Anti-inflammatory, respiratory health	Vitamin C, antioxidants

Results:

The results of the cluster analysis showed that the samples could be grouped into three clusters based on their chemical composition. The first cluster included samples from Thoothukudi, which had the highest concentrations of phenolics and flavonoids. The second cluster included samples from Dindigul and Theni, which had similar chemical compositions. The third cluster included samples from Karur, which had the lowest concentrations of phenolics and flavonoids.

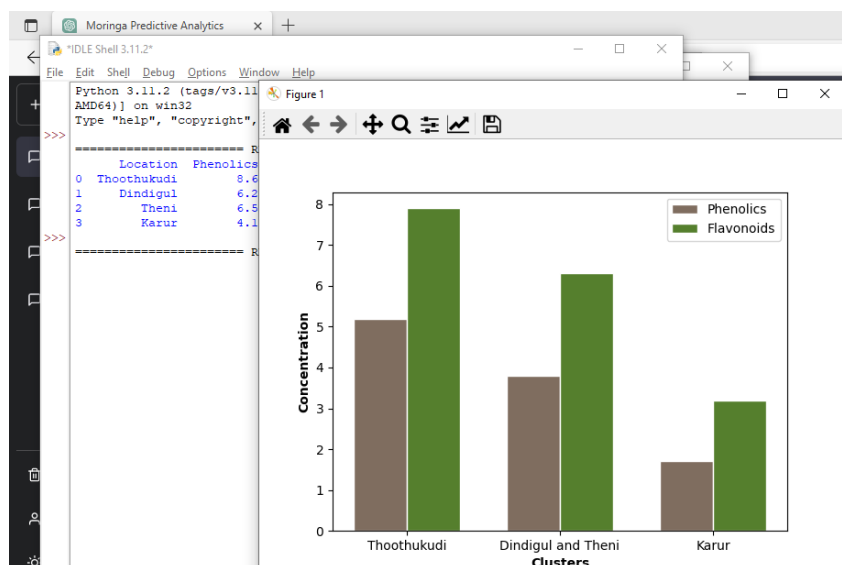
```

Select C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.2604]
(c) Microsoft Corporation. All rights reserved.

C:\Project>python drumstick.py
Location Phenolics Flavonoids SoilType IrrigationMethod Cluster
Thoothukudi 8.6 3.9 Loamy Subsurface 1
Dindigul 6.2 3.3 Red Loamy Sprinkler 0
Theni 6.5 3.4 Red Loamy Drip 0
Karur 4.1 2.5 Sandy Loam Drip 2
C:\Project>

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The analysis of the major compounds in the samples showed that the leaves of the Moringa tree had the highest concentrations of phenolics and flavonoids, followed by the flowers, seeds, and pods. The major compounds responsible for the medicinal properties of the plant were identified as quercetin, kaempferol, and rutin, which are all flavonoids.



The analysis also showed that the soil type, weather condition, and irrigation method used in different growing areas affected the chemical composition of the plant. The samples from Thoothukudi, which had the highest concentrations of phenolics and flavonoids, were grown in loamy soil and irrigated using subsurface irrigation. The samples from Dindigul and Theni, which had similar chemical compositions, were grown in red loamy soil and irrigated using sprinkler and drip irrigation, respectively. The samples from Karur, which had the lowest concentrations of phenolics and flavonoids, were grown in sandy loam soil and irrigated using drip irrigation.

Conclusion:

The study showed that different parts of the Moringa tree have different chemical compositions and therefore different medicinal properties. The study also showed that the soil type, weather condition, and irrigation method used in different growing areas affect the chemical composition of the plant. The findings of this study can be used to guide the cultivation and harvesting of Moringa trees for optimal medicinal and economic benefits. The study demonstrates the potential of data analytics in agriculture and the use of cluster analysis to analyze large datasets of plant samples. Further research can be conducted to study the effects of different growing conditions on the chemical composition and medicinal properties of the Moringa tree.

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PROTECTIVE EFFECT OF BETULINIC ACID AND FLUVASTATIN ON EXPERIMENTAL ARTHRITIS- AN INVIVO APPROACH

Limi Elizabeth Mathew and A Helen*

Department of Biochemistry, University of Kerala, Kariavattom Campus,
Thiruvananthapuram 695581. Kerala, India

*Corresponding author E-mail: Email: limi.mathew87@gmail.com,
helenabiochem@gmail.com

Abstract:

Betulinic acid (BA) is the naturally occurring triterpenoid widely distributed throughout in the plant kingdom and have anti-inflammatory effect. The enzyme HMG CoA reductase inhibitor Fluvastatin, comes under the class of statins, is a water-soluble cholesterol lowering agent. Rheumatoid arthritis (RA) is linked with the increased incidence of cardiovascular risk, but even though considerable advances in disease management, mortality remains high. Cells and cytokines involved in RA pathogenesis may also contribute to the disease condition in atherosclerosis. The activities of phospholipase A₂ and Prostaglandin E₂ was significantly reduced in the treatment group co-administered with betulinic acid and fluvastatin. Expression of CYP3A4 was decreased in drugs alone and in combination therapy when compared to the arthritic rats, shows that the drugs are well metabolized. Combination therapy significantly blocked the expression of matrix metalloproteinases MMP-2, MMP-9 and the pro-inflammatory cytokine TNF- α in the cartilage. The molecular mechanism through which the betulinic acid and fluvastatin mediates this effect was evaluated by studying TLR signaling pathway. It was found that the levels of both TLR-2 and TLR-4 were significantly increased in the cartilage of collagen induced rats. The co-administration of BA and FLU in arthritic rats exhibited a significantly decreased expressions of TLR-2 and TLR-4 than the drugs given individually when compared with collagen induced rats. This study provides a novel therapeutic approach into the molecular mechanism for the anti-arthritic effect of betulinic acid and fluvastatin in collagen induced arthritis.

Keywords: Betulinic acid, fluvastatin, arthritis, cytokines, ADMET, MD2 receptor

Introduction:

Triterpenoids are ubiquitous in the plant kingdom possess many beneficial effects of against numerous types of human diseases including different cancers. Biologically active triterpenoids with their cardioprotective and anti-inflammatory effects are studied earlier (Setzer *et al.*, 2000). There are three main triterpene families: oleanane, ursane, and lupane triterpenes. The oleanane family consists of are oleanolic acid, erythrodiol and β -amyrin; in the ursane family comprises ursolic acid and uvaol and in the lupane family are lupeol, betulin and betulinic acid. Betulinic acid, (3 β -hydroxy-lup-20(29)-en-28-oic acid) (fig.1.9.) is a naturally occurring pentacyclic triterpenoid properties widely distributed throughout plant kingdom – *Bacopa monniera* (L.), *Ziziphus mauritiana*, *Triphyophyllum*

peltatum and *Ancistrocladus heyneanus* etc, which exhibits a variety of biological and medicinal properties such as anti-cancer (Ren *et al.*, 2010), anti-malarial (Santos *et al.*, 2009), anti-retroviral and anti-inflammatory properties (Viji *et al.*, 2011). Betulinic acid protects the neuronal damage in new born rats from isoflurane-induced apoptosis in the developing brain by blocking FASL-FAS signaling pathway (Wang *et al.*, 2017). Betulinic acid is a PPAR γ antagonist that improves glucose uptake, promotes osteogenesis and inhibits adipogenesis (Brusotti *et al.*, 2017).

Fluvastatin a statin drug, used to treat hypercholesterolemia through the inhibition of 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase. Fluvastatin sodium is [R*,S*-(E)]-($\pm$)-7-[3-(4-fluorophenyl)-1-(1-methylethyl)-1H-indol-2-yl]-3,5-dihydroxy-6-heptenoic acid, monosodium salt. The empirical formula of fluvastatin sodium is C₂₄H₂₅FN₄•Na, its molecular weight is 433.46 and its structural formula is given in fig. 1.10. Fluvastatin (FLU) is a white to pale yellow, hygroscopic powder soluble in water, ethanol and methanol. LESCOL is taken as tablets inclosing fluvastatin sodium, 20 mg or 40 mg of fluvastatin, orally. LESCOL XL is supplied as tablets containing fluvastatin sodium, equivalent to 80 mg of fluvastatin, for oral administration. Studies in rats demonstrated the potent vascular protective effects in adjuvant induced arthritis (Yoshisuke *et al.*, 2007; Limi *et al.*, 2013) and provide additional scientific rationale for the use of statins to reduce cardiovascular mortality in patients with rheumatoid arthritis. It also upregulates the calcium channel expression in vascular smooth muscle cells via RhoA and ERK/p38 MAPK pathways (Ouyang *et al.*, 2014). Combined effect of telmisartan and fluvastatin was also studied recently on arachidonic acid metabolism in human liver microsomes (Kato *et al.*, 2017).

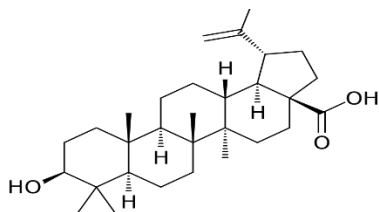


Fig. 1.11. Structure of Betulinic acid -
Formula: C₃₀H₄₈O₃, Molar
mass: 456.7 g/mol, adapted from the
wikipedia

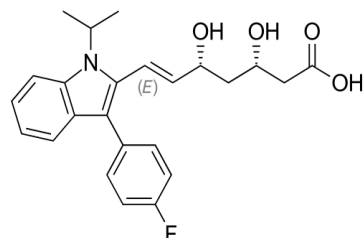


Fig. 1.12. Structure of Fluvastatin:
Structural formula C₂₄H₂₅FN₄.Na with
a molecular weight of 433.46, adapted
from the wikipedia

Synovial tissues of patients with rheumatoid arthritis (RA) have increased expression of COX-2. Cytokines play a key role as therapeutic targets in RA and other inflammatory diseases (Stefan *et al.*, 2015). Upregulated expression of COX-2 in synovial tissues is mediated by the pro-inflammatory cytokines IL-1 and TNF- α (Fattahi *et al.*, 2012; Wojdasiewicz *et al.*, 2014). The pro-inflammatory cytokines TNF- α , IL-1 and IL-6 are shown to play an important role in the pathophysiology of arthritis development in humans and animal models (McInnes *et al.*, 2007). The effects of these cytokines in arthritic joints appear to be multiple which include the expression of adhesion and chemoattractant

molecules that facilitates leukocyte influx and activation (Cannetti *et al.*, 2003). TNF- α is produced by activated macrophages/monocytes, fibroblasts, mast cells and T cells stimulates the production PGE₂ by synovial cells and thus causes joint damage in inflammatory conditions such as rheumatoid arthritis (Brennan *et al.*, 2008). Data from clinical trial and experimental study revealed that two key pro-inflammatory cytokines IL-1 and TNF α play a characteristic role in the pathogenesis of human RA and collagen induced arthritis (Erik *et al.*, 2013).

Matrix metalloproteinases (MMPs) are the key enzymes responsible for the degradation of collagen and other proteins in the extracellular matrix (ECM) (Jablonska *et al.*, 2016). MMP-2 and MMP-9 expressed by synoviocytes and play an important role in RA progression (Meng *et al.*, 2014). Report by Sandhya *et al.*, 2009 demonstrated that the expression of MMP-2, MMP-3 and MMP-9 in the synovial effusate of type II collagen induced arthritic animals can cause degradation of articular cartilage extracellular matrix. Also findings, including recent studies suggest that serum matrix metalloproteinase-3 is associated with disease activity and joint destruction in rheumatoid arthritis patients (Samia *et al.*, 2016). The previous studies in our laboratory revealed that the inflammation induced by Type II collagen injection was alleviated by BA isolated from *bacopa monniera* (Viji *et al.*, 2010) and fluvastatin proved to possess anti-inflammatory and antioxidant effect in experimental animals (Limi *et al.*, 2013) in addition to the cholesterol lowering effect. But the combination effect of betulinic acid is not elucidated so far. So the next aim is to investigate how both these compounds reduce or decrease the intensity or progression of arthritis in the joint cartilage of collagen induced rats. The aim of the study is to evaluate the protective effect of betulinic acid and fluvastatin on collagen induced arthritis.

Materials and Methods:

Animals

Female albino rats (Sprague-Dawley strain) of body weight 150-200g which were breed and reared in the department animal house were used for this study. They were provided Laboratory chow (Hindustan Lever Lab diet) and water *ad libitum* throughout the experimental period. The rats were housed in polypropylene cages in a room with temperature maintained at 26 $\pm$ 1°C and a 12 hr light and dark cycle. All experimental protocols were approved by the institutional animal ethics committee [IAEC- KU- 16/2013-14- BC- AH (25)].

Reagents and drugs

The biochemicals used in this study were purchased from Sigma- Aldrich Chemicals, Merck, Eppendorf India Ltd and Spectro Chem. Pvt. Ltd. India and the solvents of analytical grade were from SRL chemicals, Mumbai, India. The compounds betulinic acid and fluvastatin were purchased from Sigma-Aldrich and Novartis Pharma (Basel, Switzerland) respectively. The chemicals used for molecular biology works such as ethidium bromide, TRI reagent, RNA isolation kit, monoclonal and polyclonal primary antibodies, secondary antibodies and other biochemicals from Sigma chemicals Co, USA and Cell Signaling Technology. 96 well ELISA plates were obtained from NUNC (Denmark). PCR kit and Revert

first stand cDNA synthesis kit were purchased from fermentas. The primer sequences were custom synthesized from NCBI nucleotide database and were supplied by Biogene, New Delhi, India. RT-PCR kit was purchased from Eppendorf India Ltd, Chennai.

Experimental procedure

Type II Collagen induced arthritis

Rheumatoid arthritis was induced by type II collagen (CII) from bovine nasal septum which was dissolved in 0.1 M acetic acid at a concentration of 4 mg/ml and emulsified in equal volume of incomplete Freund's adjuvant. Each rat was given intradermal injections of 100 µl in divided doses at the base of the tail in two sites on day 0 and then received booster injection on day 7. Paw edema was peaked on day 14. Normal non-immune rats were used as negative control. Betulinic acid and Fluvastatin were dissolved in 1% normal saline and fed orally. The dose of Betulinic acid and fluvastatin were chosen as 2mg and 5mg /kg body weight as per the following reference [15,17] respectively. Duration of the experiment was 60 days. Rats were then sacrificed after overnight fasting by euthanasia. At the end of 60 days, the tissues and blood were isolated for evaluation of biochemical parameters.

Rats were divided into 5 groups each consists of 6 rats:

Group I- Normal rats

Group II- Collagen induced arthritic rats (CIA)

Group III- Rats were given collagen + BA (2mg/ kg body weight)

Group IV- Rats were given collagen + FLU (5mg/ kg body weight)

Group V- Rats were given collagen + BA (1mg/ kg body weight) + FLU (2.5mg/ kg body weight).

Biochemical Estimations

Malondialdehyde (MDA) was estimated by the method of Ohkawa [19]. Catalase enzyme was assayed by the method of Machely and Chance [20]. Superoxide dismutase enzyme (SOD) activity was determined by the method described by Kakkar *et al* [21]. The activity of glutathione peroxidase (GPx) was determined by the method by Agerguard and Jense [22]. Glutathione content was estimated by the method of Benke *et al* [23]. Protein was estimated by Lowry et al method [24]. Activity of SGOT was estimated by the method of Reitman and Frankel, 1957. Activity of SGOT was estimated by the method of Reitman and Frankel, 1957. LDH enzyme activity was determined by the method described by Bergmeyer and Bernt, 1974.

Enzyme Linked Immunosorbant Assay (ELISA)

The tissue was lysed in a buffer containing 50mM Tris pH 8.0, 150mM NaCl, 1% Triton X 100, 1mM Na₃VO₄, 2.5mM sodium pyrophosphate, 1mM NaF, 1mM DTT, 1mM PMSF, 1µg/ mL leupeptin. Multiwell ELISA plates coated with the lysates served as the antigen and incubated for 24 hours at 37°C. Washed the wells with the blocking buffer containing 0.2% gelatin in PBS (0.025M, pH 7.4, 0.15M NaCl) and 0.05% Tween 20. The primary antibodies were diluted in PBS Tween in the ratio of 1:500, were added to the wells (100µL) and incubated for 1h at room temperature. After washing with PBS-Tween

20, the wells were treated with HRP conjugated anti rabbit IgG that served as the secondary antibody (100µL) for 1h at room temperature. This was followed by washing with PBS-Tween 20 and PBS. Then the wells were treated with the substrate solution (0.5mL of O-dianisidine 10mg/mL methanol + 60mL of 0.1M citrate –phosphate buffer pH5.0 + 12µL of 30% H₂O₂) and incubated for 30 minutes. The reaction was stopped by the addition of 100µL 5N HCl. The optical densities of the samples were determined using microplate (Thermo Multiskan Spectrum) reader set at 405 nm.

RNA Preparation and Reverse Transcriptase Polymerase Chain Reaction (RT-PCR)

RNA was isolated by homogenizing 100mg tissue in 1mL TRI reagent (Sigma Aldrich). After homogenization, centrifuge it at 12000g for 10 min at 2-8°C and stand for 5 min. Added 0.2mL chloroform, covered the sample tightly and shaken vigorously for 15 seconds and allowed to stand for 2- 15 seconds at room temperature. Centrifuged at 12000g for 15 min at 2-8°C. A colourless aqueous phase containing RNA was obtained. Transferred the aqueous phase to a fresh tube and added 0.5mL isopropanol, allowed to stand at 5- 10 min at room temperature. Centrifuged at 12000g for 10 min at 2-8°C, RNA will be precipitated at the bottom and sides of the tube. Removed the supernatant and washed the RNA pellet by adding 1mL 75% ethanol. Vortexed the sample and then centrifuged at 75000g for 5 min at 2- 8°C. Air dried the RNA pellet for 5- 10 min. Added appropriate volume of water to the RNA pellet and facilitated dissolution at 55-60°C for 15 min.

Primers	Gene sequences
TLR - 2	Forward 5'-TCTCTGTCATGTGATGCTGCTGGT- 3' Reverse 5'-TCCAAGTGTTCAAGACTGCCCAGA- 3''
TLR - 4	Forward 5'-AGTGTATCGGTGGTCAGTGTGCTT- 3' Reverse 5'-ATGAAGATGATGCCAGAGCGGCTA- 3''
IL-1β	Forward 5'-AACCTGCTGGTGTGTGACGTTC-3' Reverse 5'-CAGCACGAGGCTTCTTTGTTGT-3'
IL-6	Forward 5'-CCACTGCCTTCCCTACTTCA3' Reverse 5'-TGGTCCTTAGCCACTCCTTC3'
TNF-α	Forward 5'-GTCGTAAACCACCAAGC-3' Reverse 5'-GACTCCAAAGTAGACCTGCCC-3'
CYP3A4	Forward 5'-TTCAGCAAGAAGAACAAGGACAA-3' Reverse 5'GGTTGAAGAAGTCCTCCTAAGC-3'
GAPDH	Forward5'-GGAGTCAACGGATTTGGTCGTAT-3' Reverse 5'AGGTCAGGTCCACCACTGAC-3'

cDNA synthesis was carried out in an Eppendorf mastercycler according to the manufacturer's instruction. The reaction mixture consisted of 5µg DNA as template, oligo dT primer, reaction buffer, RNase inhibitor, dNTPs and reverse transcriptase enzyme. Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) served as the control. The mixture was gently centrifuged and incubated for 5 minutes at 25°C followed by synthesis at 42°C for 60 minutes. The reaction was terminated by heating at 70°C for 5 minutes. The reverse

transcription products were directly used for PCR. The reaction mixture for PCR contained template DNA, PCR master mix and appropriate primers. The reaction mixture was programmed for PCR amplification as follows: incubated in an Eppendorf thermal cycler for an initial denaturation at 105°C for 1 min, template denaturation at 94°C for 30sec, primer annealing at 59°C for 30sec, and final extension at 72°C for 60sec, for a total of 30 cycles. The products of the PCR reactions were electrophoresed on 1.5% agarose gel and stained with ethidium bromide. The bands were quantified by densitometry in a Gel Documenter (BIO RAD) to determine the optical density of each band against an internal standard, GAPDH. The primer pairs for rat TLR – 2, TLR – 4, IL-1 β , IL-6, TNF- α , COX-2, CYP3A4 and GAPDH were given above table.

Histopathological analysis of the synovium

The tissue was excised, fixed in 10% formalin, decalcified in 5% nitric acid and processed for paraffin embedding. Sections were cut at 3 μ m thickness, flattened and adhered to the slides. They were stained with hematoxylin-eosin and viewed under a light microscope for histopathological changes.

Statistical analysis

The results were analyzed using a statistical program SPSS/PC+, version 17.0 (SPSS Inc., Chicago, IL, USA). One-way ANOVA employed for comparison test of significant differences among groups was determined. Pair fed comparisons between the groups was made by Duncan's multiple range tests and $p < 0.05$ was considered significant.

Results:

Effect of BA and FLU on glutamic-oxaloacetic transaminase (GOT) and glutamic-pyruvic transaminase (GPT)

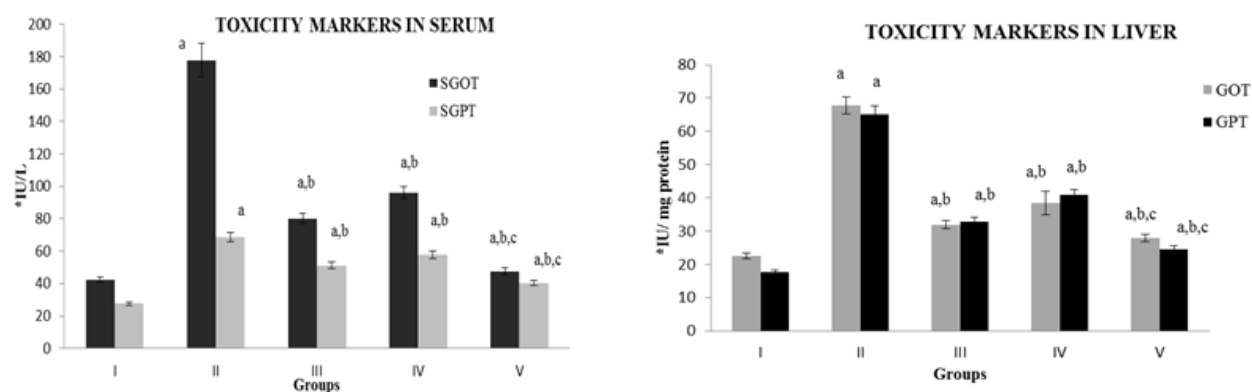


Fig 3.1. Toxicity markers in serum and liver: Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values expressed as average of 6 values $\pm$ SEM in each group, a- Significant difference when group II compared with group I at $p < 0.05$, b- Significant difference when group III, IV, V compared with groups II at $p < 0.05$, c- Significant difference when group V compared with group III and IV at $p < 0.05$. *Unit- pyruvate liberated/min/mg protein.

The toxicity markers GOT and GPT in serum and liver were significantly ($p < 0.05$) increased in collagen induced rats when compared with normal rats. Treatment with BA

and FLU, alone or in combination showed significant ($p<0.05$) reduction in toxicity markers.

Effect of BA and FLU on lactate dehydrogenase (LDH) in serum

LDH is released during tissue damage, injuries or certain pathologic diseases. The lactate dehydrogenase enzyme in the serum was significantly ($p<0.05$) increased in collagen induced rats when compared with normal rats. Betulinic acid and fluvastatin treatment alone or in combination showed significant ($p<0.05$) reduction in lactate dehydrogenase.

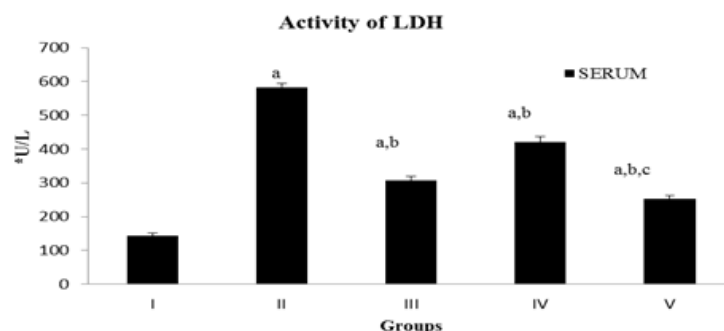


Fig.3.2. LDH enzyme activity in the serum: Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values expressed as average of 6 values $\pm$ SEM in each group, a- Significant difference when group II compared with group I at $p<0.05$, b- Significant difference when group III, IV, V compared with groups II at $p<0.05$, c- Significant difference when group V compared with group III and IV at $p<0.05$. *Units defined as the amount of enzyme that catalyzes the conversion of 1 μ mol of lactate per minute under specified conditions.

Expression of Cytochrome P450 3A4 (CYP3A4) in liver

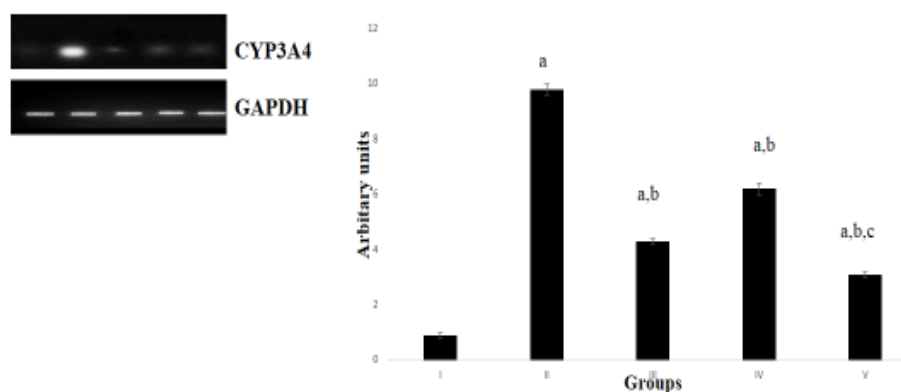


Fig. 3.3. CYP3A4 in the serum: Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values expressed as average of 6 values $\pm$ SEM in each group, a- Significant difference when group II compared with group I at $p<0.05$, b- Significant difference when group III, IV, V compared with groups II at $p<0.05$, c- Significant difference when group V compared with group III and IV at $p<0.05$.

After 60days, the expression of CYP3A4 was analyzed in the liver. The expression of CYP3A4 in liver was significantly ($p<0.05$) increased in collagen induced rats when compared with normal rats. Combination therapy with betulinic acid and fluvastatin showed a significant ($p<0.05$) reduction in the expression of CYP3A4.

Betulinic acid and fluvastatin mediated reduction of oxidative stress

The concentration of MDA was significantly ($p<0.05$) increased in collagen induced rats when compared with normal rats. Treatment with BA and FLU showed significant ($p<0.05$) decrease in MDA level indicates the reduced level of lipid peroxidation and oxidative stress than the drugs given alone. In the cartilage tissue, the activities of SOD, catalase and GPx were significantly ($p<0.05$) reduced in CIA when compared with normal rats. Combination of BA and FLU treatment significantly ($p<0.05$) increased the activities of these enzymes and restored the concentration of GSH rendering more protection against oxidative damage than the drugs given alone (Table 1).

Table 1: Antioxidant status of the cartilage tissue: Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. Values expressed as average of 6 values $\pm$ SEM in each group. a- Statistical difference with group I at $P < 0.05$, b- Statistical difference with group II at $P < 0.05$ and c- Statistical difference with group III and group IV at $P < 0.05$. CAT Units* = velocity constant / second, SOD Units# = Enzyme concentration to inhibit chromogen production (OD 560nm) by 50% in 1 min, GPx Units\$= 1 μ mol NADPH oxidized/min/mg protein.

Cartilage	Normal	CIA	CIA+ BA	CIA+FLU	CIA+BA+FLU
MDA (Mm/ g tissue)	0.97 $\pm$.07	9.37 $\pm$ 0.89 ^a	2 $\pm$.19 ^{a, b}	3.54 $\pm$ 0.42 ^{a, b}	1.75 $\pm$ 0.15 ^{a, b, c}
GSH (mmol/ g wet tissue)	129.08 $\pm$ 12.3	30.34 $\pm$ 2.89 ^a	99.2 $\pm$ 9.5 ^{a, b}	78.6 $\pm$ 7.54 ^{a, b}	107.43 $\pm$ 10.28 ^{a, b, c}
CAT (Units*/ mg protein)	5.75 $\pm$ 0.54	1.21 $\pm$ 0.11 ^a	3.48 $\pm$ 0.32 ^{a, b}	2.56 $\pm$ 0.24 ^{a, b}	4.83 $\pm$ 0.44 ^{a, b, c}
SOD (Units#/ mg protein)	3.80 $\pm$ 0.36	0.77 $\pm$ 0.06 ^a	2.73 $\pm$ 0.26 ^{a, b}	2.18 $\pm$ 0.21 ^{a, b}	3.02 $\pm$ 0.28 ^{a, b, c}
GPx (Units\$/ mg protein)	10.62 $\pm$ 1.02	1.65 $\pm$ 0.16 ^a	5.12 $\pm$ 0.48 ^{a, b}	3.2 $\pm$ 0.29 ^{a, b}	7.6 0 $\pm$ 0.73 ^{a, b, c}

Effect of Betulinic acid and fluvastatin on the release of inflammatory mediators

Since COX-2 is an enzyme responsible for inflammation, protein expression of COX-2 was estimated by ELISA. The expression of COX-2 in the synovium was significantly ($p<0.05$) increased in collagen induced rats when compared with normal rats. Supplementation of betulinic acid and fluvastatin showed significant ($p<0.05$) decrease in COX-2 than the drugs given alone.

Prostaglandin E₂ (PGE₂) is a principal mediator of inflammation in diseases such as rheumatoid arthritis. Arachidonic acid is transformed into PGE₂ via cyclooxygenase (COX) enzymes. The expression of PGE₂ was significantly ($p<0.05$) increased in CIA rats when

compared with normal rats. Administration of BA and FLU showed significant ($p < 0.05$) decrease in PGE₂ than the drugs given alone. cPLA₂ a calcium-dependent phospholipase A₂ that catalyzes the release of arachidonic acid from membrane phospholipids. The expression of cPLA₂ was significantly ($p < 0.05$) increased in CIA rats when compared with normal rats. Supplementation of betulinic acid and fluvastatin showed significant ($p < 0.05$) decrease in cPLA₂ than the drugs given alone.

Treatment with BA or FLU significantly decreased the expressions of COX-2, PGE₂ and cPLA₂ in the synovium thereby have a role in reducing inflammation in the treated group which is more prominent in the combination therapy (Fig. 3.5).

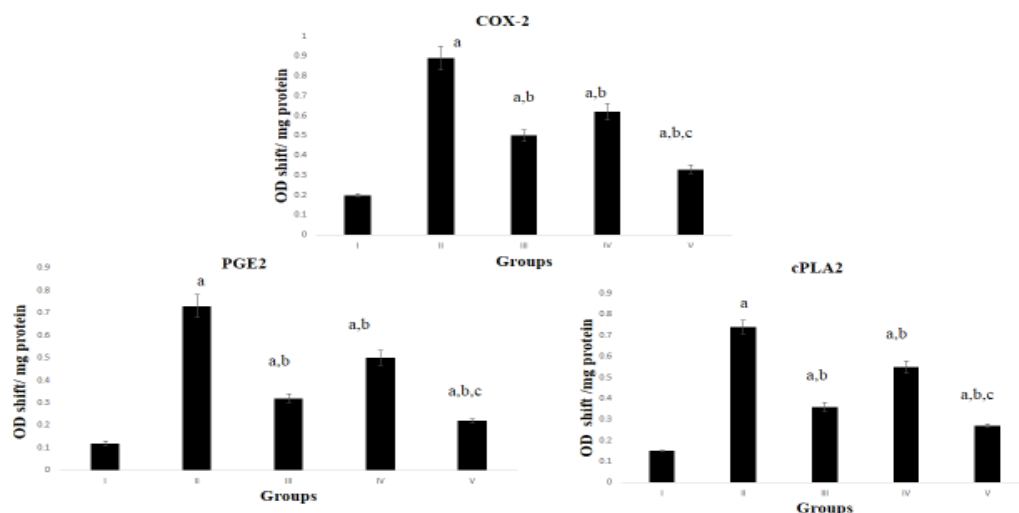
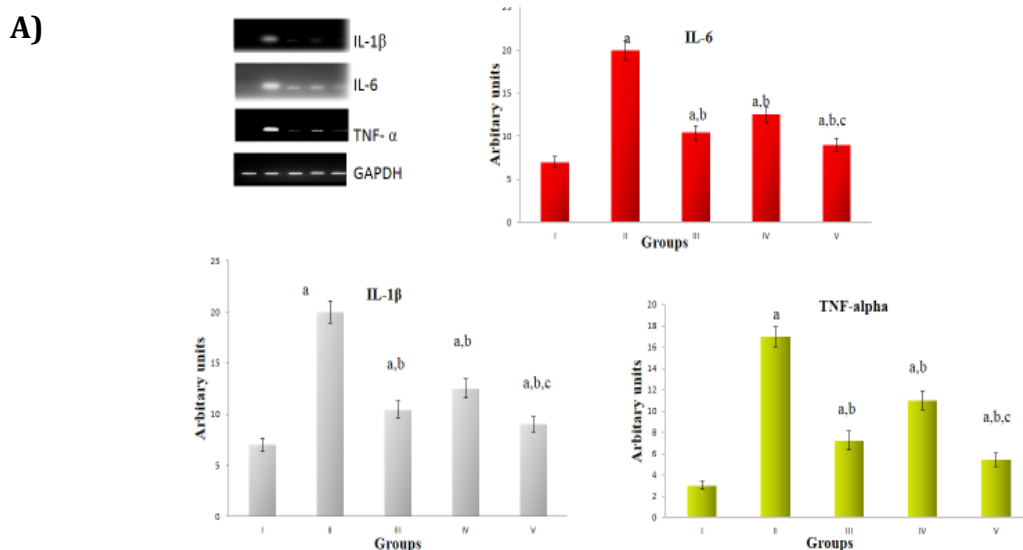


Fig. 3.5. Effect of BA and FLU on inflammatory mediators on COX-2, PGE₂ and cPLA₂:

The expression of COX-2, PGE₂ and cPLA₂ was assayed by ELISA in the synovial tissue. Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. Values expressed as average of 6 values $\pm$ SEM in each group, a- Statistical difference with group I at $P < 0.05$, b- Statistical difference with group II at $P < 0.05$ and c- Statistical difference with groups III and IV at $P < 0.05$.

Protein and m-RNA expression of pro-inflammatory cytokines



B)

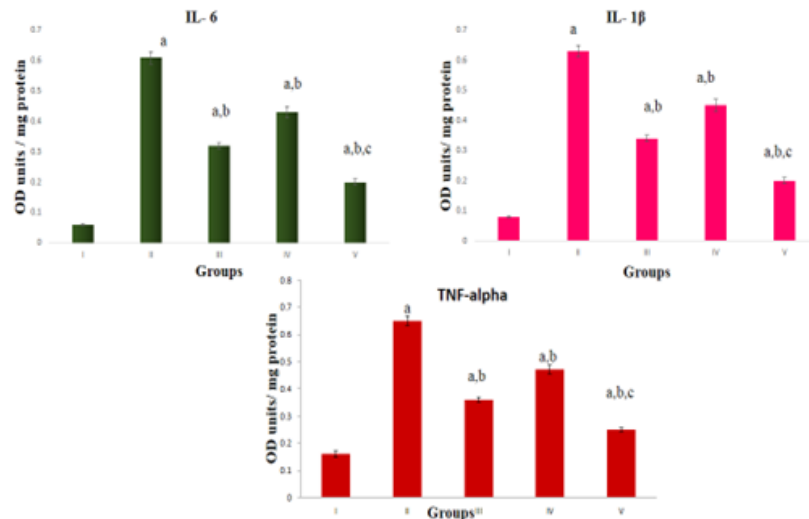


Fig. 3.6. Expression of cytokines in the cartilage: A) The relative amount of mRNA was estimated by semi quantitative RT- PCR. The PCR products were quantified by densitometry and standardized to their respective GAPDH controls. The intensity was measured and expressed as Arbitrary Units. B) Protein level by ELISA. Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values are expressed as average of 6 values $\pm$ SEM in each group, a- Statistical difference with group I at $P < 0.05$, b- Statistical difference with group II at $P < 0.05$ and c- Statistical difference with group III and group IV at $P < 0.05$.

Expression of Interferon- γ (IFN- γ)

IFN γ , or type II interferon, is a cytokine that is important for innate and adaptive immunity against viral, some bacterial and protozoal infections. IFN γ is a key activator of macrophages and inducer of class II major histocompatibility complex (MHC) molecule expression. The expression of the pro-inflammatory cytokine, IFN- γ was significantly ($p < 0.05$) increased in collagen induced rats when compared with normal rats. Administration of betulinic acid and fluvastatin showed significant ($p < 0.05$) decrease in IFN- γ than the drugs given alone.

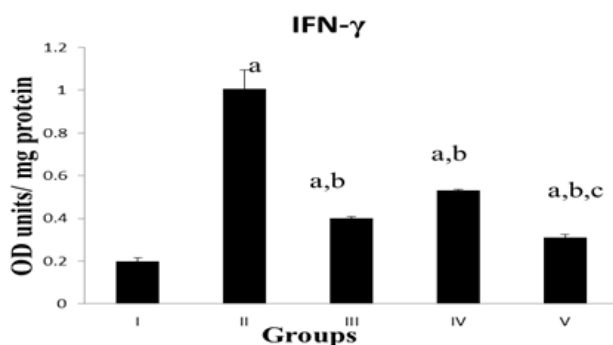


Fig. 5.3.7. IFN- γ in the cartilage: Group Normal, Group II- CIA, Group III- CIA+ E Group IV- CIA+ FLU, Group V- CIA+ BA + FLU CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values are express as average of 6 values $\pm$ SEM in each group, Statistical difference with group I at $P < 0.05$, Statistical difference with group II at $P < 0.05$ and c- Statistical difference with group III and group IV at $P < 0.05$.

Matrix metalloproteinases, MMP-2 AND MMP-9 in the cartilage

Matrix metalloproteinases (MMPs), hydrolyze components of the extracellular matrix. The level of matrix metalloproteinases MMP-2 and MMP-9 were significantly ($p < 0.05$) increased in collagen induced rats when compared with normal rats. Administration of BA and FLU showed significant ($p < 0.05$) decrease in MMP-2 and MMP-9 levels than the drugs given alone.

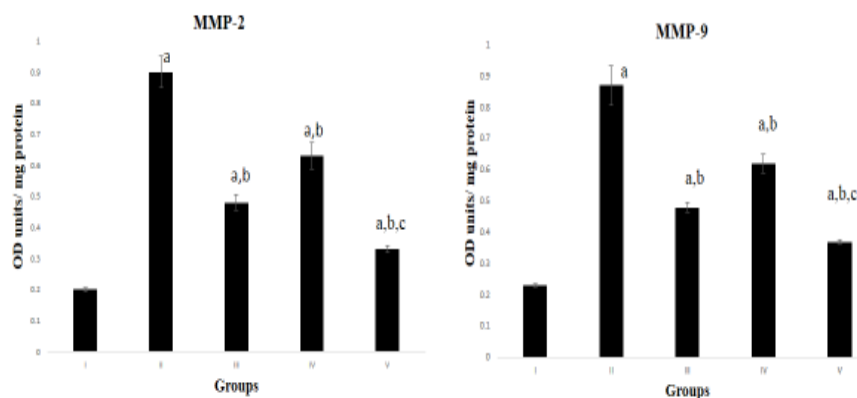


Fig. 3.8. MMP-2 AND MMP-9 level in the cartilage by ELISA: Protein level of MMP-2 and MMP-9 by ELISA. Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values are expressed as average of 6 values $\pm$ SEM in each group, a- Statistical difference with group I at $P < 0.05$, b- Statistical difference with group II at $P < 0.05$ and c- Statistical difference with group III and group IV at $P < 0.05$.

Effect of BA and FLU on the expression of TLR-2 and TLR-4 in the cartilage

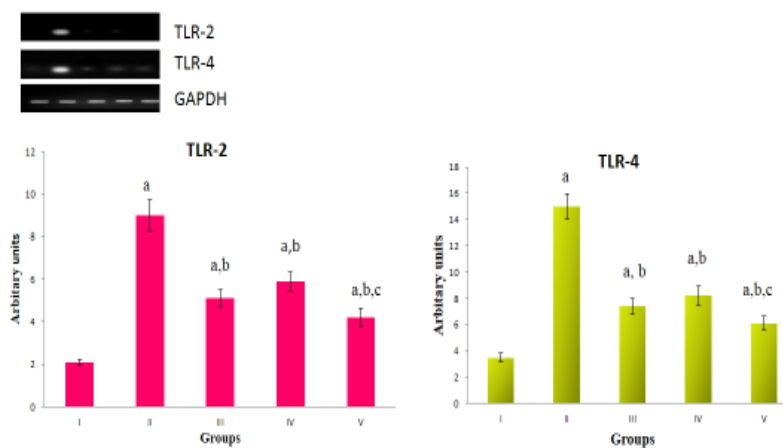


Fig. 3.9. Effect on the expression of TLR-2 and TLR-4 in the cartilage: The relative amount of mRNA was estimated by semi quantitative RT- PCR. The PCR products were quantified by densitometry and standardized to their respective GAPDH controls. The intensity was measured and expressed as Arbitrary Units. Group I- Normal, Group II- CIA, Group III- CIA+ BA, Group IV- CIA+ FLU, Group V- CIA+ BA + FLU. CIA- collagen induced arthritis, BA- betulinic acid and FLU- fluvastatin. Values expressed as average of 6 values $\pm$ SEM in each group, a- Significant difference when group II compared with group I at $p < 0.05$, b- Significant difference when group III, IV, V compared with groups II at $p < 0.05$, c- Significant difference when group V compared with group III and IV at $p < 0.05$.

The cell surface receptors TLRs especially TLR-2 and 4 play a major role in the development of autoimmune diseases, so the expression of the toll like receptors TLR-2 and TLR-4 were evaluated in the cartilage. The expression of TLR-2 and TLR-4 were significantly ($p < 0.05$) increased in collagen induced rats when compared with normal rats. Combination therapy using betulinic acid and fluvastatin showed significant ($p < 0.05$) decrease in TLR-2 and TLR-4 than the drugs given alone.

Histopathology of the synovium

The normal rats showed a synovial membrane without inflammation. Collagen induced arthritic rats showed severe inflammation associated with synovial hyperplasia and accumulation of inflammatory cells in the joint whereas in combination therapy the inflammation and synovial hyperplasia was reduced and showed a histology near to normal. Groups administered with either betulinic acid or fluvastatin showed mild inflammation without synovial hyperplasia.

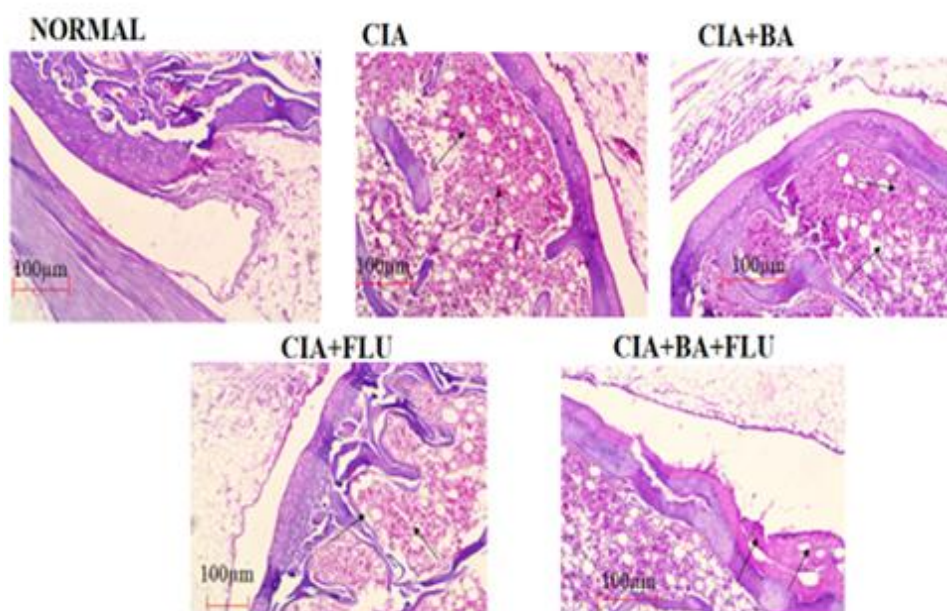


Fig.3. 10. H and E staining of the synovium: Light microscopic appearance of tissue sections obtained using hematoxylin and eosin (H & E) stain with 40X magnification. Scale bar 100µm.

Discussion:

Autoimmune arthritis was induced by immunization with an emulsion of incomplete Freund's adjuvant and type II collagen (CII) (Brand *et al.*, 2007; Viji *et al.*, 2010) which has been widely used as a typical human rheumatoid arthritic model, since the CIA model shares a number of clinical, immunologic and pathologic features with RA (Shou *et al.*, 2006). Collagen antibody induces inflammation via Fc receptor and complement factors involving the infiltration of both neutrophils and macrophages (Hietala *et al.*, 2004). This monoclonal specific antibody activates T cells and B cells which bind the cartilage *in vivo* which is critical for the development of arthritis. Rheumatoid Arthritis is associated with the inflammation of the synovial joints leading to bone destruction. So in the present study,

we have evaluated the role of BA and FLU on various inflammatory mediators and cytokines involved in the disease progression in collagen induced rats. Prostaglandins sustain homeostatic mechanisms and mediate pathogenic processes including the inflammatory reaction (Mohammad and Abbas, 2012). Cytosolic phospholipases A₂ (cPLA₂) hydrolyzes the membrane phospholipids resulting in the release of arachidonic acid (AA) which is further converted by COX-2 and prostaglandin synthases to biologically active PGs (Chih-Chung *et al.*, 2009). The activities of cPLA₂ and PGE₂ were increased in the cartilage of CIA rats which is in association with the studies that cPLA₂ and PGE₂ contributes to the pathological process leading to rheumatoid arthritis (Gheorghe *et al.*, 2011; Leclerc *et al.*, 2013). It was reported that PGE₂ aggravates collagen-induced arthritis in mice via the inflammatory IL-23/IL-17axis (Amir *et al.*, 2007). Our findings showed that the cPLA₂ activity in the cartilage was significantly reduced in the treatment group co-administered with betulinic acid and fluvastatin.

COX is an enzyme that catalyzes the formation of prostaglandins that play an important role in promoting the signs and symptoms of rheumatoid arthritis (Smith, 2002; Morita, 2002; Joan, 2003). Here, the collagen induced rats showed an increased activity COX-2 expression due to the increased production of PGE₂ characterized by synovial pannus formation and cartilage erosion. The administration of betulinic acid and fluvastatin significantly decreased the total COX and COX-2 activity in the monocytes and synovium reduced the production of lipid mediators. Cytosolic phospholipases A₂ (cPLA₂) and cyclooxygenases-1 and 2 (COX-1 and 2) play a pivotal role in the metabolism of arachidonic acid (AA) and in eicosanoid production (Yan *et al.*, 2003). Studies have shown that vascular smooth muscle cells have been shown to express COX-2 and cPLA₂, which are tightly regulated by various mediators in several species (Ali *et al.*, 2008). This is in agreement with the previous studies by Sindhu *et al.*, 2012 in adjuvant induced arthritis. This is further confirmed by significantly reduced activity of PGE₂ in the treatment group which is co-administered with BA and FLU.

Cytochrome P450 3A4 enzyme plays a key role in the body, mostly located in the liver and intestine. It oxidizes small foreign organic molecules such as toxins or drugs, so that they can be removed from the body (Ye *et al.*, 2013). Several other members of this family are also involved in drug metabolism, but CYP3A4 is the most common and the most versatile one. It is a hemoprotein, a protein containing a heme group with an iron atom. The mRNA expression of CIA rats showed increased expression of CYP3A4 which is a member of the cytochrome P450 superfamily of enzymes (Sim *et al.*, 2014; Kim *et al.*, 2015). Many reactions involved in drug metabolism, synthesis of cholesterol, steroids and other lipids components are catalyzed by this monooxygenase's cytochrome P450 proteins. The mRNA expression of CYP3A4 was decreased in drugs alone and in combination therapy when compared to the arthritic rats, suggests that the drugs are well metabolized in phase I metabolism. Previous studies have revealed the involvement of different members of this family in Phase I metabolism of xenobiotics by alkaloids and flavonoids (Wang *et al.*, 2015; Dong *et al.*, 2016).

Even though the drugs were metabolized in Phase I metabolism, the toxicity markers such as GOT, GPT and LDH enzymes were analyzed in the liver and serum. GPT and GOT enzymes are associated with the conversion of amino acids to keto acids and the difference is that GPT is found predominantly in the liver, with clinically negligible quantities found in the kidneys, heart and skeletal muscle, while GOT is found in the skeletal muscle, kidneys, brain, liver, heart and red blood cells. As a result, GPT is a more specific indicator of liver inflammation than GOT. In our studies the toxicity markers such as GOT, GPT and lactate dehydrogenase were elevated in collagen induced arthritic rats which was significantly reduced in combination therapy. A previous study revealed that BA have no toxicity even at high concentrations in animal experiments (Pisha *et al*, 1995). But methotrexate (MTX) or leflunomide (LEF) that comes under NSAIDs administration elevated liver enzymes in rheumatoid arthritis patients (Fries *et al*, 1990; Jeffrey *et al*, 2010). However, Fluvastatin, which is a statin decreases these toxicity markers than CIA rats, better effect was observed in betulinic acid alone or in combination. Earlier reports also showed that lactic dehydrogenase in the serum and synovial fluid, is a marker of joint damage in rheumatoid arthritis patients (Thompson and Jones, 1987; Pejovic *et al*, 1992). Thus, the study significantly reduced the toxicity markers in combination therapy, confers a safer therapeutic strategy

Reactive oxygen species (ROS) and nitrogen species (RNS) are potential biomarkers for disease activity in patients with rheumatoid arthritis (Khojah *et al*, 2016). The most significant method used to assess oxidative stress and an increase in ROS is to check the rise in plasma and tissue levels of SOD, CAT, GPx, GRd, reduced glutathione and MDA, one of lipid peroxidation products (Sivaraj *et al*, 2011). In the present study, the increased levels of MDA in CIA rats indicate increased lipid peroxidation due to inflammation. The increased concentration of lipid peroxidation product, measured as MDA is most widely used to assess the extent of inflammation (Guerrero-Romero *et al*, 2006). MDA is a major reactive aldehyde, an end product of the oxidation and decomposition of polyunsaturated fatty acids. In normal physiological conditions a homeostatic balance exists between the formations of ROS and their removal by endogenous antioxidant scavenging compounds. When cellular production of ROS overwhelms its antioxidant capacity, a state of oxidative stress is reached contributing to the pathogenesis of several diseases such as atherosclerosis, diabetes, arthritis, neurodegenerative disease and also in ageing process etc. On treatment with BA+ FLU, a significant decrease in the MDA levels was observed, which indicate the efficiency of these drugs in inhibiting lipid peroxidation effectively than the drugs given alone. RA is often associated with the formation of reactive oxygen species and lipid peroxides as a result of disease activity (Manjunatha *et al*, 2012; Somaiya *et al*, 2016). These cytotoxic ROS may cause oxidative damage in the cells (Halliwell, 2007).

Antioxidant enzymes play a major role in reducing the level of ROS generated (Petrozzi *et al*, 2007). In our study, decreased activity of CAT was observed in collagen induced rats. But BA+ FLU treatment significantly enhanced the catalase activity which indicates the increased decomposition of H₂O₂ to H₂O and O₂ by the enzyme. This is in

agreement with the reports of Karatas *et al.*, 2003. The first enzyme involved in the antioxidant defence, superoxide dismutase is a metallo protein that lowers the steady state level of $O_2^{\cdot-}$. A decreased activity of SOD was observed in collagen induced rats due to increased levels of superoxide anion ((Barazzone & White, 2000) and on BA+ FLU administration significant increase enzyme activity was observed indicating increased conversion of superoxide radicals to H_2O_2 . The resulting H_2O_2 is subsequently removed by the enzymatic activity of GPx or CAT. The latter is localized in peroxisomes and converts H_2O_2 with an impressive turnover rate to water and molecular oxygen (Valko *et al.*, 2004).

Previous report has shown that various anti-inflammatory and antioxidant drugs increase the activity of these antioxidant enzymes (Kriegelstein *et al.*, 2001). In the present study, administration of BA+ FLU significantly increased the activity of GPx, indicating increased conversion of peroxides to water with simultaneous oxidation of glutathione (GSH) to glutathione disulfide (GSSG) that lessens oxidative stress. GSH is accountable for the maintenance of the complete redox balance in the cell (Masella *et al.*, 2005). The levels of GSH were also increased in the treated group as it serves as a cofactor for detoxifying enzymes like GPx, which in turn prevent lipid oxidative damage by reducing lipid peroxides (Flohe, 1978) and this helps in the regeneration of oxidized forms of antioxidant vitamins C and E. These results evidence that the collagen induction cause an imbalance between oxidants and antioxidant enzymes. This imbalance was brought to near normal levels by the administration of BA+ FLU to arthritis induced rats. Thus, it is concluded that the antioxidant status of CAT, SOD, GPx and GSH was increased and the lipid peroxidation product MDA (TBARS) decreased on combination therapy in the tissues studied. Reports showed that betulinic acid (BA) possess potent antioxidant activity thereby reducing oxidative stress (Julius *et al.*, 2013; Peng *et al.*, 2015; Lee *et al.*, 2015). Previous studies in our lab also demonstrates the antioxidant effect of BA alone and FLU in different studies (Viji *et al.*, 2011; Limi *et al.*, 2013).

Then we evaluated whether BA and FLU had a regulatory role on the expression of cytokines in the joint cartilage of CIA rats. It was found that combination therapy significantly reduced the expression of pro-inflammatory cytokines such as IL-6, TNF- α and IL-1 β in the cartilage while in CIA rats, the expression of these cytokines was increased contributing to the pathophysiology of arthritis. Increased concentrations of TNF- α and IL-6 were observed in the serum as well as synovial fluid of RA patients correlates with the disease activity and joint destruction in RA (Matsuno *et al.*, 2002; Srirangan *et al.*, 2010; Scheller *et al.*, 2011). Recent studies showed that serum levels of IL-6 and TNF- α may correlate with the severity of rheumatoid arthritis (Shi-Tong Wei *et al.*, 2015) and these cytokines can stimulate the production of PGE2 by synovial cells that contribute to joint damage in inflammatory conditions in RA. Also, the elevated concentrations of IL-1 in the plasma and synovial fluid associate with several factors of disease activity in RA patients (Kay and Calabrese, 2004; Burger *et al.*, 2006) and IL-1 together with TNF- α are considered to be key mediators in RA (Joosten *et al.*, 2010). After 60 days, increased level of IFN- γ was observed in the cartilage of CIA rats. Zhang *et al.*, 2017 have shown that LTB4 stimulates

the expression of interleukins, interferon- γ and chemokines in the synovial cells. IFN- γ level was decreased in combination therapy using BA and FLU which was consistent with the current report by Lee *et al.*, 2017 which showed that IFN- γ regulates inflammatory cell death in experimental autoimmune arthritis since IFN- γ has important effects on endothelial cells, promoting expression of adhesion molecules (Iryna *et al.*, 2014).

Recent findings specified that MMPs have a regulatory role on varied aspects of inflammation and immunity involving the synthesis of pro-inflammatory cytokines and chemokines (Cekici *et al.*, 2014; Robinson *et al.*, 2016; Turner *et al.*, 2014). The activities of MMP-2 and 9 were markedly increased in the cartilage in CIA rats. On 60 days, treatment with BA and FLU significantly reduced the activities of MMP-2 and 9 in the joint cartilage. This is in association to the report of McCawley and Matrisian, 2001 that MMPs repress inflammation by the biologically active molecules such as cytokines, chemokines and growth factor receptor. Reports showed that MMPs contribute to joint destruction in rheumatoid arthritis (RA) by directly degrading the cartilage and bone (Jackson *et al.*, 2001) and synovial fluids from RA patients showed enhanced levels of MMP-2 and MMP-9 (Yoshihara *et al.*, 2000). Expression of MMP-2, 3 and 9 were elevated in arthritis which degrades the non-collagen matrix components of the joints (Burrage *et al.*, 2006, Sandhya *et al.*, 2009). Also, MMP-14 (MT1- MMP) an activator of MMP-2 was found increased in the synovium of RA patients (Yamanaka *et al.*, 2000). Furthermore, MMP-9 from macrophages and neutrophils is thought to play a key role in RA (Jovanovic *et al.*, 2000). Study by Meng *et al.*, 2014 suggest that MMP-2 and MMP-9 expressed by synoviocytes play important role in the angiogenesis in RA progression. Current reports also showed that serum MMP-3 is a specific marker of disease activity and joint damage in RA patients (Samia *et al.*, 2016). Current studies showed that betulinic acid derivative SH479 inhibits arthritis by modulating T cell differentiation and cytokine balance in collagen-induced model (Chen *et al.*, 2017). These results conclude that the synergistic effect of betulinic acid and fluvastatin showed potent anti-inflammatory effect in collagen induced arthritis.

Conclusion:

Collagen induction increases the pro-inflammatory cytokines whereas combination therapy with betulinic acid and fluvastatin decreased cytokine level in the joint cartilage further hinders the production of other pro-inflammatory mediators and enzymes involved in inflammatory response. This is also supported by the histopathological examination of the synovium. Collagen induced arthritic rats showed a severe inflammation associated with synovial hyperplasia and accumulation of inflammatory cells in the joint whereas in combination therapy the inflammation and synovial hyperplasia was reduced, showed a histology near to normal. However, the effect is more prominent in combination therapy than FLU alone. This may be due to the antioxidant effect of betulinic acid.

Acknowledgement:

The authors gratefully acknowledge the help rendered by the Veterinary surgeon, Dr. Ananthalakshmi for assisting in the animal experiments. The authors are also very

thankful to the financial assistance rendered by UGC, New Delhi (UGC BSR RFSMS) in the form of junior and senior research fellowships.

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A REVIEW ON PHARMACOLOGICAL ACTIVITIES OF *Kedrostis foetidissima*

(JACQ.) COGN.

Gayathri S, Muthamizhan V J and Santhi R*

Department of Biochemistry,
PSG College of Arts & Science, Coimbatore-641 014.

*Corresponding author E-mail: santhi@psgcas.ac.in

Abstract:

Many traditional medicines in current usage are from medicinal plants, minerals and organic matter. Nowadays there is an increased attention towards the usage of medicinal to treat various disease. *Kedrostis foetidissima* (Jacq.) Cogn., is a conventional medicinal plant of the Cucurbitaceae family, which is abundant in India, Sri Lanka, Ethiopia and Western Malaysia. Many members of Cucurbitaceae are browbeaten for their therapeutic and cost-effective values. The entire parts of the plant are used in conventional systems of medicines and suggested that they have medicinal properties in both *in vitro* and *in vivo* studies. Recently wide research work had been carried out using the various extracts, important phytochemicals from *Kedrostis foetidissima* to validate its pharmacological and biological activities. It possesses numerous activities like antimicrobial, antioxidant, anticancer, gastroprotective, cardioprotective, antidiabetic, anti-inflammatory properties. This is due to the presence of various metabolites like phenols, alkaloids, flavonoids, tannins, terpenoids and steroids. The present review gives chemical constituents and pharmacological activities of *Kedrostis foetidissima*.

Keywords: *Kedrostis foetidissima*, pharmacological activity, antiproliferative

Introduction:

In general humans for their food, clothing, shelter and medicine depend on plant resources. Nature will provide food and remedy in the form of herbs for human, animals as well as birds (Hashemi *et al.*, 2012). There has been an increased awareness of the limitations of synthetic drugs and chemicals, as well as the potential for adverse effects and toxicity. This has led many people to seek out alternative approaches to health and wellness, including the use of herbal remedies (Okitoi *et al.*, 2007).

The Cucurbitaceae is basically a tropical plant family which contain 110 genera and 640 species (Kavitha *et al.*, 2015). Throughout India there is 37 genera and 97 species are cultivated. It is widely distributed in the areas of Tamil Nādu, Gujarat, Punjab, Uttar Pradesh, Maharashtra and Andhra Pradesh. The pharmacological evaluation of this plant provides the importance regarding the morphology, microscopical and physical characteristics of crude extract (Raja *et al.*, 2021). The main aim of this review is to give the need, chemical components, their activities and the pharmacological values of this plant.

Vernacular Names (Nirmala *et al.*, 2013)

In Tamil it is called as Appakovai, in Telugu as Kukumadumda /Nagadonda, in Kannada it is named as Kukumadumdarnara.

Synonyms (Heath and Heath, 2009)

- ❖ *Kedrostis foetidissima*
- ❖ *Trichosanthes foetidissima*
- ❖ *Zelmeria obtusiloba* Sand.
- ❖ *Melothira foetidissima*
- ❖ *Bryonia foetidissima*

Taxonomical Classification (Kunthavi *et al.*, 2018)

Kingdom: Plantae
Phylum: Tracheophyte
Class: Magnoliopsida
Series: Calyciflorae
Order: Cucurbitales
Family: Cucurbitaceae
Genus: *Kedrostis*
Species: *foetidissima*



Figure 1: Whole plant of *Kedrostis foetidissima*



Figure 2: Ripen fruit of *Kedrostis foetidissima*



Figure 3: Tuber of *Kedrostis foetidissima*

Medicinal Values of Various Parts of *Kedrostis foetidissima*

Plant Parts	Medicinal Uses
Leaf	Anti-diarrheal, Antibacterial, Antifungal, Wound healing, Antiinflammatory, Antianemic, Antidiabetic, Antiproliferative, Anti-fouling agents, Gastroprotective and Immune modulator
Stem	Anti-bacterial, Anti-fungal, Wound healing, Immune modulator
Root	Anti-fungal, Anti-bacterial

Pharmacological Activities of *Kedrostis foetidissima*

Plants can often be more cost-effective than synthetic drugs. While some herbs may be more expensive than others, overall, they can be a more affordable option for many people, especially when compared to the high cost of prescription drugs. The various medicinal activities of *K. foetidissima* were given below.

Anti-Diarrheal activity

Kedrostis foetidissima, a traditional remedy for child diarrhoea. The antidiarrheal efficiency of *Kedrostis foetidissima* leaf extract in ethanol was examined in albino mice. Research of the ethanolic extract of this plant reveals the presence of terpenoids, tannins and flavonoids. One of the findings demonstrated a significant decrease in faecal output with *Kedrostis foetidissima* in the number of diarrheal incidents in a castor oil-induced diarrhoea test. According to the findings, it is concluded that *Kedrostis foetidissima* ethanolic leaf extract had antidiarrheal properties (Sengottuvelu, 2015).

Anti-Bacterial activity

The antibacterial activity of chloroform extracts of stem and leaf of *Kedrostis foetidissima* were carried out against various microorganisms using agar disc diffusion technique. The results shown that extract of stem offered the highest zone of inhibition against *Pseudomonas aeruginosa* (Priyavardhini *et al.*, 2012; Vasantha *et al.*, 2012). Another study also supported the above findings and confirmed the antimicrobial properties (Raja *et al.*, 2019).

Antifungal activity

K. foetidissima leaf, stem, and tuber extracts were experienced for antifungal activity using the disc diffusion method with several solvents against *Candida albicans*, *C. tropicalis*, *Aspergillus niger*, *A. flavus*, and *A. versicolor*. The methanolic extract of the examined plant components are most effective against fungus. As a result, *K. foetidissima* can be utilised to discover its bioactive natural compounds that employed as a starting point for the creation of novel medicines that meet unmet therapeutic needs (Priyavardhini *et al.*, 2012).

The antifungal activity was analysed against few microorganisms on Muller Hinton agar and potato dextrose agar. The result revealed that they have effective activities against *Trichophyton rubrum* and mild effect in *Epidermophyton floccosum* (Subramani and Kamaraj, 2014).

Wound Healing activity

Using an incision wound model on healthy young adult Albino Wistar rats, it was investigated how well *Kedrostis foetidissima* (Jacq.) Cogn. leaf and stem petroleum ether extract treated wounds and its effects compared to control. It exhibits significant wound healing properties and this study confirms the plant's usage in traditional medicine (Amutha and Lalitha, 2013).

Anti-Inflammatory activity

The qualitative phytochemical analysis of *Kedrostis foetidissima* showed the presence of alkaloids, flavonoids, tannins, triterpenoids, phenols, steroids, saponins and glycosides. The plant's widely known for its ability to reduce inflammation since it contains numerous secondary metabolites in large quantities. The recent researches contribute to usefulness of the plant in treating variety of ailments and disorders. The antiinflammatory activity of *Kedrostis foetidissima* leaf extracts were assessed by inhibition of protein denaturation. The methanolic leaf extract was found to have a potent antiinflammatory activity and shows maximum inhibition of 80.25% protein denaturation at the concentration of 800µg/ml (Jagadeeswari and Hemashenpagam, 2019).

Cardio Protective Effect

An isoproterenol (ISO)-induced rat model was used to assess the cardioprotective effects of the partially purified phenolic fraction of *Kedrostis foetidissima* (PFK). After two days of ISO induction, there is a significant increase in the levels of triglycerides, cholesterol, phospholipids, free fatty acids, low-density lipoproteins and cardiac biomarker enzymes, whereas there is a significant decrease in the levels of high-density lipoproteins and antioxidant enzyme activity. Antioxidant enzyme activity significantly increased after 45 days of pre-treatment with phenolic fraction in experimental rats. The study showed that PFK reduced the negative effects of ISO on the cardiovascular system by enhancing the endogenous antioxidant system in the heart and thereby reducing the amount of lipid peroxidation brought on by ISO-induced free radicals (Pavithra *et al.*, 2020).

Free radical scavenging and antioxidant activity

The activity of antioxidant of crude phenolic fraction of *K. Foetidissima* was investigated *in vitro* by Phosphomolybdenum assay. The crude phenolic fraction was found to have high number of phenols followed by flavonoids and tannins. The study also revealed that, as the concentration of the phenolic fraction increase the antioxidant activity increases. The results prove that there is strong correlation with phenolic compounds and antioxidant activity which supports the traditional use of *K. foetidissima* plant as a potent resource of antioxidant compounds that could be utilized pharmaceutically (Pavithra *et al.* 2019; Kalaisezhiyen and Sasikumar, 2012).

Anti-Anaemic activity

Anaemia was induced by administering phenyl hydrazine to evaluate the anti-anaemic properties of the Cucurbitaceae plants *Mukia macrocarpa* (MM) and *Kedrostis foetidissima* (KF). For the study, rats with haemoglobin contents less than 14 mg/dl were chosen. On the first, second, third and fourth weeks of the treatment, animals were punctured in the sinus to obtain blood samples. When compared to the standard drug (Vitamin B12), both the doses of MM and KF extracts considerably increased the RBC content from the first week to the fourth week of treatment. Following treatment with MM

extract, the WBC content did not change significantly. But there was less significant decrease in WBC in Vitamin B12 and KF extract treated groups (Saravanan and Manokaran, 2012).

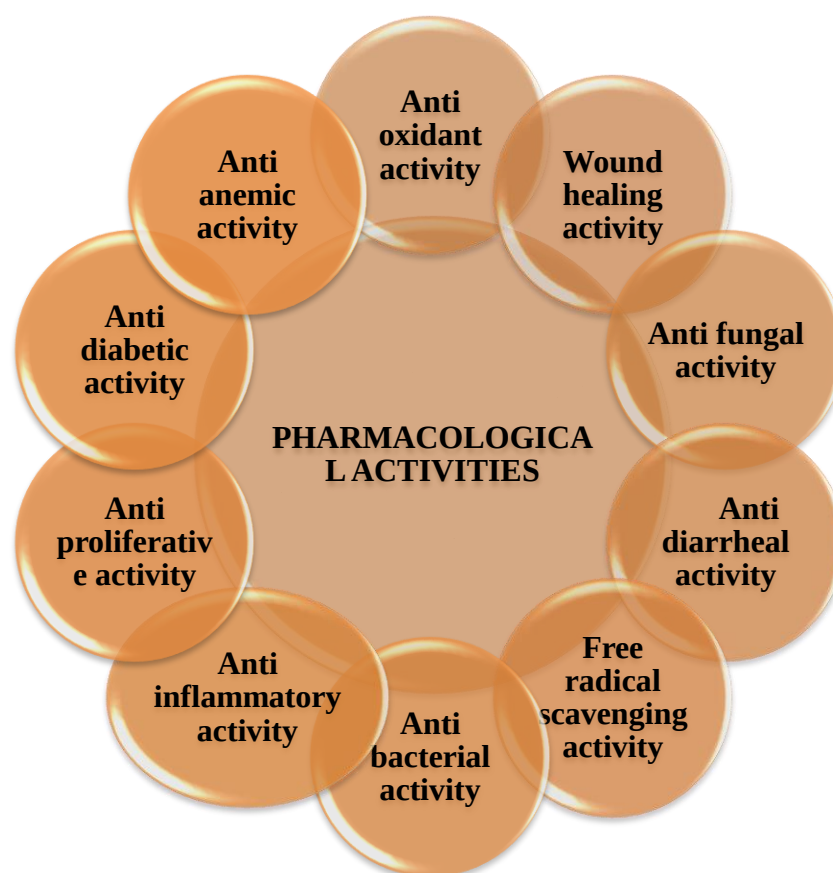


Fig. 4: Various Pharmacological activities of *Kedrostis foetidissima*

Alpha-Amylase Inhibition activity

The ability of *K. foetidissima* (Jacq.) extracts towards the inhibition of alpha-amylase was evaluated by the Dinitro salicylic acid method. All eight extracts exhibit excellent inhibition activity as measured by the IE50. Ethyl acetate extract has an IE50 of 21.02 g/ml, while petroleum ether extract has an IE50 of 37.14 g/ml. When compared to the standard drug Acarbose, ethanol and ethyl acetate extract exhibit excellent inhibition efficiency at 30 g/ml, demonstrating that this plant is an effective, natural treatment for diabetic patients that don't have any negative side effects (Amutha and Lalitha, 2015).

Anti-Proliferative activity

MCF-7 and YMB-1 cell lines were subjected to different concentrations (0-100g/ml) of the methanolic extract in order to assess the anti-proliferative effects of *K. foetidissima*, which are related to the putative anticarcinogenic characteristics in breast cancer. A dose- and time-dependent suppression of cell proliferation was induced by the extract, which was followed by a parallel decline in cell viability. All things considered, the evidence points

to the presence of bioactive substances in the methanolic extract which is useful to treat breast cancer (Choene and Motadi, 2012).

Three different techniques were used to create biogenic nanoparticles that were effective against bone cancer cell lines with the aqueous extracts of *Kedrostis foetidissima*. By using FTIR, relationship between the phytoconstituents and the gold nanoparticles was analysed. The use of XRD, SEM, and TEM analysis was used to confirm the formation of gold nanoparticles. The TEM analysis supported the existence of gold nanoparticles in the form of flowers that were smaller than 25 nm that exhibit 88% cell viability when used to treat bone cancer cell lines (Jannathukl and Lalitha, 2016).

The characteristics and effectiveness of the gold and silver nanoparticles on human lung cancer cell lines (A-549) were studied using *Kedrostis foetidissima* (Jacq.) Cogn. traditional medicinal plant. Using an ethanol extract of the plant *K. foetidissima*, gold and silver nanoparticles were created using the solar irradiation method. The findings show that compared to AuNPs (IC₅₀-106.27 g/mL), silver nanoparticles exhibit significantly less cytotoxicity (IC₅₀-62.16 g/mL) towards A-549 (Amutha and Pottail, 2021).

Conclusion:

In this article, we have collected and reviewed several research articles and reviews. From this, it is clear that *Kedrostis foetidissima* harbors a variety of pharmacological properties.

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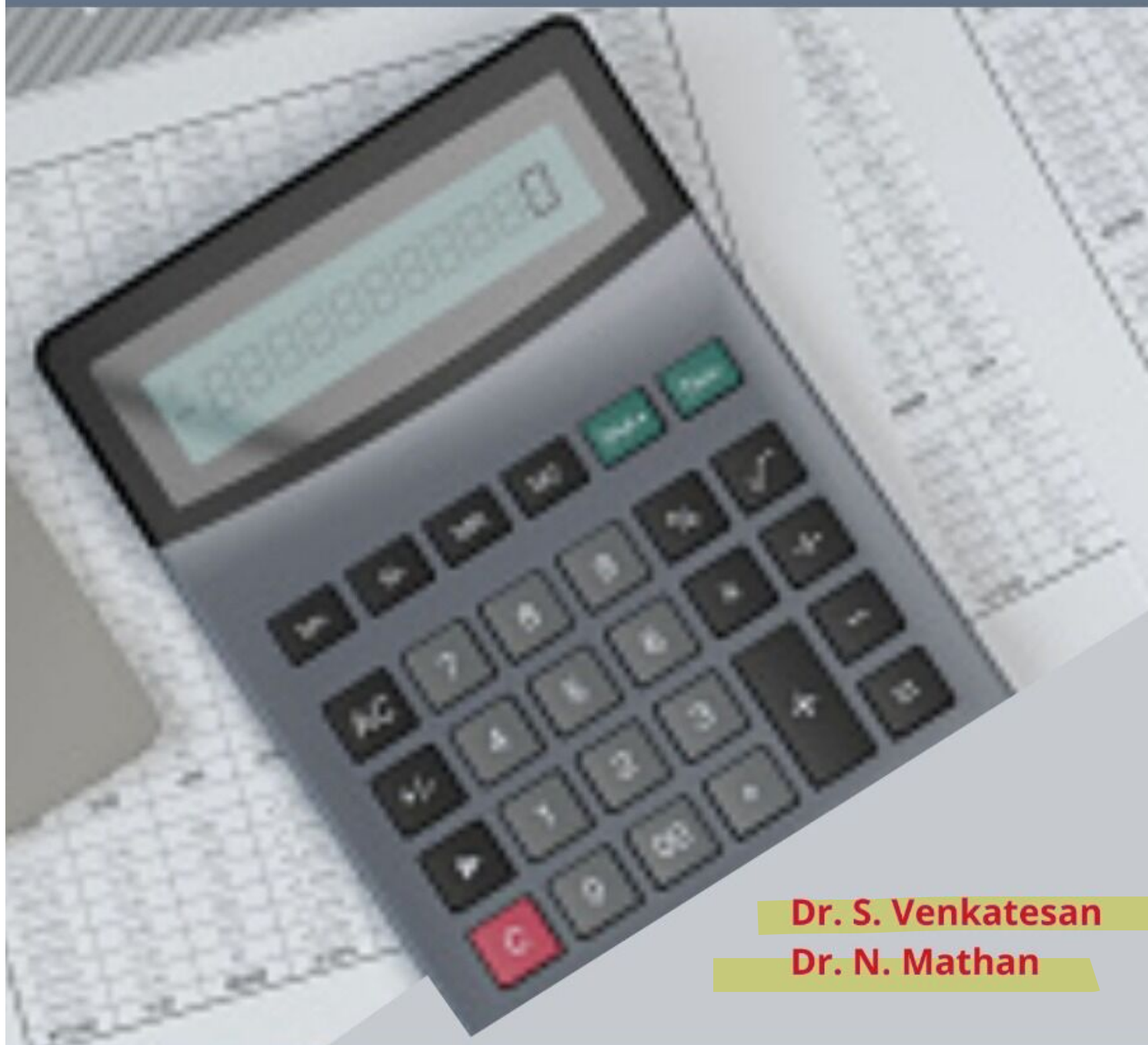
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About the Authors



Dr.S. Venkatesan. M.Com.,M.Phil.,MBA., M.H.R.M.Ph.D. Faculty of Commerce, SRM Institute of Science & Technology,Ramapuram campus, Chennai. He has 22 years of U.G & P.G Teaching experience in reputed institutions in India and overseas. He has published research articles in reputed National and international UGC care list and Scopus journals. His field of interest includes Financial Accounting. Human Recourse Management, Corporate Accounting, Management Accounting & Cost Accounting. He is the Life Time Member in Indian Commerce Association.



Dr.N.Mathan, Faculty in the School of Management studies, Sathyabama Institute of Science &Technology, Sholinganallur, Chennai. He did his Ph.D. in the field of Commerce from Bharathidasan University. He has over 17 Years teaching experience and He published many research articles in national and international journals which is listed in UGC care list and Scopus journals. His areas of interest Financial Accounting, Corporate Accounting, Management Accounting.

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EXPLORING THE ASSOCIATION OF MULTIPLE INTELLIGENCE ON INTEREST OF HIGH SCHOOL STUDENTS

**MS. M. JAYASEELY**

Assistant Professor,
School of Management Studies
Sathyabama Institute of Science and Technology,
Chennai (Tamil Nadu), India

❖ INTRODUCTION:

In our day-to-day conversation we often comment that a particular child or individual is very intelligent or is not intelligent. All such comments are based on our observation of the performance or behaviour of the individual concerned in comparison to others of this group. Interest, attitude, the desire for knowledge, communicative skill and similar other attributes contribute towards his performance or behaviour. However, there is something else which is also responsible to a large degree. In psychology this is termed intelligence.

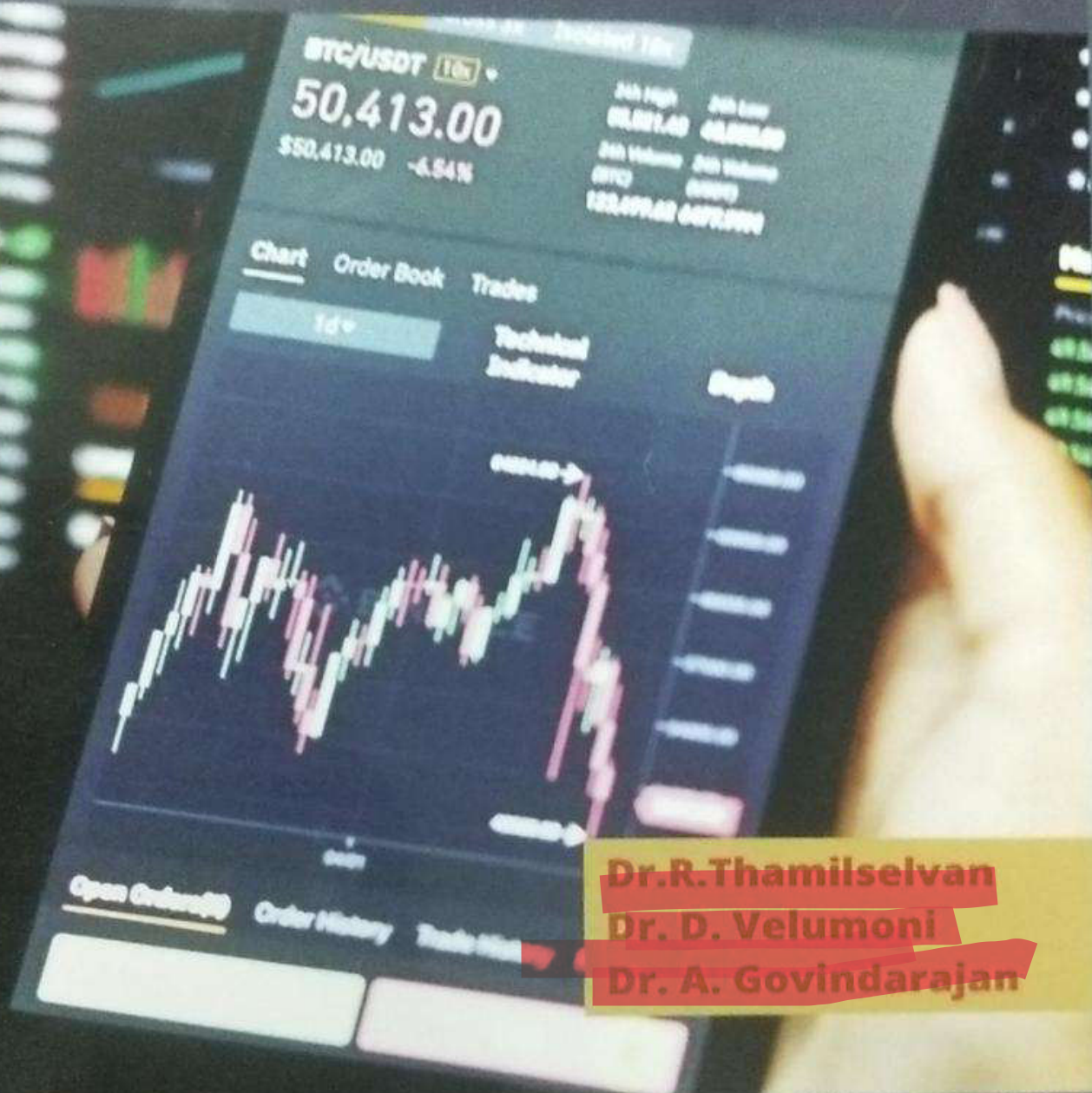
❖ MEANING OF EDUCATION:

Education means to know the knowledge. Without this, life of human being does not operate. Education teaches the lesson of humanity.. A right to education has been created and recognized by some jurisdictions: Since 1952, Article 2 of the first protocol to the European convention on Human Rights obliges all signatory parties to guarantee the right to education.

❖ TYPES OF INTELLIGENCE:

Howard Gardner claims that all human beings have multiple intelligences. The first two have been typically valued in schools; the next three are usually associated with the arts; and the final two are what Howard Gardner called 'personal intelligences' (Gardner 1999: 41-43).

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Dr. TE. Sakthi Sathish is an academicians working as an Associate Professor in the School of Management Studies at Sathyabama Institute of Science and Technology, Chennai. She has more than 20 years of experience in teaching and 3 years of industry experience. She has acquired a Doctoral Degree in Management in 2014 and has published more than 30 articles in National and International Journals. She has participated in various conferences, workshops, FDPs and seminars and also organized many conferences, workshops and seminars in her institution. She has been awarded 5 design patents and currently she is working as a Co-PI in a research funded by National Project. She is also involved in the training and placement activities of differently-abled students in her institution. She has been elected as a resource person in research award, topics in various institutions and is also actively involved in various roles as academic expert and member in other educational institutions.



Dr. Shikha Sathish, working as an Associate Professor in the School of Management Studies, Sathyabama Institute of Science and Technology, Chennai. She has about 11 years of teaching experience. She received her Doctorate degree in Retail Management from Sathyabama Institute of Science and Technology in 2015. She has published 18 research papers in both National and International level. She is a member of IAFMR, Chennai. Her research fields are Women Entrepreneurship, Retailing and Digital Marketing.



Dr. George R, working as an Associate Professor in the School of Management Studies, Sathyabama Institute of Science and Technology, Chennai. She has about 17 years of teaching experience. She received her Doctorate degree in Management from Tiruvallur University in 2002. She has published 40 research papers in both National and International level. Her research fields are Human Resource Management, Marketing and Insurance, Business Law, Strategic Management, BPM a passion for teaching, research and consultancy.



Dr. Chinnappa Mahapatra is presently working as Assistant Professor in the Department of Physics, Osmania College of Science, Tirupur University, Tirupur. He achieved Ph.D. degree in Physics from the Rangaiah University in 2008. He published 28 research papers in National and International journals and presented research papers in 15 National and International conferences. He is the member of Indian Physics Association, Tirupur and the member of Indian Magnetic Resonance Society, Bangalore. He awarded 15th All India Gold Medal from Global Science, Progress and Research Association, New Delhi, for the release of India award from International Publishing House, New Delhi and International Star Laureates award from Science Research and Development Council, New Delhi. His research fields are Nuclear Physics, synthesis and characterization of semiconductors, Molecular applications of magnetic, ferro and AC and DC conductivities of dielectric materials.

AUTHORS PROFILE



Dr. Sushil Beliya is working as a Professor in Dr. APJ Abdul Kalam University Indore Madhya Pradesh. He has obtained Ph.D., MBA, PGDCA and B. Com Degrees, He has more than 14 Years' experience in Education Sector of Madhya Pradesh as well as he Worked for Corporate Social Service Skill development and placement. He also gives their service as Expert lecturer in different PGDM Institute of Indore region and Visiting Faculty of Management in Rajiv Gandhi Proudyogiki Vishwavidyalaya Bhopal, and has presented research papers in National and International Journals and Seminars.



Dr. Shivlal Mewada (Founder Member, ISROSET, www.isroset.org) is working with the Department of Computer Science, Govt. College, Makdona-Ujjain-India. Mewada received a Ph.D. degree in Computer Science from the Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, India in 2020. He has been awarded a prestigious Junior Research Fellow (JRF) by the Indian Government under the UGC Fellow scheme, UGC, New Delhi, India in 2011. He has three patents on his account; Out of which two patents have been granted by the Government of Australia and one patent has been published by the Government of India. He is a founder member of ISROSET. He has been a member of IEEE since 2013. He is also a technical committee and editorial member of various reputed international journals, including Taylor & Francis, Inderscience, IEEE, and Springer conferences. He chaired 3 national seminars/conferences and 4 international conferences. He is an astute academician and has organized 2 special sessions for international conferences. He also contributed to the organization of 3 national webinars and 3 national and 5 international conferences. Dr. Mewada has published five book chapters and over 40 articles in peer-reviewed journals including IEEE, AIP, and CRC Press conferences, that are indexed in E-SCI, SCI, SCI-E, WoS, and Scopus. His areas of interest include cryptography, information security, cloud computing, IoT, and computational intelligence-based education. He has 10 years of teaching experience and 10 years of research experience.



Dr. Moumita Roy Working as an Assistant Professor in the Department of Commerce at Kanchrapara College. She graduated in B.Com (honors) at Asansol Girls College under The University of Burdwan, Asansol, West Bengal, India. She secured Master of Commerce and Master of Business Administration in Finance from The University of Burdwan, West Bengal, India. She has completed her Ph.D. in the year 2021 in the field of Finance from The University of Burdwan, West Bengal India. She is in teaching profession for more than 14 years. She has presented number of papers in National and International Journals, Conference and Symposiums. Her main area of interest is Finance and Management.



Dr. B. Bhavya, MBA., M.Com., M.Phil., PGLL&AL., PGDHRL., M.A (LM)., Ph.D working as an Assistant Professor in the School of Management Studies at Sathyabama Institute of Science and Technology. She is in teaching profession for more than 13 years. She has published a book on International Trade and have also presented number of papers in National and International Journals, Conference and Symposiums. Her main area of interest includes Management Studies - Human Resource Management.



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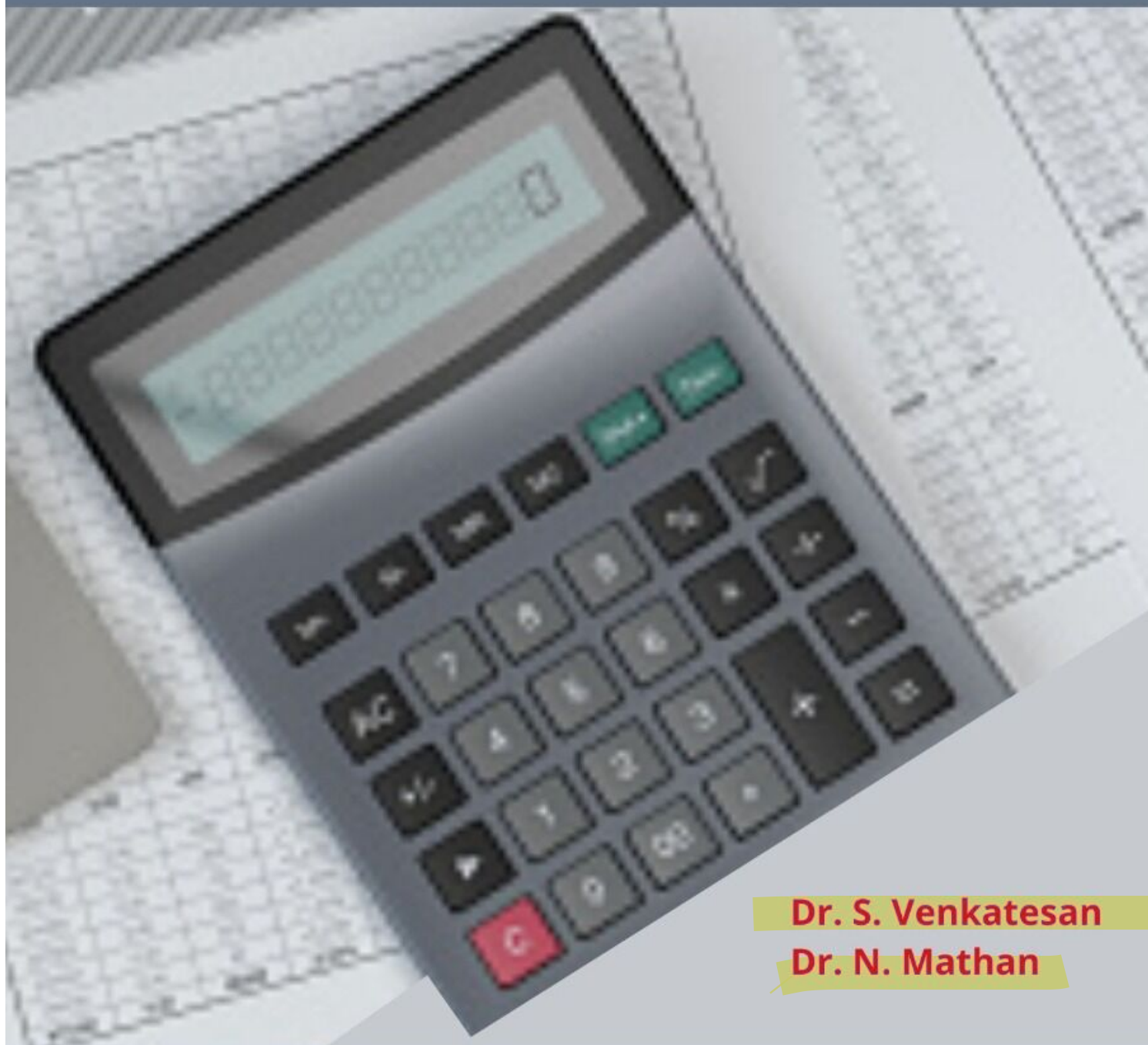
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Dr.S. Venkatesan. M.Com.,M.Phil.,MBA., M.H.R.M.Ph.D. Faculty of Commerce, SRM Institute of Science & Technology,Ramapuram campus, Chennai. He has 22 years of U.G & P.G Teaching experience in reputed institutions in India and overseas. He has published research articles in reputed National and international UGC care list and Scopus journals. His field of interest includes Financial Accounting. Human Recourse Management, Corporate Accounting, Management Accounting & Cost Accounting. He is the Life Time Member in Indian Commerce Association.



Dr.N.Mathan, Faculty in the School of Management studies, Sathyabama Institute of Science &Technology, Sholinganallur, Chennai. He did his Ph.D. in the field of Commerce from Bharathidasan University. He has over 17 Years teaching experience and He published many research articles in national and international journals which is listed in UGC care list and Scopus journals. His areas of interest Financial Accounting, Corporate Accounting, Management Accounting.

ISBN: 978-81-956844-3-4



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Professor and Head, Department of Management Studies,
Anand Institute of Higher Technology, Chennai,
Chengalpattu (Dt.), Tamil Nadu.

Dr. S. KRISHNAKUMARI, MBA., MHRM., M.Sc(Psy)., Ph.D

Assistant Professor, School of Management Studies,
Sathyabama Institute of Science and Technology, Chennai,
Chengalpattu (Dt.), Tamil Nadu.

V. SUNDHARA MOORTHY, MBA., PGDHRM.,(Ph.D)

Assistant Professor, Department of Management Studies,
Mailam Engineering College, Mailam,
Villupuram (Dt.), Tamil Nadu.

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PREFACE

This book "Managerial Economics" was written with an objective of giving a glimpse on the concepts and applications of managerial economics in the Indian context. It is a comprehensive text book, which provides a good coverage of the fundamentals of Managerial Economics, the concepts of scarcity and efficiency and the principles of micro and macroeconomics for the economic environment of business.

The book is made simple and easily understandable for the students from various disciplines. This is mainly directed towards the students learning the syllabus of Anna university, but this would be exciting the general readers who are interested in having a conventional learning method.

The contents of the book have been distributed as five different chapters covering the following areas such as Introduction of economics, Consumer and Producer Behavior, Product & Factor Markets, Macroeconomic performance in economy, Aggregate supply and role of Money.

We sincerely hope that this book fulfills the requirement of the students learning Management and Commerce from various other universities also.

As errors are inevitable, we shall be grateful if mistakes are brought to my notice. Such corrections will be incorporated in subsequent editions.

We extend our sincere thanks to all the Management, Principal, Dean and Head of the departments of all our Educational Institutions, who had supported and encouraged us in bringing our dreams into reality by publishing this book.

We would like to acknowledge and grateful thanks to Mrs.Nirmala Durai, Proprietrix of Lakshmi Publications, Mr.A.Durai, B.E., Founder and Managing Director of Lakshmi publications, Suchitra Publications for their involvement to make this publication successful and Mrs.P.S.Malathi (Typescript) for their kind timely support for publishing this title.

Dr.D.YUVARAJ, yuvarajd81@gmail.com

Dr.S.KRISHNAKUMARI, krishnakumaris0611@gmail.com

V. SUNDHARA MOORTHY, sundarvivek.2007@gmail.com

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Dr. M. SUDHA PAULIN

Assistant Professor,
School of Management Studies,
Sathyabama Institute of Science and Technology,
Chennai, Tamilnadu, India.

Dr. M. JOHN BRITTO

Assistant Professor,
School of Management Studies,
Sathyabama Institute of Science and Technology,
Chennai, Tamilnadu, India.

Dr .J. RANI

Associate Professor,
School of Management Studies,
Sathyabama Institute of Science and Technology,
Chennai, Tamilnadu, India.

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SUSTAINABLE CITIES AND COMMUNITIES

Dr. K. Santhanalaxmi

Assistant Professor, School of Management Studies,
Sathyabama Institute of Science and Technology, Chennai.

&

Dr. AL. Chidambaram

Assistant Professor, School of Management Studies, Alagappa
University, Karaikudi.

Introduction

The Sustainable Development Goals were established in 2015 by the United Nations in order to enhance world peace and prosperity for people and the environment. The present and future were taken into consideration when doing this. The SDGs lay a heavy focus on the necessity of coordinating efforts to combat climate change, enhance health and education, decrease inequality, and foster economic development with those to end poverty and other forms of deprivation. Urbanization, which refers to the process through which we are progressively relocating to cities, has emerged as one of the primary traits of the twenty-first century. Cities serve as centres for economic development, employment, and innovation. Already, 85% of the world's GDP and 55% of people live in urban areas. Yet, the rate at which urbanisation processes are developing is also very problematic. Our air, water, and soil resources are being harmed by urban pollution, which accounts for 75% of global greenhouse gas emissions. It is impossible to

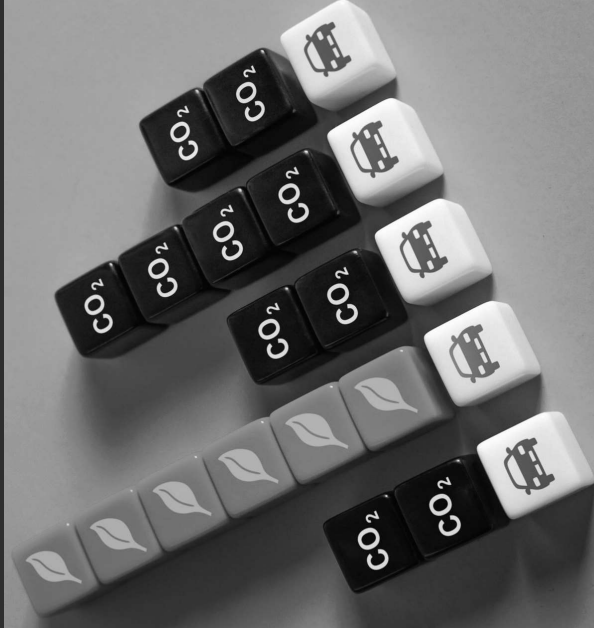
RESEARCH METHODOLOGY TECHNIQUES



Dr. Akash Mohanty
Dr. U. Rahamathunnisa
Dr. K. Sudhakar
Dr. Anish Mariadhas



The demand for energy is a significant topic in both developing and developed nations. The need for energy is growing rapidly every day. Biodiesel is a viable alternative answer to this issue, hence it is vital to discover an environmentally friendly alternative solution. This project's primary goal is to evaluate and contrast the performance of a diesel engine using microalgae and julfiflora. Heterogenous acid serves as a catalyst in the combination of biofuel and diesel. The transesterification process was used to esterify both Micro algae and Juliflora oil. Magnetic stir ration was used to prepare the bio samples. Break power, break thermal efficiency, specific fuel consumption, and results from all emission metrics demonstrate that S1 performs better than D100 and other biodiesel samples.

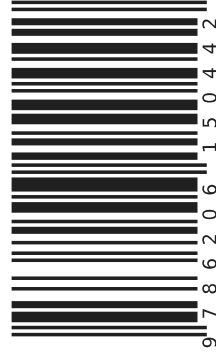


Dr. S. GANESAN was born in Chettikulan, Tuticorin Dist, Tamil Nadu. He completed BE from GCT and ME from Anna university. He presently working as a professor in Sathyabama Institute of Science and Technology, Chennai. He holds teaching and research experience for 20 years. He has published 160 papers in various reputed Journals.

Ganesan Subbiah
Hemanandh J.

Influence of Heterogenous Catalyst on Diesel Engine Performance

Influence of Heterogenous Acid Catalyst on Diesel Engine Performance and Emissions using Dual Fuel



EMERGING TECHNOLOGIES IN AUTOMOTIVE AND MECHANICAL SCIENCES

Volume II



Dr.M.Chandrasekaran

Dr.S.Ganesan

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ISBN 978-819620983-4



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Volume II, 2023



Prof. Dr. M. CHANDRASEKARAN graduated with a Ph.D from National Institute of Technology, Trichy, India. He is having more than 20 Yrs of Experience in various levels and from Sept 2011 till now he is Professor and Director, Faculty of Mechanical Engineering, Vels University, Chennai. His area of expertise includes Job Shop Scheduling, Optimization, Heuristics. Current research interests include Multi objective optimization of Job Shop Scheduling, Flexible Manufacturing system, Composites and Design optimization of various gear parameters. Has published more than 75 publications that appear in international and local scientific journals. He has also served as Keynote Speaker, Programme Committee Chair, Technical Committee member and session Chair in various international Conferences.

He is also an Editor-in-chief for several International Journals like International Journal of Production Technology and Management Research (IJPTMR), International Journal of Mechanical Engineering and Material Sciences (IJMEMS). He is also Editorial board member in USAK University Journal of Material Sciences (UUJMS), Turkey; International Journal of Mechanical Engineering & Technology (IJMET); International Journal of Production Technology and Management (IJPTM); International Journal of Design and Manufacturing Technology (IJDMT) for IAEME. He is an active Reviewer at Springer link, Taylor & Francis, Elsevier and reviewed more than 150 Research Papers. He is also an Approved Research Supervisor for various leading universities in India. He is also a member in American Society of Mechanical Engineers (ASME), Life Member in Institution of Engineers (MIE), National Institution for Quality and Reliability (MNIQR), Indian Society for Technical Education (MISTE), International Association of Engineers (IAENG) and Indian Institute of Production Engineers (IIPE).

Dr.S.GANESAN was born in Chettikulan, Tuticorin Dist, Tamil Nadu. He completed Bachelor of Engineering from Government College of Technology in Mechanical Engineering and Master of Engineering from Anna University. He continued the research in the field of alternative fuels and presently working as a Professor in Sathyabama Institute of Science and Technology, Chennai. He holds teaching and research experience for 20 years. He has published 160 papers in various reputed International Journals.



Dr.M.RUBAN has completed UG in Mechanical Engineering in 2010 and PG completed in the year 2012. He working as Assistant Professor in Vels Institute of Science, Technology and Advanced Studies and has vast experience in Thermal Energy Storage System. He has published a number of research papers, more than 30 papers and also presented papers in National and International conferences. He is guiding 2 Ph.D scholars in the field of composite materials. He guided more than 15 UG projects and 10 PG projects. He having more than 4 patents and one MOU.

Dr.B.BALAJI completed his Ph.D in Automated Manufacturing of Auxetic Structures in 2022 from Shiv Nadar University (Institution of Eminence), Greater Noida, India. He completed M.E. in Computer Integrated Manufacturing in the year 2009 at PSG College of Technology, Coimbatore, India. He completed B.E in Mechanical Engineering in 2005 from Anna University, India. He has 4 years of industrial experience and 5.5 years of teaching experience. He has published many papers in reputed international journals and presented technical papers at international conferences. His area of interest includes manufacturing automation, low-cost automation and mechatronics system. He has also delivered many guest lectures in his domain. He is at present working as an Assistant Professor at GLA University, Mathura, Uttar Pradesh and a Process Automation consultant for Berger Nippon Paint Automotive coating private limited (BPNA), Greater Noida, Uttar Pradesh. And in collaboration with Indian Council for Agricultural Research (ICAR), Baramati, Maharashtra, he is developing a Smart livestock monitoring system.



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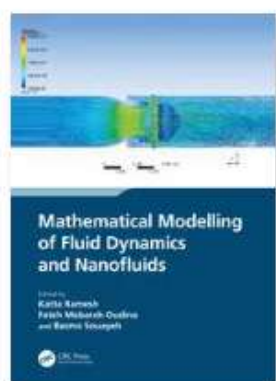
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Chapter

Influence of Lorentz Force on Cu-Water Nanoliquid Convective Thermal Transfer in a Porous Lid-Driven Cavity with Uniform and Linearly Heated Boundaries

By *L. Jino, A. Vanav Kumar, M. Berlin, Swapnali Doley, G. Saravanakumar, Ashwin Jacob, H. A. Kumara Swamy*

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Edition	1st Edition
First Published	2023
Imprint	CRC Press
Pages	20
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S. No	Name of the teacher	Title of the book/ chapters	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute	Name of the publisher
1	Dr.P.Malliga	Investigation on Growth and Characterisation of NLO single crystals	2022	978-6205494059	Sathyabama Institute of Science and Technology	Lambert Academic Publishing
2	Dr. Helen Merina Albert	Engineering Physics-1	2022	978-93-5625-138-0	Sathyabama Institute of Science and Technology	Scientific International Publishing House
3	Dr. K. Vijai Anand	Antimicrobial Nanosystems- Fabrication and Development	2023	978-0323911566	Sathyabama Institute of Science and Technology	Elsevier
4	Dr. M. Dakshana	Graphene Oxide in Enhanced Energy Storage devices	2022	9781003215196	Sathyabama Institute of Science and Technology	Taylor & Francis
5	Dr. D.S.Jayalakshmi	Pressure induced Phase Transition of LaAlO ₃ Perovskite	2022	978-620-5-49263-5	Sathyabama Institute of Science and Technology	Lambert Academic Publishing



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A novel, semiconducting optical material, L-alanine hydrochloride (LAH), thiourea LAH (TU-LAH) and urea LAH (U-LAH) single crystals were grown successfully by slow solvent evaporation method at room temperature of 34 °C. The crystal structure and lattice parameters were determined by single crystal X-ray diffraction analysis which shows that the grown crystals belong to orthorhombic system with the noncentrosymmetric space group P212121. XRD data of TU-LAH and U-LAH crystals show a slight change in the values of lattice parameters and volume in comparison with the pure LAH crystal indicating the inclusion of dopant urea and thiourea. The chemical composition of LAH, TU-LAH and U-LAH was established by EDAX analysis. The EDAX spectrum reveals the presence of thiourea in the TU-LAH crystal. The weight percentage (wt %) of C, N and O as obtained from EDAX analysis is in good agreement with the theoretical values. FTIR studies confirm the presence of functional groups and the modes of vibration. The C-H stretching is observed at 320 cm⁻¹ which confirms that the dopant has entered into the pure LAH crystal.

Amino Acid NLO single crystals



I am Dr. P. Maliga and has obtained B.Sc, M.Sc. and M.Phil. (Physics) from Queen Mary's College (Autonomous), Chennai. I have also obtained B.Ed from HNOU, New Delhi. I had served for three years as Lecturer in Hindustani College of Arts and Science, Chennai.



Maliga Palanivelu, V. Dhanshan, V. Deepika

Investigation on growth and characterisation of NLO single crystals

Amino Acid NLO single crystals

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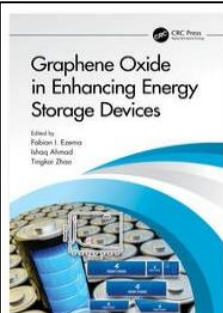
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Chapter

Role of Graphene Oxide (GO) in Enhancing Performance of Energy Storage Devices

By S. Meyvel, M. Malarvizhi, M. Dakshana, P. Sathya

Book [Graphene Oxide in Enhancing Energy Storage Devices](#)

Edition 1st Edition

First Published 2022

Imprint CRC Press

Pages 37

eBook ISBN 9781003215196



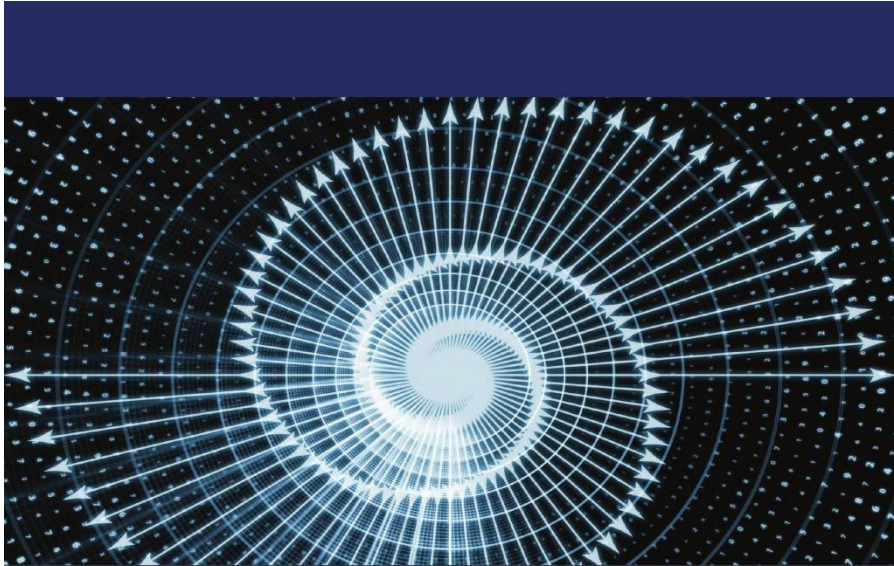
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Trend Analysis of Air Quality Index in Chennai, India

M. Nirmala ^{a*} and M. Mallika ^a

DOI: 10.9734/bpi/npgees/v6/18578D

ABSTRACT

The quality of the air is one of India's major problems. In accordance with a report from the World Health Organization (WHO), air pollution causes 2.4 million deaths worldwide each year. This research aims to comprehend air pollution issues in Chennai by developing an appropriate time series model and analyzing the results. The database monitored at various monitoring centers in Chennai, India, is used in this study to analyze the Air Quality Index (AQI). For this purpose, a data set consisting of monthly Ambient Air Quality data of Chennai city with various air pollutants for commercial, residential and industrial area were collected from Central Pollution Board, Chennai. The data set consisting of Ambient Air Quality data of Chennai city with various parameters such as Sulphur oxide (SO₂), nitrogen oxide (NO_x), Respiratory suspended particulate matter (RSPM), Transpiratory suspended particulate matter (TSPM) are collected weekly from the year Jan 2018 to Aug 2019 for the areas Adyar (Residential area), Thiyagaraya Nagar (Commercial Area), Annanagar (Commercial Area) from Tamil Nadu Pollution Control Board, Chennai.

Keywords: Air pollution; air quality index; trend; Chennai.

1. INTRODUCTION

There are various types of pollution in the universe. One of them is air pollution. It has an impact on the health of humans, plants, and animals, as well as the entire ecosystem. The state of the air around us is referred to as air quality. The emissions of gases from vehicles and wastes from industries pose a significant threat to human health and contribute significantly to air pollution [1,2]. As a result, air quality in cities is significantly worse than in rural areas. Planting trees and plants can be regarded one solution to overcome air pollution [3,1]. Because of the adverse effects of air pollution throughout the world this topic is of prime concern for most of the researchers increasing and higher concentrations of air pollution can be life intimidating and thereby air pollution became one of the major issues in the world (Kurt and Oktay, 2010). Gautham sarella has analyzed

^a Department of Mathematics, Sathyabama Institute of Science and Technology, Chennai, India.

*Corresponding author: E-mail: mnirmalamaths@gmail.com;

the ambient air in the vapi city. The AQI of 4 major pollutants like PM₁₀, PM_{2.5}, SO₂, and NO₂ is found in 3 different locations such as Industrial, Residential and Commercial Area has been taken. The AQI falls on moderately polluted [4]. T.Senthilnathan [5] has assessed about the pollutant in the Chennai city at residential and traffic intersection sampling stations using high volume sampler. Thilagaraj has assessed the AQI in 4 places of Chennai. He has done a survey based on questionnaire from various people. Biju B [6] has analyzed the air quality in Thiruvananthapuram. The principle components of pollution are suspended particulate matter and it falls under the range Moderately Polluted. Devendara dohare has done a literature review relating to the monitoring of Ambient Air Pollution in India. R.Saravana Kumar has assessed the condition and quality of air in the city of Coimbatore by measuring Air Quality Index. The work was carried out based on measuring four major air pollutants such as PM₁₀, PM_{2.5}, SO₂ and NO₂ at different climate conditions. Air quality monitoring and forecasting using smart drones and recurrent neural network for sustainable development in Chennai city was made by Hemamalini et al [7]. Senthilnathan [5] identified the measurements of urban ambient air quality of Chennai City.

2. STUDY AREA AND MATERIALS

Chennai, formerly known as Madras is one of the metro cities in India and is called the Gateway of South India. Chennai has the third-largest expatriate population in India at 35,000 in 2009, 82,790 in 2011 and estimated at over 100,000 Chennai Population 2017 – 9.88 Million (estimated). Tamil Nadu Pollution Control Board is operating eight ambient air quality monitoring stations in Chennai under National Air Quality Monitoring Programme (NAMP) funded by Central Pollution Control Board. All the stations are functioning on 24 hours basis, twice a week. The samples collected from NAMP stations are analyzed for the Respirable Suspended Particulate Matter (RSPM) (RSPM is particulate matter less than 10 microns) and gaseous pollutants such as Sulphur di oxide (SO₂) and Nitrogen di Oxides (NO₂).

The Air Quality Index is a number which is used to measures the quality of air on any specified day. It differs from place to place and country to country. It tells us whether the air at a particular place is polluted or not. Thus, Air Quality Index mainly deals with health issues after few hours as a result of breathing polluted air. Environmental Protection Agency (EPA) calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulphur dioxide, and nitrogen dioxide. For each of them, air quality standards are established so as to protect human health. The major threat to human health is the pollutants Ground-level ozone and airborne particles.

For this study, the data set consisting of Ambient Air Quality data of Chennai city with various parameters such as Sulphur oxide (SO₂), nitrogen oxide (NO_x), Respiratory suspended particulate matter (RSPM), Transpiratory suspended particulate matter (TSPM) are collected weekly from the year Jan 2018 to Aug

Determination of Chennai Annual Rainfall Using Datamining Technique

M. Mallika ^{a*} and M. Nirmala ^a

DOI: 10.9734/bpi/ramrcs/v8/1718B

Abstract

India is basically an agricultural country and weather forecasting is a challenge that has depended primarily on model-based methods. A basic requirement for human survival is water and rainfall is one of the main source of water. Rainfall prediction is very vital for agricultural and meteorological department and is one of the most challenging tasks. Due to the increase in population, the demand for water has also increased. This has resulted in decrease of availability of water as the ground water levels have been depleted. Chennai city in particular depends heavily on its ground water resources which are replenished by rainwater. Thus, early prediction of rainfall is very much vital. Various techniques like ARIMA, ANN, Regression analysis, Genetic Algorithm, Fuzzy logic, SVM etc., are applied for rainfall prediction. This paper presents one of the data mining technique *k*-nearest neighbour for the prediction of Chennai rainfall. Validation of the model is done by the error measure Mean Absolute Percentage Error (MAPE) and analysis show that *k*-nearest neighbour for *k* = 3 yielded best results when compared to *k* = 5.

Keywords: Rainfall prediction; data mining; k-nearest neighbor; inverse distance weighting and MAPE.

1 Introduction

Making predictions about weather has been a daunting task due to the dynamic nature of atmosphere. Rainfall is a natural climatic phenomenon whose prediction is very essential and challenging. Rainfall prediction is very much useful for agriculture, which contributes to the economy of the nation. Heavy rainfall may result in flooding, landslides and has a strong influence on traffic control, the operation of sewage systems, and other human activities and environment. Hence rainfall forecast is an essential and vital process nowadays. As far as Chennai city is concerned, it relies very much on its ground water resources which are replenished by rainwater and hence prediction of rainfall plays a very major role.

Indrabayu, Nadjamuddin Harun et al., in their paper proposed a new approach which combines SVM and Fuzzy logic methods. The performance of the proposed method is compared to the Neural Network (NN)-Fuzzy. The results confirm that the SVM-Fuzzy achieves higher accuracy than NN-Fuzzy [1]. In another paper Nikhil Sethi, and Kanwal Garg presents multiple linear regression technique for the early prediction of rainfall [2]. M. Nirmala and S.M. Sundaram in their paper, has made modeling and forecasting of monthly rainfall in Tamilnadu through the conventional method called Box-Jenkins Seasonal ARIMA model [3].

Akashdeep Gupta, Anjali Gautam et al., presents a study of neural network model for prediction of Indian rainfall. In this paper multilayered artificial neural network with learning by backpropagation algorithm is used. The proposed model has been able to predict values with suitable results [4]. Indrabayu, Nadjamuddin Harun et al., in another paper, two methods (i.e). Auto-Regressive Integrated Moving Average (ARIMA) and Adaptive Splines Threshold Autoregressive (ASTAR) are compared in terms of accuracy in prediction. ASTAR outperformed ARIMA with less RMSE [5].

Ashwini U, Kalaivani K, et.al., in their research work have applied Seasonal ARIMA for forecasting Tamilnadu rainfall which gives less error using the error measure RMSE [6]. Jyothis Joseph, Ratheesh TK have used data

^a Sathyabama Institute of Science and Technology, Chennai, India.

*Corresponding author: E-mail: sindhikas@gmail.com;

mining techniques such as clustering and classification techniques for rainfall prediction [7]. Khalid Alkhatib, Hassan Najadat, et.al., in their work, applied K-Nearest Neighbor algorithm and non-linear regression approach for predicting stock prices for a sample of six major companies [8]. Kannan M, et.al, used multiple linear regression for predicting rainfall fall in ground level [9].

Mallika M and Nirmala M, in their paper has attempted a hybrid approach of k nearest neighbour and ARIMA for the prediction of Chennai Rainfall [10]. Patana Wichitarapongsakun, Charoon Sarin, et.al, used Moving average, Simple and Double Exponential Smoothing models to predict rainfall and concluded that Simple Exponential outperformed the other two in terms of accuracy [11]. Sagar S.Badhiye et.al.,used K-Nearest Neighbor for prediction of temperature and humidity data for a specific region and shown that the results were satisfactory [12] whereas Shoba G, Dr. Shobha G, in their research paper have done a survey of the data mining techniques for rainfall prediction [13].

Geographical inputs of Chennai City from reliable sources and terminologies related to k nearest neighbour are used for this research work [14], [15] and [16].

In this paper k-nearest neighbour technique is used for the prediction of Chennai rainfall.

2 Study Area and Materials

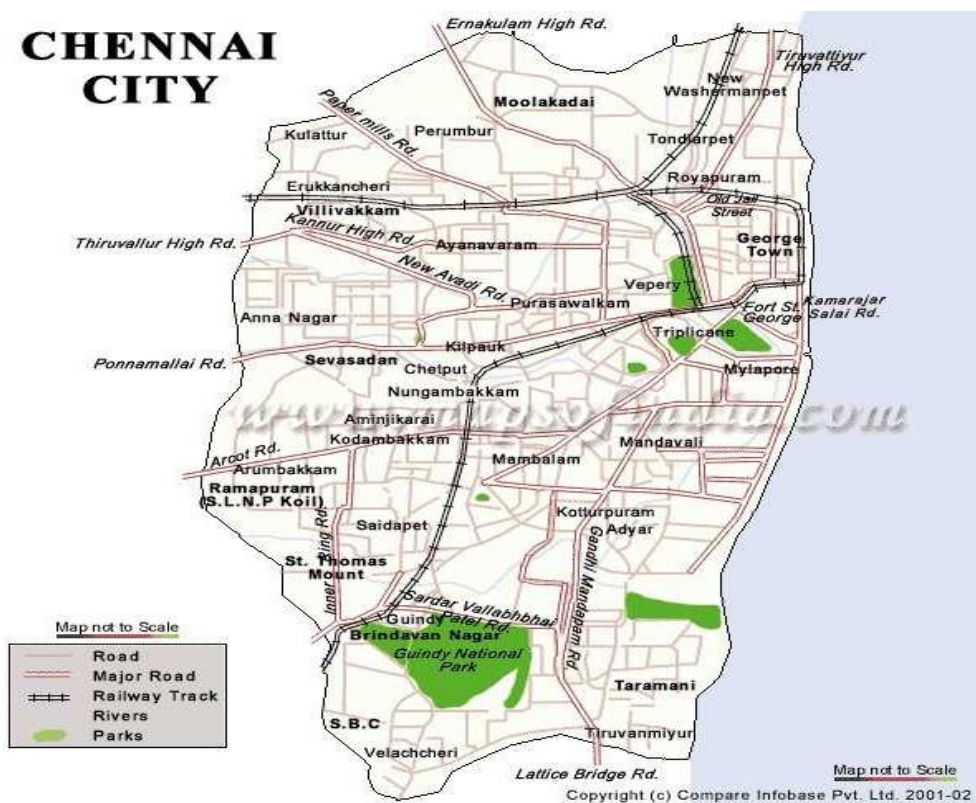


Fig. 1. Chennai, Tamil Nādu

Chennai is situated on the north-east end of Tamil Nadu on the coast of Bay of Bengal. It lies between $12^{\circ} 9'$ and $13^{\circ} 9'$ of the northern latitude and $80^{\circ} 12'$ and $80^{\circ} 19'$ of the southern longitude on a 'sandy shelving breaker swept beach'. It stretches nearly 25.60 kms. along the Bay coast from Thiruvannmiyur in the south to Thiruvottiyur in the north and runs inland in a rugged semi-circular fashion. It is bounded on the east by the Bay of Bengal and on the remaining three sides by Chengalpattu and Thiruvallur Districts.

Chennai had a population of 4,646,732 as per 2011 census released by Directorate of Census Operations in Tamil Nadu. As the city lacks a perennial water source, meeting the water requirements of the population has

Advances in Academic Research and Development

Volume - 9

Chief Editor

Dr. Mahadeo B. Shinde

R.M.N., PSY.N, M.Sc.(N) Ph.D.(N), Professor, Krishna Institute of Medical
Sciences Deemed University, Karad, Satara, Maharashtra, India

Co-editor

Dr. Anjali

Assistant Professor, Department of Education, SPC (PG) College, Baghpat,
Uttar Pradesh, India



Integrated Publications TM
New Delhi

Published By: Integrated Publications

Integrated Publications

H. No. - 3 Pocket - H34, Sector - 3,

Rohini, Delhi-110085, India

Chief Editor: Dr. Mahadeo B. Shinde

Co-editor: Dr. Anjali

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Publication Year: 2023

Pages: 187

ISBN: 978-93-95118-20-0

Book DOI: <https://doi.org/10.22271/int.book.211>

Price: ₹ 814/-

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Chapter - 3

Time Series Models of Production of Crude Oil in India

Dr. E. Priyadarshini, Dr. M. Vidhya, Dr. S. Geethamalini and Dr. K. Bhuvaneswari and
Dr. S. Jancy

Abstract

Time series forecasts are the most important quantitative models with significant interest in the literature. The main objective of this paper is to help decision-makers to reduce the risks of crude oil and improve the accuracy of crude oil price forecasts. The average crude oil rate from May 2021 to December 2021 were analyzed by Box-Jenkins model. Autocorrelation and partial autocorrelation functions were calculated for the data and appropriate Box-Jenkins Autoregressive Integrated Moving Average model was fitted. Validity of the model was tested using standard statistical error measures like MSE, RMSE and MAPE.

Keywords: time series, box-Jenkins, forecast, error measures

1. Introduction to forecasting

1.1 Introduction

Crude oil, liquid petroleum that is found accumulated in various porous rock formations in Earth's crust and is extracted for burning as fuel or for processing into chemical products. Crude oil is a naturally occurring petroleum product composed of hydrocarbon deposits and other organic materials. A type of fossil fuel, crude oil is refined to produce usable products including gasoline, diesel and various other forms of petrochemicals. Crude oil is typically obtained through drilling, where it is usually found alongside other resources, such as natural gas (which is lighter and therefore sits above the crude oil). Although it is often called "black gold", crude oil has a range of viscosity and can vary in colour from black to yellow depending on its hydrocarbon composition. Distillation, the process by which oil is heated and separated into different components, is the first stage in refining. Although fossil fuels like coal have been harvested for centuries, crude oil was first discovered and developed during the Industrial Revolution and its industrial uses were developed in the 19th century. Newly

The objective of the book based on the thesis is to establish network simulation model for the transient free convective heat and mass transfer effects in vertical cone under various boundary conditions. Spatial discretization is applied to the transient boundary layer equations to get a set of ordinary differential equations are obtained, one for each control volume. The numerical solution of non-linear system of partial differential equations is obtained by implementing Network simulation method (NSM) which is based on thermo-electric analogy. Numerical values are presented for velocity, temperature, concentration, local and average wall shear stress, and local and average Nusselt number for various parameters. The present results are compared with available results in literature.



Immanuel Yovan

NUMERICAL SOLUTIONS OF UNSTEADY FREE CONVECTIVE HEAT AND MASS TRANSFER

UNSTEADY FREE CONVECTIVE HEAT AND MASS
TRANSFER EFFECTS ON VERTICAL CONE USING
NETWORK SIMULATION MODEL



Dr. Y. Immanuel did his undergraduate and postgraduate in Mathematics at St. John's college which is affiliated to Manonmaniam Sundaranar University, Tamilnadu. He obtained his M.Phil from the Ramanujan Institute for Advanced Study in Mathematics, Chennai in 1997. He obtained his Ph.D in 2019 Sathyabama Institute of Science and Technology, India.



Immanuel Yovan

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Materials and Technologies for a Green Environment

Edited by

Harikrishnan Santhanam

*Kings Engineering College Department of Mechanical
Engineering, India*

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CHAPTER 3

Solar Electric Vehicle Charging and Grid Interaction: An Integrated Module

D. Muruganandam^{1,*}, J. Jayapriya¹, P.K. Chidambaram² and B.Karthik Anand³

¹ Department of Mechanical Engineering, Sri Venkateswara college of Technology Chennai, Tamil Nadu, India

² Department of Mathematics, Sathyabama Institute of Science and Technology, Chennai,

Tamilnadu, India.

³ Department of Mechanical Engineering, Newprince Shri Bhavani College of Engineering and Technology, Chennai, Tamil Nadu, India

Abstract: Electric mobility is one of the key technologies for the replacement of non-renewable energy sources in the long term; creating new markets, opportunities, and new technologies, as the old energy order comes to an end with the evolution of new ones. With the passing of around two centuries, electric vehicle technology has developed to different levels across the globe. Norway has the highest percentage of electric vehicles while China has the highest number of electric vehicles sold per year in the world. India is catching up with electric vehicle penetration. As per 2018 data, 49% of the total vehicles sold in Norway were electric. In 2019, China registered the maximum number of electric vehicles sold – 1.15 million vehicles. The key advantages of e-mobility are a reduction in GHG emissions, reduction in the dependency of fossil fuels, higher efficiency compared to ICE vehicles, fewer noise emissions, and the flexibility of EVs becoming a platform for collaborative development of autonomous cars and shared mobility and MaaS. The key challenges are the total cost of ownership, charging infrastructure, reliance on the imported content and parts, customer acceptance of EVs, vehicle range anxiety and battery manufacturing, and availability of raw materials. This research investigates in detail the opportunities created by technologies such as solar-powered vehicle charging, second life of traction battery, smart grid integration, connected and autonomous CAVE and vehicle light-weighting to enable e-mobility as a more commercial means of transportation.

Keywords: CAVE, GHG, ICE vehicles, MaaS.

* **Corresponding author D.Muruganandam:** Department of Mechanical Engineering, Sri Venkateswara college of Technology Chennai, Tamil Nadu, India; Email: murudurai@gmail.com

Harikrishnan Santhanam (Ed.)
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ω – Fuzzy Translation and Multiplication in BH – Algebras

A. Prasanna ^{a*}, M. Premkumar ^{bω*} and S. Ismail Mohideen ^{a#}

DOI: 10.9734/bpi/tier/v3/6131F

ABSTRACT

This paper focuses on the novel exploration of ω – Fuzzy Translation and Multiplication in BH – Algebras. To explore this ω –Fuzzy is defined first in BH – Algebras and used in Fuzzy Translation and Multiplication in BH – Algebras by tracing its algebraic properties.

Keywords: BH –Algebra; BH –Ideal; fuzzy BH –Ideal; fuzzy BH –Sub algebra; ω –fuzzy translation (ω – FT); ω – fuzzy multiplication (ω – FM).

1. INTRODUCTION

The concept of fuzzy sets was proposed by Zadeh L A [1]. The new notation for BH –Algebras was described by Jun Y B et al. [2]. Zhang Q et al. [3] developed the notion of Fuzzy BH –Algebras. Priya T et al. [4] investigated the new Fuzzy Translation and Multiplication notation on PS –Algebras. Kandaraj N et al. [5] created the notion of Fuzzy Ideals and Fuzzy Dot Ideals on BH –Algebras. The various concepts of Fuzzy Translation and Multiplication on B –Algebras were illustrated by Prasanna A et al. [6]. More recent development of Fuzzy Translation and Multiplication on BG –Algebras was proposed by Prasanna A et al. [7]. Abu Ayub Ansari et al. [8] developed the aspects of the Fuzzy Translation of Fuzzy β – Ideals of β –Aalgebras. Kyoung Ja Lee, et al.[9] described the new notation of Fuzzy Translations and Fuzzy Multiplication of BCK/BCI –Algebras. Some updates in this area are available elsewhere and may find attention of the readers [10-12].

In section 2 of this research paper basic fundamental elementary definition and related results are defined. In section 3, ω – Fuzzy BH –sub algebra and Fuzzy BH –Ideal with respect to the Fuzzy BH –sub algebra and Fuzzy BH –Ideal are described. The algebraic properties of ω – Fuzzy Translations (ω –FT) and ω – Fuzzy Multiplications(ω –FM) and generalization results are stated and proved.

2. PRELIMINARIES

In this section we recall the basic elementary fundamental definition of fuzzy sets and fuzzy BH –Algebra that will play a key role for our further results.

Definition: 2.1 [2]: A BH –algebra is a nonempty set X with a constant 0 and a binary operation $*$ satisfying the following conditions

- (i) $x * x = 0$
- (ii) $x * 0 = 0$
- (iii) $x * y = 0$, and $y * x = 0 \Rightarrow x = y, \forall x, y \in X$.

^{*}Assistant Professor, PG and Research;

^ωAssistant Professor;

[#]Principal, Head and Associate Professor, PG and Research;

^a Department of Mathematics, Jamal Mohamed College (Autonomous), (Affiliated to Bharathidasan University), Tiruchirappalli-620020, Tamil Nadu, India.

^b Department of Mathematics, Sathyabama Institute of Science and Technology, Chennai-600119, Tamil Nadu, India.

^{*}Corresponding author: E-mail: mpem.maths3033@gmail.com;

On Algebraic Attributes of χ -Fuzzy Subring, Normal Subring and Ideal

M. Premkumar^{a*o#}, A. Prasanna^{b†#¥} and S. Ismail Mohideen^{b‡F}

DOI: 10.9734/bpi/rhmcs/v1/3271A

Abstract

This paper defines and discusses the basic algebraic properties of the χ -Fuzzy Subring, Normal Subring, and Ideal. It also explains the homomorphic behaviour of these objects and describes the behaviour of their inverse images. There have been discovered a number of algebraic structures related to the results.

Keywords: Fuzzy Set (FS); Fuzzy Subring (FSR); Fuzzy Normal Subring (FNSR); χ -Fuzzy Subring (χ -FSR); χ -Fuzzy Normal Subring (χ -FNSR); Fuzzy Ideal (FI); χ -Fuzzy Ideal (χ -FI).

AMS (MOS) Subject Classifications: 03E72, 08A72, 20N25

1 Introduction

Zadeh's pioneering work on fuzzy subsets of a set in [1]. The concept of fuzzy groups was introduced by Rosenfeld in [2]. Chang and Mi-Ae Park first discussed K-fuzzy ideals in semi rings in [3]. In [4], Wang-Jin Liu expanded on the ideas of fuzzy ideals and fuzzy invariant subgroups. In [5, [6], and [7], Sharma examined the idea of " α -Fuzzy subgroups" as well as " α -Anti Fuzzy Subgroups" "T-fuzzy subrings," and "ideal." Malik developed the idea of extension of fuzzy subring and fuzzy ideal in [8]. In [9] and [10] Mukhrjee, initiated by the new notions of on fuzzy ideals of a ring and Prime fuzzy ideals in ring. Chakranarty in [11], develop the notation of fuzzy homomorphism and

^a Department of Mathematics, Sathyabama Institute of Science and Technology (Deemed To Be University) Chennai-600119, Tamilnadu, India.

^b Department of Mathematics, Jamal Mohamed College (Autonomous), (Affiliated to Bharathidasan University), Tiruchirappalli-620020, Tamilnadu, India.

[#] Assistant Professor;

[¥] PG and Research;

^F Principal, Head and Associate Professor

^o Orchid id: 0000-0002-8637-063X

[†] Orchid id: 0000-0002-1827-7687

[‡] Orchid id: 0000-0003-3443-9129

^{*}Corresponding author: E-mail: mprem.maths3033@gmail.com;

On the Algebraic Characteristics of the Normalization of Fuzzy BG – Ideals in BG – Algebra

M. Premkumar ^{a*}, A. Prasanna ^b, V. Helan Sinthiya ^c,
Y. Immanuel ^a, S. Ismail Mohideen ^b, J. Juliet Jeyapackiam ^d
and Priya Shirley Muller ^a

DOI: 10.9734/bpi/rhmcs/v8/5958A

Abstract

In this paper, we define a Algebraic Properties on Normal fuzzy BG – ideal in BG-Algebra discussed some of their properties and Examples. Additionally, normalization of fuzzy BG – Sub algebra in BG-Algebra were studied.

Keywords: Normal fuzzy BG – sub algebra; normal fuzzy BG-ideal.

1 Introduction

The concept of fuzzy set was initiated by Zadeh L A [1]. Fuzzy sets are extremely useful to deal with the many problems in applied mathematics, control engineering, information sciences, expert systems etc. Although there are several generalizations of fuzzy sets, none of them address the issues of members with membership degree 0 who have opposing qualities [2]. Imai Y and Iseki K [3] introduced two classes of abstract algebras BCK - algebras and BCI – algebras. Neggers J and Kim H S [4] introduced a new notion called B - algebra. Kim C B and Kim H S [5] introduced a new notion called BG - algebra which is a generalization of B - algebra. Muthuraj R, Sridharan M and Sitharselvam P M [6] introduced the notion of Fuzzy BG - ideals in BG - algebra. Priya T and Ramachandran T [7] discussed the Normalization of Fuzzy PS - ideals and Fuzzy PS - Sub algebras of PS - algebras. Ahn S S and Lee D [8] introduced a new concept Fuzzy sub-algebras of BG algebras. Akram M and Dar K H [9] discussed the notion of Fuzzy

^a Department of Mathematics, Sathyabama Institute of Science and Technology (Deemed To Be University), Chennai-600119, Tamilnadu, India.

^b Department of Mathematics, Jamal Mohamed College (Autonomous), (Affiliated to Bharathidasan University), Tiruchirappalli-620020, Tamilnadu, India.

^c Department of Mathematics, School of Engineering and Technology, Dhanalakshmi Srinivasan University, Trichy, Tamilnadu, India.

^d Department of Mathematics, Jayaraj Annapackiam CSI College of Engineering Nazareth, Tuticorin-628617, India.

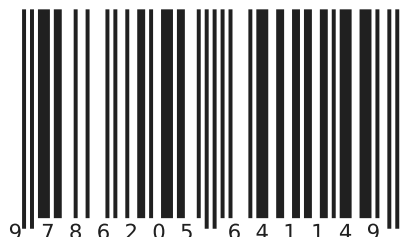
*Corresponding author: E-mail: mprem.maths3033@gmail.com;

Magnetohydrodynamics describes the dynamics of a fluid that interacts with a magnetic field. This subject is of prime importance in missile and spacecraft dynamics, propulsion communications, and power generators. Hydromagnetic flows occur in astrophysics and geo-physics also. There are some characteristic lengths of considerable importance in MHD. They are Debye characteristics length and Larmor radius - the radius of the path of a charged particle moving in a magnetic field and transverse to the field lines. Larmor radius is also known as gyro radius and cyclotron radius. These quantities are useful for the description of MHD phenomena in magnetohydrodynamics. The basic concept in electromagnetism is Coulomb's law for the force on a charged particle, in an electrical field. Coulomb's law states that "The force on a charged particle is proportional to the product of the charge and the local electrical field seen by the particle". When a charged particle moves in the presence of an arbitrary electric and magnetic field, the resulting force is called the Lorentz force.



R. Delhi Babu has completed his Ph.D in the area of fluid dynamics at Sathyabama Institute of Science and Technology in 2020 and presently working as an Assistant Professor, Department of Mathematics, Sathyabama Institute of Science and Technology, Chennai. He qualified SLET for Assistant Professor in 2017 and NET for Assistant Professor in 2022.

Effect of MHD between two parallel plates with angular velocity



R Delhi Babu

R Delhi Babu

Effect of MHD flow between two parallel plates with angular
velocity

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120 High Road, East Finchley, London, N2 9ED, United Kingdom

Str. Armeneasca 28/1, office 1, Chisinau MD-2012, Republic of Moldova,
Europe

Printed at: see last page

ISBN: 978-620-5-64114-9

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CHAPTER 1

INTRODUCTION

1.1 MAGNETOHYDRODYNAMIC FLOW

Magnetohydrodynamics describes the dynamics of a fluid which interacts with a magnetic field. This subject is of prime importance, in missile and space craft dynamics, propulsion communications and power generators. Hydromagnetic flows occur in astrophysics and geo-physics also. There are some characteristic lengths of considerable importance in MHD. They are Debye characteristics length and Larmor radius (The radius of the path of a charged particle moving in a magnetic field and transverse to the field lines. Larmor radius is also known as, gyro radius and cyclotron radius. These quantities are useful for the description of MHD phenomena in magnetohydrodynamics.

The basic concept in electromagnetism is Coulomb's law for the force on a charged particle, in an electrical field. The Coulomb's law states that "The force on a charged particle is proportional to the product of the charge and the local electrical field seen by the particle". When a charged particle moves in the presence of an arbitrary electric and magnetic fields, the resulting force is called the Lorentz force.



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Criteria 3.4.6 Proofs

Concurrent Social Media in Collaborative Media Education

Dr.N. Raja

Assistant Professor, Department of Visual Communication, Sathyabama Institute of Science and Technology,
Deemed to University, Chennai, India

E-mail : raja.viscom@sathyabama.ac.in

Abstract- The man in pre-historic times, that is, about 50,000 years ago, was in the cave, recording his social interactive urges in various kinds of drawings and paintings on the walls, thinking that his fellow human beings in his times or posterity would happen on them and try to decode them. That was probably the first seed sown of social media to catch on down the line. The man in the ancient cave is now the man on the web for all especially education. Media students who were selected for the study have recorded their responses towards concurrent social media learning dimensions: Interactivity, Informativeness, Effectiveness, and Stress. These factors help in assessing media students' perception regarding social media learning.

Keywords: Concurrent social media, Social Media Learning, Collaborative Media Education, Learning through Social Networks

I. INTRODUCTION

The emergence of Internet, Web.2.0 and cloud computing technology are in the twilight of 20th century and their astounding and amazing growth at the dawn of the 21st century, a major media was born and started spreading its tentacles over the globe, converting people who are divided by race, religion, geography, language, culture et al, into Oliver Goldsmith's 'citizens of the world' or to put it in modern parlance, 'citizens of the world'.

II. REVIEW OF LITERATURE

The four eras as described by Baran and Davis are recapped here in order to elucidate one of the major media theories Cultivation Theory which Gerbner used in his study of TV influence on the society. Just as Gerbner used the Cultivation Theory to examine how the TV viewers created a world in parallel to the reality, so we can use the same theory to study how the social media consumers and content

creators are creating a world, a digital world at that, carved out of the reality and yet far from the reality and also study how they cultivate their own perceptions and personalities. The way the social media user are engaged, knowingly or unknowingly, in social construction of reality can be analysed with the help of the Cultivation Theory.

Gerbner, using the cultivation theory, has viewed the TV medium as a powerful one that changes the viewers' perceptions of the reality and impacts their reality in such a way that the actual reality merges with the TV-created reality and manipulates the reality to suit the interests of the powerful corporate operating the TV medium.

The mindset of the viewers overly exposed to TV is shaped in such a way that whatever world is created on the small screen is thought as the spitting image of the reality. That is what Gerbner calls 'mean world syndrome.' His cultivation theory helped him arrive at this conclusion. The same mindset of TV viewers can also be said to be prevailing among the social media users too in this digital age. What TV in the 1960s did to the audience, social media are doing to its user's post-millennium. [11] (Raziye Nevzat, 2018).

So, it all boils down to this fact: Nowadays, living in the world of digital surveillance, no one has their own private or real world. The world they are supposed to be living in has been thrust on them by media, particularly social media whose power and influence have outsmarted their predecessors. Mankind is now living in a media-created or media-crafted world, making Gerbner stand vindicated.

The world has become a massive shopping mall. There are ads galore ubiquitous; its is the capitalist logic that 'colonizes the social, public and private world' [5] (Christian Fuchs, 2017).



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2nd International Conference on Recent Development in Engineering, Sciences, Humanities, and Management
Government Engineering College Bharatpur, Rajasthan
Date: 18th March 2023
ISBN : 978-93-91535-43-8



IMPACT STUDY ON POPULAR VOICE ASSISTANTS AND ITS USAGE TOWARDS YOUNGSTERS

G. Lakshna ¹, Pugalendhi R ², Dr. N. Nazini ³

E-Mail: pugal.viscom@sathyabama.ac.in

Department Of Visual communication

Sathyabama Institute of science and technology, Chennai 119

ABSTRACT

Intelligent Virtual Assistant also known as Voice Assistants are a boon to everyone in the twenty-first century. It has prepared the way for a new technology in which we may ask machines questions and communicate with Voice assistants in the same way that we do with humans. This new technology has captivated the entire world in a variety of ways, including smart phones, laptops, computers, and so on. Siri by Apple, Google Assistant by Google, Cortana by Microsoft, Bixby Key by Samsung and Amazon Echo by Amazon are examples of significant Voice assistants. Virtual voice assistants are now employed for a variety of applications. Aside from their intriguing potential, many users are concerned about their privacy and what happens to the data gathered by the voice assistant. It is unclear which elements contribute to voice assistant acceptance. In this research paper, the researcher aims to find whether voice assistant is a boon or bane for the users. Google Form surveys were used to collect the data with the support of Chennai based users, totally 100 responders have participated. This paper is an attempt to understand how voice assistant is playing a vital role in everyone's day-to-day life.

Keywords: Voice assistants, commands, Google assistant, Siri, Cortana, Echo, Bixby, vital role, good companion, trustworthy

1. INTRODUCTION

Voice assistants have a rich history that dates back over 100 years, which may seem odd given apps were only created in the last ten years. A voice assistant is a computer assistant that listens to particular vocal commands and returns relevant information or performs specified actions as desired by the user using speech recognition, language processing algorithms, and voice synthesis. Voice assistants can return relevant information based on particular commands, sometimes referred to as intentions, voiced by the user by listening for certain keywords and filtering out extraneous noise. While some voice assistants are software-based and may be integrated into most devices, others are intended exclusively for single device uses. Since their introduction in 2014, voice



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Proceedings for the International Conference on Recent Trends in Computing, Communication and Information Technology

A STUDY ON POPULAR SOCIAL MEDIA: YOUTUBE PLAY VITAL ROLE IN WOMEN ENTREPRENEURSHIP

Pugalendhi R¹

¹Department of Visual Communication,
Sathyabama Institute of Science and Technology, Chennai.
Email id: ¹pugal.viscom@sathyabama.ac.in

Dr. Janet Mary S²

²Department of Communication,
Madras Christian College, Chennai.
Email id: ²janetmary@mcc.edu.in

ABSTRACT

The need for social media has greatly grown during the last ten years. Social media platforms like YouTube have a huge following among users. The number of YouTube visitors is rising, and so are the numbers of YouTube channel moderators globally today. (YouTube-2021) In only the past five years, YouTube's growth has doubled. The impact of YouTube to the development of female entrepreneurs is discussed. The research aims to investigate the part YouTube plays for Indian women in business using survey analysis. This study looked into the usefulness of YouTube for female entrepreneurs. Grounded theory data analysis is employed to achieve this. The results demonstrate that YouTube has improved the lives of female entrepreneurs generally.

Keywords Empowerment, YouTube, Chennai, Women Entrepreneurship, .

1. INTRODUCTION

A recent Cornell study found that independent women who work in traditionally feminine internet business practices, like marketing or blogging, feel pressured to do so. Regarding women's contribution to progress, there is no longer any debate. In India, women make up almost 45% of the population. One of the most crucial elements for aiding in the progress of a nation is seen to be entrepreneurship. Online interactions on YouTube serve as a hub for community-based feedback, content sharing, and specific routes for collaboration. Today, YouTube is a must for all ages. A woman who starts and runs her own business is referred to as a women's entrepreneur.

Ladies's entrepreneurs are those women who created a new industry with a novel idea in order to become self-sufficient without working for the government. In India, there are over 8 million female company owners, accounting for 14% of all firms, according to the sixth economic census conducted by the Indian government.

1.1 STATUS OF WOMEN ENTREPRENEURS

The Indian female entrepreneur possesses a variety of traits. The complete enterprise is managed by a woman or a group. To start with Women entrepreneurs struggle with a variety of issues as they work to grow their



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Science, Education and Innovations in the context of modern problems - SEI

IMCRA - International Meetings and Conferences Research Association

ISSN 2790-0169 / E-ISSN 2790-0177

YOUTUBE AS AN INSTRUCTIVE MEDIUM FOR SCHOOL STUDENTS IN CHENNAI DURING COVID-19 EPIDEMIC

R .Pugalendhi¹ and Dr. S.Janet Mary²

(1)Department of Visual Communication, Sathyabama Institute of Science and Technology,
India Tamil Nadu ,Chennai.

(2)Department Of Communication, Madras Christian College, Chennai
Tamilnadu.India.

Abstract

The aim of this research study is to examine how YouTube helps as an instructive medium for school students during the Covid-19 epidemic. Totally 200 school students participated, in it 100 Students (Boys) and 100 Students (Girls) from urban Chennai, they are all studying classes 6th to 8th Standard took part in this study. This topic analyzes deeply the methodology of how the YouTube platform helps the school students' education community to learn complex special subjects in this modern era as technology is constantly changing. The educator needs adequate levels of technological knowledge as they lay the foundation of different perceptions to students. This research study is based on an analysis of pre-existing literature and quantitative data that was gathered through a questionnaire with school students. Some findings include the sign of distraction while watching videos because of frequent advertisements by the business community. This research gives the space for the thought of future research relevant to YouTube, particularly related to school students' usage of YouTube and the level of appropriate utilization. It also talks about the steps to enhance and improve the quality of the content published on YouTube to make it more authentic and reliable.

Keywords: YouTube, Social Media, instructive medium, Covid-19 epidemic, School students, Chennai.

Introduction

YouTube is one of the trendy media platforms that allow billions of people to get connected together in a network place. YouTube emerged in the year 2005 on the 14th of February as a social media site. Each individual user uses YouTube to discover, watch and share the video created by a content creator or who uploaded it into his/her own YouTube channel. This social media site helps to connect, inform and educate every user across the world. This research study aims to understand how YouTube is used for educational purposes for an effective outcome. It is that YouTube, a visual library and powerful educational tool used in this contemporary technology to educate in schools and institutions. This study has identified YouTube video usage by school students to develop their skills and enhance their



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Social Media Engagement On COVID-19 Vaccination During The Pandemic: Cross-Sectional Survey In Chennai Metropolitan

Pugalendhi Rajamanickam^{*1,a}, Janet Mary Santhappan^{2,b}

¹Department of Visual Communication, Sathyabama Institute of Science and Technology, Semmancheri,
Chennai, Tamil Nadu 600119, India.

²Department of Communication, Madras Christian College, Tambaram East, Tambaram, Chennai, Tamil Nadu
600059, India.

Corresponding author: ^apugal.viscom@sathyabama.ac.in
^bjanetmary@mcc.edu.in

Abstract. Social media plays an idealistic part in the present society. It assumes a significant role in expanding public awareness and gathers perspectives. Thus, social media has taken a huge place among people all over the world. And the ideas shared on social media reach people instantly. The Covid-19 virus, which is affecting more and more people around the world. It has infected millions in various countries and caused many thousands of deaths. In India, a country with a large population, the incidence of this virus is really higher. A Pune-based serum company has won a contract to develop the Covishield, a vaccine developed by the University of Oxford in the United Kingdom to control the virus. And Bharat Biotech, based in Hyderabad has developed a vaccine called 'Covaxin' in the national level invention. The two vaccines have been approved by the federal government for use on an emergency basis. Accordingly, the Ministry of Health and Family Welfare of India has confirmed that these two vaccines are completely safe. Covid-19 vaccination is currently being implemented across India. This study explains whether the news about the Covid-19 vaccine that is appearing on social media at the moment is raising awareness or causing fear among the people. For this study the researcher selected the most Covid-19 affected areas in Chennai, Namely called Royapuram, Thiru Vi Ka Nagar, Anna Nagar, and Kodambakkam. A total of 320 Respondents participated in the study and responded. This study was conducted from 10 March 2021 to 10 April 2021.

Keywords: Covid-19 Vaccines, Covid -19, Social Media, Covaxin and Covishield vaccines

1. INTRODUCTION

As of 19 April 2021, WHO reports 142,238,073 confirmed cases and 3,032,124 confirmed deaths in 207 countries, areas, or regions. [1] have explained that social media have become the most important platform for online communication, democracy, fact, and origin of infotainment. In a pandemic condition like the Covid-19 outbreak, social media is the most searched platform for gathering news. However, there are lakhs of people spreading information, awareness, and rumors about Covid-19 Vaccines and vaccination [2]. In this study, Social media must be controlled to support the public health response [3]. A well-planned analysis of global online conversations could provide an assessment of the spread and possible changes in public attitudes and behavior. Development of new vaccines, internationally coordinated responses to public perceptions and attitudes [4]. Numerous research articles have been published on the Covid-19 and its associated diseases, but a few studies have been published on the Covid-19 vaccines and their benefits and harms[5]. In this study, the researcher explained, which social media is popular among urban areas of Chennai[6]. Also, the researchers have found, whether social media is creating awareness or causing fear to the public concerning the Covid-19 Vaccines. In-depth interviews were conducted using five close-



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Language, Culture and Identity
IMC Dhenkanal, Monograph
ISBN 978-93-5680-603-0

ICONOGRAPHY OF MUSLIM CULTURE AND IDENTITY IN THE TAMIL FILM *THUPPAKI*

Dr.N.Nazini

Asst.Professor, Sathyabama Institute of Science and Technology,Chennai

A.R.Vimal Raj

Asst. Professor, Sathyabama Institute of Science and Technology,Chennai

Abstract

Indian cinema has been a represent to the multidimensional nature of the subcontinent, be its representation of Indian customs, society, castes, classes, politics, art, or religion. Minorities especially Muslims, as kings, spies, friends, traitors, or smugglers, gangsters transform to terrorists. This has been a universal theme in commercial cinema. This paper attempts to examine the iconography of Muslim characters, culture and identity in Tamil cinema. The theory of social construction of reality comprises the ideas of socialization by which individuals make sense of the world through various characteristics, one of which is the mass media. Stuart hall's positioning of Movies can both develop an image and distort the same image. Tamil cinema portrays the image of Muslim cast in films from pre-independence period to post-independence in India with conflicts of India and Pakistan. The controversial issues like Kashmir insurgency, communal riots, 9/11 interpreted in films were created to portray Muslims characters based on those issues. This paper aims to study how Tamil cinema attempts to influence its audience through the images and its misinterpretation used in the recent movies. The paper presents a content analysis of the selected film *Thuppaki* (Translation: GUN) from the recent times where only the lead roles played as Muslim characters in films.

Keywords: Muslim Community, Tamil cinema, Portrayal, Identity, Terrorist

Introduction:

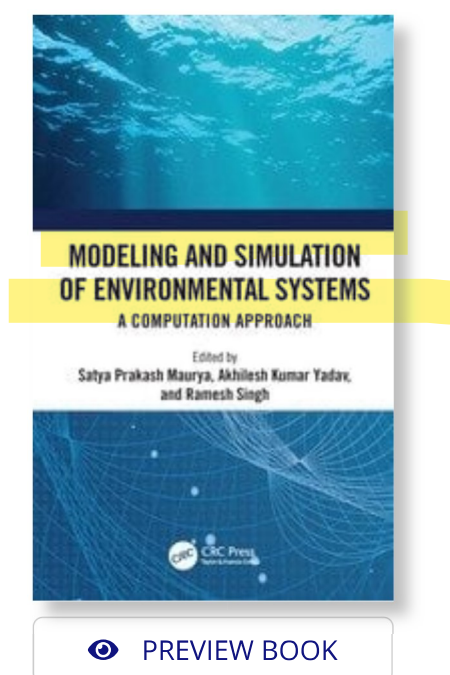
The world has been shifted after the 9/11 incident to a greater extent. The responsibility of this incident was laid upon "Muslims" by the west. After that, Muslims are blamed as terrorists all over the world without any discrimination of gender or age. A recent

incident which has affected the Muslims more is the 26/11 Mumbai attack. The wave of terrorism and the picture of Muslims as terrorists, invaded the world almost at the same time. Cinema as an art form not only reflects the society it is set in, but also acts as a reflector to that society some films leave their mark on society and society in turn, reacts to these films in various ways.

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ECOLOGICAL ENVIRONMENT: A NEW PERSPECTIVE

Editor-in-Chief

Dr. Santhi Devi R.

Associate Professor, Department of Geography,
Bharathi women's College (A), Chennai – 600 108.

Editors

Dr. Rajasugunasekar D.

Scientist – F, Institute of Forest Genetic and Tree Breeding,
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and

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ECOLOGICAL ENVIRONMENT: A NEW PERSPECTIVE

Editor-in-Chief

Dr. Santhi Devi R.

Associate Professor, Department of Geography,
Bharathi women's College (A), Chennai – 600 108.

Editors

Dr. Rajasugunasekar D.

Scientist – F, Institute of Forest Genetic and Tree Breeding,
Coimbatore - 641002

and

Dr. A. Sivakumar

International Peer Reviewer,
Papua New Guinea Journal of Teacher Education
University of Goroka, Goroka -441, Papua New Guinea.

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2. Hydrochemical Investigation and Water Quality Mapping in and Around Pallikaranai Marshland Area in Chennai, India

Authors : S. Packialakshmi, K. Nagamani, B. Anuradha

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Sustainable and Circular Management of Resources and Waste Towards a Green Deal

2023, Pages 297-308

Chapter 22 - Water and climate change from the regional, national, and international perspective

Amgalan Magsar^{1,2}, Nagamani Katukotta³, Mohammad Suhail Meer³, Bimastyaji Surya Ramadan^{2,4}, Toru Matsumoto²

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<https://doi.org/10.1016/B978-0-323-95278-1.00023-1>

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Abstract

Global warming occurs due to the increase in greenhouse gas emissions, mainly from anthropogenic sources, including industries, agriculture, solid wastes, and transportation. This chapter presents the recent challenges of climate change impacts in Asian countries. In recent years, severe weather disasters have increased in most Asian countries, especially in Indonesia, India, and Japan, caused by increased seawater temperature. Firstly, the chapter is addressed to the impact of climate change at the regional, national, and international levels from an environmental socioeconomic point of view. Secondly, several case studies on climate change in tropical, arid, and semiarid regions in Asia are presented. The scarcity of available water resources for ecosystems and their inhabitants is also discussed. Sustainable use of freshwater, improvement of sanitation systems, implementation in climate change adaptation, and mitigation measures for local and national levels are discussed.

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Advances of Artificial Intelligence in a Green Energy Environment



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Artificial intelligence–based intelligent geospatial analysis in disaster management

R. Subhashini¹, J. Joshua Thomas², A. Sivasangari¹, P. Mohana³,
S. Vigneshwari¹ and P. Asha¹

¹*School of Computing, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India;* ²*UOW Malaysia KDU Penang University College, George Town, Pulau Pinang, Malaysia;*

³*Centre for Remote Sensing and Geo-informatics, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India*

11.1 Introduction

Mankind has to follow the survival of the fittest strategy to fight against the natural disasters over the past few decades. Landslides are one among the prevailing natural hazards which claims lives, livelihoods, sizable infrastructural losses, and environmental damages. By using the remote sensing technology, landslides are identified through topographic surfaces and remote sensing images. Since there is high identification accuracy through visual interpretation, the process requires more man power and time-consuming. Therefore, in recent years, semiautomated and automated methods based on artificial intelligence (AI) have become popular for landslide identification. The role of landslide identification is crucial in case of mitigation and managing risks. Recent researchers are interested in devising a variety of algorithms on AI and machine learning (ML) over geographical information system (GIS). Location information recognition and timely prediction are the two important factors to be considered on landslide research while evaluating the performance.

The identification of landslides using optical images is barely explored and most researchers concentrate only on remote sensing images of rainfall data, terrestrial data, and geological data. The general types of data used for analysis are topographic data, geological data, and rainfall-related data. Land usage, altitude, land cover, contours, slope fluctuation, gradient, wetness index, and incurvation are the possible causes whose features are analyzed as topographical factors. Digital elevation models (DEMs) and satellite images (LISS-

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ஒருங்கிணைந்த பண்ணையம்



முனைவர் வி.சங்கீதா
முனைவர் நேதாஜி மாரியப்பன்
முனைவர் மு.புனிதாவதி
முனைவர் பெ.மோகனா

நூலாசிரியர்கள் குறிப்பு



முனைவர் வி.சங்கீதா அவர்கள் பிறந்த இடம்: அனுக்கூர், பெரம்பலூர் மாவட்டம். பெற்றோர்: திரு.மு.விசயேந்திரன், திருமதி வி.இந்திராகாந்தி. பள்ளிக்கல்வி: புனித தோமினிக் பெண்கள் மேல்நிலைப் பள்ளி மற்றும் தந்தை ரோவர் மேல்நிலைப் பள்ளி. உயர் கல்வி: தோட்டக்கலை அறிவியலில் இளங்கலைப் பட்டம்: பண்டித ஜவஹர்லால் நேரு வேளாண்மைக் கல்லூரி மற்றும் ஆராய்ச்சி நிலையம், காரைக்கால். முதுகலை மற்றும் முனைவர் பட்டம்: தமிழ்நாடு வேளாண்மைப் பல்கலைக் கழகம், கோவை. இப்போதைய பணி: தோட்டக்கலைத் தொழில் நுட்ப வல்லுநர், வேளாண்மை அறிவியல் நிலையம், பெரம்பலூர்.



முனைவர் வே.எ.நேதாஜி மாரியப்பன் அவர்கள் பிறந்த இடம்: அயனாவரம், சென்னை. பெற்றோர்: திரு.வே.எத்திராஜன், திருமதி எ.சசிலா. பள்ளிக்கல்வி: அஞ்சகம் உயர்நிலைப் பள்ளி, மேற்கு மாம்பலம், சென்னை. உயர்கல்வி: வேளாண் அறிவியலில் இளங்கலை மற்றும் முனைவர் பட்டம்: அண்ணாமலைப் பல்கலைக் கழகம், சிதம்பரம். முதுகலைப் பட்டம்: தமிழ்நாடு வேளாண்மைப் பல்கலைக் கழகம், கோவை. இப்போதைய பணி: முதுநிலை விஞ்ஞானி மற்றும் தலைவர், வேளாண்மை அறிவியல் நிலையம், பெரம்பலூர்.



முனைவர் மு.புனிதாவதி அவர்கள் பிறந்த இடம்: சிறுமணியேந்தல், இராமநாதபுரம் மாவட்டம். பெற்றோர்: திரு.நா.முத்துச்சாமி, திருமதி மு.மதி. பள்ளிக்கல்வி: முஸ்லிம் மேல்நிலைப் பள்ளி, அபிராமம். உயர் கல்வி: வேளாண் அறிவியலில் இளங்கலைப் பட்டம்: வேளாண்மைக் கல்லூரி மற்றும் ஆராய்ச்சி நிலையம், மதுரை. முதுகலைப் பட்டம்: வேளாண்மைக் கல்லூரி மற்றும் ஆராய்ச்சி நிலையம், கிள்ளிக்குளம். முனைவர் பட்டம்: அண்ணாமலைப் பல்கலைக் கழகம், சிதம்பரம். இப்போதைய பணி: தொழில் நுட்ப வல்லுநர், வேளாண்மை அறிவியல் நிலையம், பெரம்பலூர்.



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₹ 140



Chapter 1

Isolation and Identification of *Aeromonas* sp. from Fishes

Mirunalini Ganesan, Ravi Mani, and Sakthinarendran Sai

Abstract

Aeromonas is an important bacterial pathogen that is frequently isolated from diseased fish throughout the world. Bacterial fish diseases, especially bacterial hemorrhagic septicemia and motile *Aeromonas* septicemia in freshwater fish, caused great losses. The researchers observed histopathological changes in intestines, the liver, and kidneys of the affected fish. Many researchers have isolated and identified *Aeromonas hydrophila* from carp, catfishes, perches, and eels and found that they are highly pathogenic. Here, we describe the methods used to isolate and identify *Aeromonas* spp. in fish by biochemical tests and other means. Our goals are to provide the reader with guidelines on how to identify *Aeromonas* infection and isolate the bacteria.

Key words Bacterial fish diseases, *Aeromonas*, Isolation, Identification, Characterization

1 Introduction

Aeromonas spp. are opportunistic pathogens that frequently cause infections as a result of host damage or stress [1]. Human illnesses caused by these bacteria include endocarditis, gastroenteritis, peritonitis, and septicemia [2]. They are also the most common infections in farmed fish [3]. *Aeromonas* spp., include *A. caviae*, *A. veronii*, *A. salmonicida* [4, 5], *A. hydrophila* [6], *A. sobria*, and *A. bestiarum*. Among these, *A. hydrophila* is thought to be the most dangerous to aquatic animals, producing hemorrhagic illness in farmed fish on a regular basis [7]. *A. veronii*, on the other hand, has recently been found to infect fish with many of the same symptoms and histological abnormalities as *A. hydrophila*. Virulence factors are used to measure virulence and toxicity of bacterial infections. The pathogenicity of *A. veronii* is mostly attributable to virulence factors and synergistic interactions. Virulence factors include cytotoxic enterotoxins (act, alt, ast), aerolysin (aer), polar flagella (fla), serine protease (ser), elastase (ahyB), lipase (lip), DNases (exu), glycerophospholipid: cholesterol acyltransferase (gcaT), and type III secretion system (ascV). To better understand

the pathophysiology and epidemiology of *A. veronii*, it is critical to explore the virulence-related characteristics of clinical isolates [8]. However, data and information regarding sick fish are scarce.

To clarify what constitutes a favorable development platform for this pathogen, it is essential to analyze the growth properties of the bacterial isolate under various circumstances. *Aeromonas* is an aquatic-specific environmental bacterium that can be irregularly transferred to people [9, 10]. Foods derived from animals, fish, and vegetables have long been thought to be key carriers of *Aeromonas* spp. infections. Gastroenteritis is the most common human infection caused by *Aeromonas* spp.; however, other serious diseases, such as systemic infections, are less common and are usually associated with immunocompromised individuals. Furthermore, these microbes are known to cause major infections in fish. *Aeromonas* spp. can survive and multiply at low temperatures in a variety of food products stored between -2 and 10°C , such as beef, roast beef, and pork, and can even produce virulence factors at these low temperatures. Although the incidence of foodborne outbreaks caused by *Aeromonas* spp. has been relatively low in the past, their presence in the food chain should not be overlooked. Little research has been conducted on the incidence of *Aeromonas* spp. in frozen fish, despite the fact that there have been many surveys on the prevalence of *Aeromonas* spp. in food products. Furthermore, these studies employed strains that were incorrectly identified using standard biochemical approaches, which resulted in unsatisfactory results.

2 Materials

2.1 Isolation of *Aeromonas* from Infected Fish

- Infected fish.
- Needles.
- Dissection kits.
- Petri plates.
- Incubator.

2.2 Staining and Biochemical Methods

- Refer to standard microbiology laboratory manual.

2.3 Molecular Identification

- PCR reaction fine chemicals as per standard protocols.
- Primers-F-5' AGAGTTTGATCATGGCTCAG 3', R-5' GGTTACCTTGTTACGACTT3'.
- Thermocycler.
- Geldoc/transilluminator.

3 Methods

3.1 Fish Sampling

- Collect fish with clinical signs such as darkening skin, external hemorrhages, and internal bleeding in the liver, kidneys, and skin, or a combination of these symptoms.
- Sterilize the equipment, such as needles, by spraying them with 70% alcohol and then expose them to the flames directly.
- Sterilize the Petri dishes by autoclaving them for 10–15 min at 121 °C and 1 atm pressure.
- Dissect liver, spleen, and kidneys from the fish after cleaning their skin with 75% ethyl alcohol.

3.2 Isolation of Bacteria

- Homogenize the dissected organs with 2 mL of PBS and centrifuge at 500 rpm for 5 min.
- Discard the supernatant and wash the pellet three times with PBS.
- Finally suspend the pellet with 1 mL of sterile PBS.
- Prepare Luria–Bertani (LB) medium (10 g/L tryptone, 5 g/L yeast extract, 10 g/L NaCl, 15 g/L agar: pH 7) and autoclave it.
- Pour the autoclaved media into Petri plates and allow to solidify.
- Add 0.1 µL of the suspended pellet and spread plate it.
- Incubate it at 37 °C for 24–48 h and observe the colonies.

3.3 Identification of *Aeromonas* Bacteria

- *Aeromonas* is a rod-shaped, nonspore-forming, oxidase-positive, glucose-fermenting, facultatively anaerobic, and Gram-negative bacterium that lives in water.
- *Aeromonas* spp. colonies on trypticase soy agar are smooth, convex, and rounded, and they are tan/buff in color.
- Perform Gram staining as per the standard protocol.

3.4 Characterization of *Aeromonas* Bacteria

- *Aeromonas* spp. colonies on trypticase soy agar are smooth, convex, and rounded, and they are tan/buff in color. Characterization results of *Aeromonas* spp. are shown in Table 1.
- Weigh 25 g of fish flesh aseptically and homogenize for 2 min in stomacher bags containing 225 mL of alkaline peptone water.
- After 18 h of incubation at 37 °C, inoculate an aliquot of the enrichment in blood agar containing 30 mg/L ampicillin and incubate for 24 h at 28 °C.
- Select more or less than five presumptive *Aeromonas* colonies for further identification, but consider only one isolate representing a species from each sample for incidence calculation.

Table 1**The characterization result for the following *Aeromonas* spp. [12]**

Characteristics	Results for the following species				
	<i>A. hydrophila</i>	<i>A. caviae</i>	<i>A. sobria</i>	<i>A. veronii</i>	<i>A. salmonicida</i>
Physiological characteristics					
Gram stain	—	—	—	—	—
Shape	Rod	Rod	Rod	Rod	Rod
Motility	+	+	+	+	+
Catalase	+	+	+	+	+
Oxidase	+	+	+	+	Nd
Gas from glucose ^a	+	—	+	+	—
Methyl red	+	—	+	Nd	Nd
Voges–Proskauer ^a	+	—	—	+	—
Lysine decarboxylase ^a	+	—	+	+	Nd
Ornithine decarboxylase ^a	—	—	—	+	Nd
Vibriostatic 0/129	+	+	+	Nd	Nd
Production of:					
Indole ^a	+	+	+	+	+
Urease	—	—	—	Nd	—
Nitrate	+	+	+	Nd	—
Congo red	+	+	—	Nd	Nd
H ₂ S from L-cysteine	+	—	—	—	Nd
Hydrolysis of:					
Arbutin ^a	+	+	Nd	Nd	Nd
Inulin	—	—	—	Nd	Nd
DNase	+	+	—	Nd	+
Elastin ^a	+	—	—	Nd	—
Esculin ^a	+	+	—	—	+
Starch ^a	+	+	+	—	Nd
Gelatin	+	+ / —	—	Nd	Nd
Beta hemolysis	+	—	—	Nd	+
Alpha hemolysis	+	—	—	Nd	Nd
Prolin	+	+	+	Nd	Nd
Acid from:					

(continued)

Table 1
(continued)

Characteristics	Results for the following species				
	<i>A. hydrophila</i>	<i>A. caviae</i>	<i>A. sobria</i>	<i>A. veronii</i>	<i>A. salmonicida</i>
Adonitol	—	—	—	—	—
D-Arabitol	—	—	—	+	Nd
L-Arabitol	—	—	—	Nd	Nd
L- Arabinose ^a	+	—	—	Nd	+
D- Arabinose	+	+	—	Nd	Nd
D-Fucose	—	—	—	Nd	Nd
L-Fucose	—	—	—	Nd	Nd
Galactose	+	+	+	Nd	Nd
Gluconate	+	—	—	+	Nd
Dulcitol	—	—	—	—	Nd
Lactose	+	+	—	+	+
D- Mannitol ^a	+	+	+	Nd	+
Maltose	+	+	+	+	+
Melibiose	—	—	—	Nd	+
Inositol	—	—	—	—	—
D- Mannose	+	+	+	+	Nd
Salicin	+	+	—	—	+
Malonate	—	—	—	+	Nd
D- Sorbitol ^a	—	—	—	—	—
Saccharose (sucrose) ^a	+	+	+	+	+
Utilization of:					
Acetate	+	+	—	Nd	Nd
Arginine dihydrolase	+	+	—	—	Nd
Histidine	+	+	+	Nd	Nd
Lysine	+	+	+	Nd	Nd
Casein	+	—	—	Nd	Nd
Protease	+	+	—	Nd	Nd
Hemagglutination	+	—	—	Nd	Nd
Antibiotic susceptibility					
Ampicillin	R	R	R	R	R

(continued)

Table 1
(continued)

Characteristics	Results for the following species				
	<i>A. hydrophila</i>	<i>A. caviae</i>	<i>A. sobria</i>	<i>A. veronii</i>	<i>A. salmonicida</i>
Cephalothin	R	R	S	Nd	R
Gentamicin	R	R	R	S	NA
Penicillin	R	R	R	R	NA
Tetracycline	S	S	S	S	NA
Neomycin	S	S	S	M	NA
Carbenicillin	R	R	S	Nd	NA
Oxacillin	S	S	S	R	NA
Chloramphenicol	S	S	S	S	S
Nitrofurantoin	S	S	S	S	NA
Cefuroxime	S	S	S	Nd	NA
Cefotaxime	S	S	S	Nd	NA
Ciprofloxacin	R	R	R	S	NA
Clindamycin	R	R	R	R	NA
Erythromycin	R	R	R	M	R
Streptomycin	R	R	R	Nd	NA
Imipenem	S	S	S	S	NA
Kanamycin	R	R	R	S	NA
Piperacillin	S	S	S	R	NA
Polymyxin B	R	R	R	S	NA
Rifampicin	R	R	R	S	NA
Trimethoprim–sulfamethoxazole	S	S	S	Nd	NA

+ shows positive result, – shows negative result, +/- undeterminable, *Nd* not determined, *R* resistant against the antibiotic, *S* susceptible to antibiotic, *M* medium resistance, *NA* not available

^aMajor tests for *Aeromonas* spp.

- Maintain the stock cultures of each strain for short periods at room temperature on blood agar base slants and for longer storage, and either freeze at -70°C in 20% (w/v) glycerol–Todd–Hewitt broth (Oxoid, Madrid, Spain) or lyophilize in 7.5% horse glucose serum as a cryoprotector.

3.4.1 Hemolytic Activity

- On an agar basis (Oxoid) supplemented with 5% sheep erythrocytes, the strains are evaluated for hemolytic activity.

- Streak each suspension over the plates with five microliters and incubate for 24 h at 22 °C and 37 °C.
- Presence of distinct colorless zone around the colonies indicates hemolytic activity [11].

3.4.2 Proteolytic Activity

- Determine casein hydrolysis by streaking each suspension onto Mueller–Hinton agar (Oxoid) containing 10% (w/v) skimmed milk (Difco, Barcelona, Spain) and incubate at 37 °C for 24 h.
- Caseinase activity is shown by the appearance of a translucent zone around the colonies. Each suspension is put in 4-mm-diameter wells cut into an agarose gel and incubate for 20 h at 22 °C.
- Precipitate unhydrolyzed gelatin by immersing the plates in a saturated ammonium sulfate solution at 70 °C.
- Gelatinase activity is shown by the appearance of a translucent zone around the colonies.

3.4.3 Lipolytic Activity

- Streak 5 mL suspension onto resazurin–butter agar and incubate at 37 °C for 24 h.
- Presence of pink colonies indicates lipase activity.

3.4.4 Nuclease Activity

- Extracellular nucleases (DNases) are determined on DNase agar plates (Difco) with 0.005% methyl green.
- Streak 5 µL bacterial suspension onto the plates and incubate at 37 °C for 24 h.
- A pink halo around the colonies indicates nuclease activity.

3.4.5 Congo Red Dye Uptake

- The ability to take up Congo red dye is determined on agar plates supplemented with 50 µg/mL/mL of Congo red dye.
- Streak 5 µL bacterial suspension onto the plates and incubate at 37 °C for 24 h.
- Orange colonies are considered positive and express different intensities in the dye uptake as + and ++.

3.4.6 Molecular Identification

Reidentify all strains on the basis of the restriction fragment length polymorphism patterns (RFLP) obtained from the 16S rDNA following the method described by Borrell et al. [9].

Add 200 µM each of dATP, dTTP, dCTP, and dGTP.

Add 5 µL 1× PCR buffer (50 mM KCL, 10 mM Tris–HCl, pH 8.3).

Add 5 µL 2.5 mM MgCl₂.

Add 2 μ L of 5 pM of each primer.

Add 3 μ L of 10 ng of genomic DNA.

Perform PCR using the following conditions: denaturation at 93 °C for 3 min, followed by 35 cycles at 94 °C for 1 min, 56 °C for 1 min, and 72 °C for 2 min. After the final cycle, extension at 72 °C is allowed for 10 min.

3.4.7 Antimicrobial Susceptibility

The resistance of all strains to different antimicrobial agents is determined by the disk diffusion method as described by Institute CALS [12].

Acknowledgments

The work is supported by the Ministry of Earth Sciences grant (MoES) (MoES/36/OOIS/53/2016), Govt. of India, and Sathyabama Institute of Science and Technology.

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Chapter 2

Isolation and Identification of Edwardsiellosis-Causing Microorganism

Sakthinarenderan Sai, Ravi Mani, and Mirunalini Ganesan

Abstract

Isolation and identification of pathogenic bacteria are crucial for aquatic health management. Identifying the correct pathogenic bacteria at the species level is crucial in preparing for precautionary and disease management practices. Edwardsiellosis is an epidemic caused by *Edwardsiella* sp. This causes great economic losses for fish culture in marine and freshwater habitats. This chapter discusses various protocols for their isolation and identification.

Key words *Edwardsiella*, API 20E, Immunoassay blot, Edwardsiellosis polymerase amplification, PCR assay

1 Introduction

Edwardsiellosis is an important bacterial outbreak in most tropical aquaculture systems. The causative organism is Gram-negative rod bacteria belonging to the family *Enterobacteriaceae* and genus *Edwardsiella* [1]. It comprises five species: *E. tarda* [2], *E. ictaluri* [3], *E. hoshinae* [4], *E. piscicida* [5], and *E. anguillarum* [6]. The disease outbreaks have been reported for 20 species of freshwater and marine fish worldwide [7, 8]. The isolation and identification of pathogenic fish species are important for the control and prevention of major economic losses in aquaculture. This chapter describes the protocol for isolating and identifying different identification techniques used for *Edwardsiella* spp. from the infected fish species.



Methods for Characterizing *Flavobacterium* in Fish

Yamini Gopi, Sakthinarenderan Sai, Mirunalini Ganesan, and Ravi Mani

Abstract

Bacterial gill disease, rainbow trout fry syndrome, Columnaris disease, and bacterial cold-water disease are caused by bacteria that are pathogenic to fish. They belong to the *Flavobacteriaceae* family. They are spotted with yellow pigmentation in aquatic organisms. These kinds of bacteria are isolated and identified using techniques such as Gram staining, motility, gliding motility, biochemical tests, and API 20E. It can also be identified using technical methods by plate count and microscopy. Molecular characterization such as DNA extraction, polymerase chain reaction (PCR), and phylogenetic analysis is also done to identify the species.

Key words *Flavobacteriaceae*, Yellow pigmentation, Gram staining, Motility, Gliding motility, Biochemical test, API 20E, Microscope, Plate count, DNA extraction, PCR, Phylogeny

1 Introduction

Flavobacterium spp. inhabiting fresh and marine environments may produce yellow-pigmented colonies on culture. It is very important to know the clinical information about bacterial cells to differentiate them into pathogens or saprophytes. Therefore, cells that produce yellow pigmentation, usually long and thin, adhere to the surface or epithelium of aquatic species belonging to the family *Flavobacteriaceae* [1]. The genus *Flavobacterium* comprises of more than 100 species [2]. Most of the *Flavobacterium* spp. are Gram-negative, long, slender gliding rods of 4–10 μm and 0.3–0.5 μm wide, strictly aerobic [3], and the colony sizes are round, convex, rhizoid, and flat, which grow an optimal temperature of 20–30 $^{\circ}\text{C}$ for most of the species. Among them, many are pathogenic and causative agents of various diseases in fish. *Flavobacterium psychrophilum* is the causative agent of rainbow trout fry syndrome and bacterial cold-water disease [4]. This type of disease occurs in cold water at 16 $^{\circ}\text{C}$, with open lesions on the external surface of the fish. *Flavobacterium branchiophilum* and *Flavobacter-*



Chapter 4

Isolation and Identification of *Citrobacter* Species

Sakthinarenderan Sai, Ravi Mani, and Mirunalini Ganesan

Abstract

Isolation and identification of pathogenic bacteria is a crucial part of aquatic health management. Identifying the correct pathogenic bacteria at the species level is key to preparing precautionary and disease management practices. The pathogenic effects of *Citrobacter* sp. include tail necrosis, hemorrhage, reddening of the body, and lesions in the intestine. They are facultative pathogens that infect wild and cultured fish, turtles, aquatic mammals, and humans. It is an important threat to the aquaculture industry, leading to the mass mortality of cultured fish, thereby resulting in economic loss. This chapter discusses various protocols for their isolation and identification.

Key words *Citrobacter*, API 20E, PCR assay, Facultative pathogen, *C. freundii*, *C. braakii*

1 Introduction

The genus *Citrobacter* belongs to the *Enterobacteriaceae* family and consists of approximately 13 species [1]. *Citrobacter* is a Gram-negative, anaerobic bacterium that causes severe damage to the intestine and hepatopancreas in cultured fish, thereby leading to mass mortality. They are opportunistic pathogens in various fish, turtles, and humans [2]. *C. freundii* and *C. braakii* are the most infectious agents among other species of genus *Citrobacter*, which causes a great economic loss for the aquaculture industry [3]. Sato et al. were the first to isolate and describe the pathogenicity of *C. freundii* in diseased fish (*Mola mola*) [4]. Identification of pathogenic strains infecting fish is important for the control and prevention of major economic losses in aquaculture. This chapter deals with the protocol for isolating and identifying the different identification techniques used for *Citrobacter* species from infected fish.

Biotechnology for Toxicity Remediation and Environmental Sustainability



Edited by

K. M. Gothandam

Ramachandran Srinivasan

Shivendu Ranjan

Nandita Dasgupta

CHAPTER 2

Production of Biofuels and Value-Added Products Using Anaerobic Digestion of Wastewater

Rajathirajan Siva Dharshini, Shivakumar Renuka Dharani, K. N.
Arul Jothi, Ramachandran Srinivasan, and Mohandass Ramya

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2.1 INTRODUCTION

Globally, water pollution poses a significant threat to living organisms, ecological systems, and climatic changes. The inadequately treated wastewater from various industries, agricultural processes, and households is considered a substantial

water pollution source. The wastewater generally includes a wide range of hazardous chemical substances, pathogenic bacteria, and organic and inorganic substances that affect aquatic ecosystems' physical and chemical nature. Therefore, it is essential to screen and treat the wastewater before releasing it into the environment. These industrial wastewaters are heavy and high in strength and show difficulties in treating them. These wastewaters are high in chemical oxygen demand (COD) of 10,000 mg/L, or biological oxygen demand (BOD) of 5,000 mg/L. Anaerobic digestion (AD) is the method of energy recovery in the wastewater digester in the absence of oxygen, as microorganisms metabolize the organic matter into bioenergy and petrochemicals (Braun 2007; Petersson and Wellinger 2009).

The hopeful prospect of wastewater treatment strategies is to extricate the maximum beneficial things, such as useful microorganisms and substrates for bioenergy. On the other hand, due to an overwhelming need and an increasing population growth, there is an overexploitation and destruction of natural resources that lead to the deterioration of renewable and nonrenewable energy resources. Consequently, there is always a quest for novel renewable and nonrenewable energy resources (Otto et al. 2020). Interestingly, the combination of wastewater treatment and the production of bioenergy can address two significant problems of the existing scenario.

Anaerobic digestion is a useful alternative for wastewater treatment and energy recovery (Pantaleo et al. 2013). Anaerobic digestion is an economical and cost-effective technique and adaptable to every climatic condition (Lansing et al. 2008). To the concern of human health and environment, AD has zero adverse effects (Paolini et al. 2018). The process profoundly relies on the mutual and syntrophic interaction of a consortium of microorganisms to digest problematic organic waste into simple soluble monomers that include amino acids, fatty acids, and simple sugars. This review presents anaerobic digestion using wastewater as a substrate for the coupled system of biofuels and value-added product production and wastewater treatment. The overview of wastewater from industries subjected to anaerobic digestion is discussed, along with the participation of microorganisms to improve energy production and COD removal.

2.2 WASTEWATER TREATMENT STRATEGIES

Wastewater can reverse into reusable and potable by employing various wastewater treatment strategies. Generally, wastewater treatment involves removing contaminants, such as chemicals and sewage (Von Sperling 2015), in three distinct stages: primary, secondary, and tertiary (Kreiling et al. 1981). The primary stage employs the sedimentation principle to remove solid wastes within the water by passing them through a series of settling water tanks and filters to separate the water from the contaminants. The resulting leftover sludge from the primary treatment is pumped into sludge treatment facilities for other processes (Ødegaard 2006). In the secondary stage, the effluent from the primary treatment is filtered to remove the suspended solids through biofiltration, aeration, and oxidation ponds (Verma et al. 2006). Biofiltration involves sand filters, contact filters, and trickling filters to

remove the solid residues from the wastewater. Aeration is carried out in oxygen to metabolize the organic matter in the wastewater, resulting in microbial growth and inorganic end products. In oxidation ponds, the effluents from the aeration process are passed into natural water bodies like lagoons for a period of two or three weeks. The tertiary stage is a specific process to remove phosphates, nitrates, and pathogens to convert the treated wastewater into potable water for human consumption (Weber and Hopkins 1970).

Based on the techniques employed, wastewater treatment is categorized into four different types, namely, physical, chemical, sludge, and biological treatments (Von Sperling 2015). Physical treatment involves multiple steps, like screening to remove objects such as plastics and metals, sedimentation, skimming, and filtration, to separate the water from solids, and aeration to supply oxygen for the significant degradation of organic matters. In chemical treatment, chemicals like chlorine and ozone are employed to kill the bacteria in wastewater (Qiang et al. 2006). Sludge treatment is a combination of thickening (to form more rapidly settling aggregates) and dewatering processes. The biological treatment uses microorganisms to digest organic matters such as human waste, food, soap, and oils present in the wastewater (Lapara and Alleman 1999). Biological treatment is classified into three categories, namely, aerobic digestion, anaerobic digestion, and composting. In aerobic processes, bacterial organisms decompose the organic matter in the presence of oxygen. In anaerobic processes, the wastewater is subjected to fermentation in the absence of oxygen at a specific temperature. Composting involves the aerobic method of treating the wastewater by mixing it with sawdust or other carbon sources.

Apart from different physical, chemical, and biological approaches, dark anaerobic fermentation with moderate complexity of operation processes is advantageous and applicable to the different types of feedstocks, and it shows high productivity as compared with light fermentation (Khongkliang et al. 2017). Several studies report converting organic matter into bioenergy through anaerobic digestion (Puyol et al. 2017). Many improved bioreactors are used for anaerobic digestion of new substrates, such as pharmaceutical, municipal sewage, petrochemical, and winery wastewater (Dereli et al. 2012). There is a shift in the case of biomass where the preference has turned towards increased carbon contained in sewage for the generation of several bioproductions and their derivatives by anaerobic digestion. It concerns both waste management and energy production in a parallel manner; thus, we further discuss AD-associated remediation and bioenergy production strategies.

2.3 ANAEROBIC DIGESTION IN WASTEWATER TREATMENT

Microbial anaerobic digestion is an efficient way of organic incineration (Nasir et al. 2012) and can be processed without pretreatment. It is not only viable in large-scale industries but is also applicable in small-scale industries. As compared with other technologies, anaerobic digestion does not form gaseous pollutants and hence does not require a gas purification system as an accessory module (Appels et al. 2011). Anaerobic digestion (AD) is standard among other wastewater

treatment methods and used extensively in the production of bioenergy and other petrochemicals in addition to waste reduction (Rajagopal et al. 2013). Anaerobic digestion involves four stages, namely, hydrolysis, acidogenesis, acetogenesis, and methanogenesis. In hydrolysis, extracellular enzymes from hydrolytic strains of microbes decompose the polymers of carbohydrates and fats into simple monomers and dimers. The extracellular enzymes from microorganisms employed for enzyme hydrolysis are galactosidases, lipases, laccases, and phytases (Chylenski et al. 2017). In the acidogenesis phase, fermentative or acidogenic microorganisms convert the hydrolytic products into acetic acid and its intermediate compounds, such as ethanol, lactic acid, short-chain fatty acids (C3–C6), hydrogen, and carbon dioxide (Lozano et al. 2009). Like acetate, carbon dioxide, formate, methylamines, methyl sulfide, acetone, and methanol directly follow methanogenesis. Acetogens utilize other intermediates in the acetogenesis process (Manyi-Loh et al. 2013). Both acetogenesis and methanogenesis use products of acidogenesis to produce different biofuels, bioproducts, and so on. The complete cycle of anaerobic digestion is highly dependent on the organic composition of the source and on the acetogens and methanogens employed (Lim et al. 2020).

AD is widely used to treat wastewaters from the olive mill, in starch processing, biodiesel manufacturing containing crude glycerol, and activated sludge and produces volatile fatty acids (VFA) (Sun et al. 2011; Trevisan et al. 2014; Wang et al. 2015). These VFAs are then converted into biofuels and other value-added products like polyhydroxyalkanoate (PHA), directed to electricity generation in microbial fuel cells (MFC). VFA, as a carbon source in nutrient removal and lipid production by microorganisms, is then used for biodiesel production (Christophe et al. 2012). Along with VFA, methane, PHA, and MFC are used to produce hydrogen, ABE (acetone, butanol, ethanol), and other biofuels and their derivatives.

2.4 TYPES OF INDUSTRIAL WASTEWATER AND THEIR VALUE-ADDED PRODUCTS

Wastewater treatment using anaerobic digestion allows for removing the contaminants and converting wastewater into an effluent that returns to the water cycle. Wastewaters from industries such as agriculture, agroindustry, food, sugar, oil, pulp and paper, sago, brewery, distillery, and biodiesel are utilized to produce various value-added bioproducts (Figure 2.1). The standard value-added products made from industrial wastewater are ABE, hydrogen, PHA, biogas, MFC, and enzymes.

2.4.1 Agriculture and Agro-Industrial Wastewater

Agroindustries such as olive oil mills, cheese factories, and dairy farms utilize agricultural raw materials like vegetables, fruits, milk, and meat. These industries generate millions of wastewaters and many by-products that might be dangerous to the environment due to harmful contaminants. The wastes from these industries are mostly composed of kerosene, petroleum, paraffin, olive oil, and glycerol (Mafakher

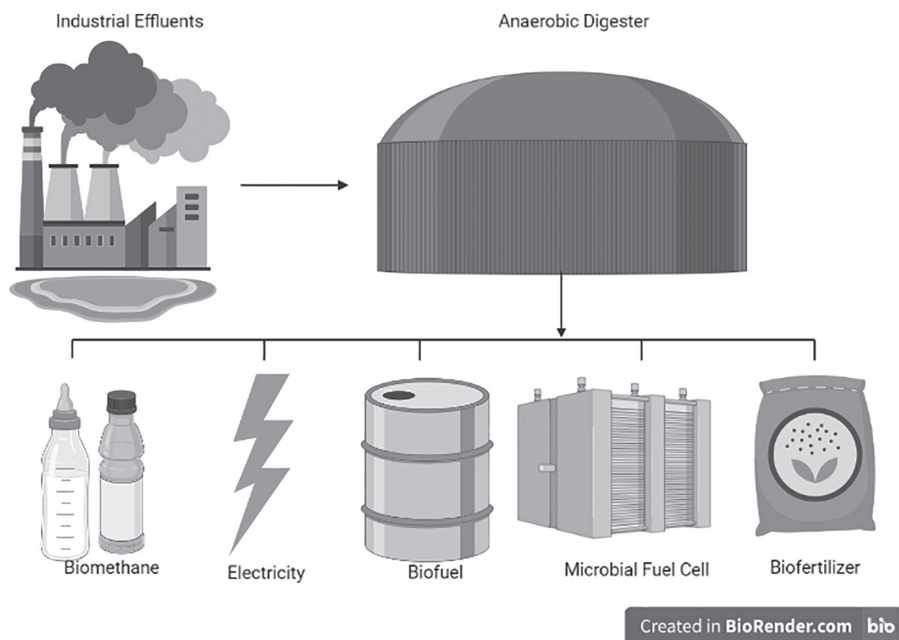


Figure 2.1 Schematic representation of bioenergy and bioproducts production using wastewater as the source.

Table 2.1 List of Bioenergy and Value-Added Products Generated Using Wastewater as Feedstock

Type of Wastewater	Products	Yield	Reference
Agricultural and agro-industrial wastewater	Biogas	239 mL CH ₄ /g VS	Valenti et al. (2018)
		560.47 mL	Onthong and Juntarachat (2017)
		1.8 L/L.d	Kacprzak et al. (2010)
Food industrial wastewater	Methane	695 mL g/L VS	Almomani et al. (2019)
	PHA	1.2 g/L	Pagliano et al. (2017)
	Bioelectricity	330 mV	Logroño et al. (2015)
	Ethanol	0.43 g/g	Yang et al. (2014)
	Methane	0.99 L/g	Alves et al. (2009)
Sugar industrial wastewater	PHA	5.297 g/L	Singh et al. (2013b)
	Hydrogen	3.87 L/L.d	Salem et al. (2017)
		32 kg/m ³ d	Han et al. (2012)
Oil industrial effluents	Biogas	27.65 m ³ biogas/m ³	Wang et al. (2015)
	Methane	325.13 mL CH ₄ /g MLSS d	Krishnan et al. (2016)
		175.15 mL H ₂ /g MLSS d	Krishnan et al. (2016)
	Hydrogen	0.35 L H ₂ /g COD	Singh et al. (2013c)

(Continued)

Table 2.1 (Continued)

Type of Wastewater	Products	Yield	Reference
Pulp and paper industrial wastewater	Methane	269 ml/g VS _{added} 200 mL/g VS _{added}	Priadi et al. (2014) Lin et al. (2011)
	Ethanol	42.5 g/L	Lin et al. (2012)
Sago industrial wastewater	Biogas	2.8 L	Kowsalya and Poovitha (2018)
		30.7 m ³ /d	Rajesh Banu et al. (2006)
		3393 mL/L	Elaiyaraju and Partha (2016)
		0.2–0.25 m ³ /kg COD/day	Saravanan et al. (2001)
Brewery wastewater	Biogas	0.53 L/g COD	Chen et al. (2016)
		0.34 ± 0.06 m ³ CH ₄ kg-s/COD	Di Biase et al. (2018)
Distillery wastewater	Hydrogen	125 mL H ₂ /g COD	Intanoo et al. (2014)
		380 mL H ₂ /g COD	Malik et al. (2014)
		125.1 mL H ₂ /g COD	Poontaweegeratigarn et al. (2012)
		130 mL H ₂ /gCOD	Intanoo et al. (2012)
Biodiesel industrial wastewater	Methane	220 L/kg COD	Buitrón et al. (2014)
	Lipids and carotenoids	230 µg/gd.w	Kot et al. (2019)
	Biogas	9.8 L H ₂ /g	Chookaew et al. (2014)

et al. 2010). Agroindustries regularly release a complex of low-value crude fats and fatty acids containing effluents and grease containing wastewater. It is essential to treat the wastewater generated from the agroindustry and agriculture practices to recover essential organic by-products. The application of anaerobic digestion for agri-oriented wastes has tremendous scope for resource sustainability.

A work by Kacprzak et al. (2010) showed an increased methane production by the codigestion of corn stillage, cheese whey, and glycerin, and biogas was produced at a rate of 2.2 L L⁻¹ d⁻¹. In another study, methane production from agricultural wastes was enhanced by processing it with semisolid chicken manure in an anaerobic codigestion process and achieved a maximum methane production of 695 mL g/L VS (volatile solids) (Abouelenien et al. 2014). Valenti et al. (2018) studied the anaerobic codigestion of agricultural wastes and by-products from six feedstocks (citrus pulp, olive pomace, cattle manure, poultry litter, whey, and corn silage) to produce biogas for renewable energy generation. The batch anaerobic codigestion with six studied feedstock mixtures generated an average of 239 mL CH₄/g VS. The studies, as mentioned earlier, suggest the viability of anaerobic digestion for the treatment of agro-industrial wastewater in combination with bio-energy production.

Microbial communities play an essential role in the anaerobic digestion of agro-industrial wastewater. For example, *Penicillium simplicissium*, a facultative anaerobic fungus isolated from babassu oil industrial waste, was reported to produce

lipase enzyme using soybean meal, additives of soya bean oil, and wastewater from the slaughterhouse as a carbon source (De Vrieze et al. 2014). Besides, *Yarrowia lipolytica*, known for its ability to convert waste materials to valuable biomass or products grown on the medium containing agro-industrial fatty waste, produced citric acid and lipase (Forster-Carneiro et al. 2007). Mafakher et al. (2010) isolated two lipolytic yeast strains of *Y. lipolytica* from the agro-industrial wastewater treatment plant. These two strains are investigated for their lipase and citric acid production capability on agro-industrial wastes, such as glycerol, paraffin, olive oil, kerosene, and petroleum, which are the pollutants of olive oil factories and petroleum-contaminated wastewater. Compared to other industrial wastes, when olive oil was used as an energy source, it yielded nearly 10–12 g/L higher lipase and citric acid. Among the two strains, strain 1 (M1) produced better lipase and citric acid than strain 2 (M2). The study concluded that *Y. lipolytica* is a suitable micro-organism for the digestion of olive oil containing industrial wastewater for a better yield of lipase and citric acid.

2.4.2 Food Industrial Wastewater

Food wastes are produced to no small extent and reach up to 1.3 tons annually, contributing significantly to municipal waste (FAO 2019; Paritosh et al. 2018). The composition of wastewater from food industries varied based on their substrates and processing techniques, mainly in terms of organic matter, acids, proteins, aromatic compounds, and nutrients. The typical components, such as total solids, total nitrogen, total phosphorus, and biological and chemical oxygen demand (BOD and COD), are present in the food industrial wastewater (Rajagopal et al. 2013). The food industry wastewater is hazardous if released in the environment without treatment; hence, it is essential to treat and manage them appropriately. Anaerobic digestion also enables biogas production while treating food industry wastewater (Ariunbaatar et al. 2016; Strazzera et al. 2018).

Loaded substrates present in food industrial wastewater are highly valuable substrates for biofuels and bioelectricity (Conesa and Rey 2015; Logroño et al. 2015). Food industrial wastewater with a complex of nutrients acts as an effective medium for the growth of filamentous fungi, such as *Rhizopus microsporus* var. *oligosporus* (*R. oligosporus*). *R. oligosporus*, a zygomycete, is used as a primary source in the production of tempeh (feed for humans, fishes, and animals) (Nitayavardhana and Khanal 2010; Wikandari et al. 2012). Codigestion of piggery wastewater and food waste slurry from restaurants was evaluated in the presence of trace elements solution (Na, K, Ca, Mg) (Zhang et al. 2011). The increased metabolic activity resulted in the methane of 1.34 mL/g VS added in the high retention time (HRT) of 20 days at pH 7.37, with reduced volatile solids up to 75.6%. Another study by Kim et al. (2010) has shown that, in anaerobic digestion, the bacterial hydrolysis of suspended organic matter from food recycling wastewater changes the pH from 5 to 7 and temperature 40°C to 60°C. Furthermore, the treatment also increased propionic acid (8.1 g/L) and butyric acid (12.8 g/L) concentrations within two days of incubation. The key microorganisms identified in the study are

Clostridium thermopalamrium, *C. novyi*, *Aeromonas sharmiana*, *Bacillus coagulans*, and *Pseudomonas plecoglossicida*.

Wastewater from the seafood canning industry contains high ammonium concentration. Treating the wastewater is necessary to protect the environment. For that, *Arthospira* sp. and *Nostoc* sp. PCC 7314 were cultured in the wastewater in a semi-continuous manner. At the same time, we monitored the production of protein and exopolysaccharides produced by *Arthospira* sp. and *Nostoc* sp. PCC 7314. Protein production was increased up to 2.5 ± 0.2 mg mL⁻¹, including phycobiliprotein (allophycocyanin, 84.3 ± 10.2 mg g⁻¹; phycocyanin, 73.7 ± 7.7 mg g⁻¹). Exopolysaccharides (962.7 ± 26.7 mg L⁻¹) are also produced in the *Nostoc* sp. culture in anaerobic digestion (Álvarez and Otero 2020). Internal circulation bioreactor and laboratory batch test were employed in industrial dairy wastewater and cheese whey treatment using anaerobic sludge as the inoculum. The anaerobic sludge was highly loaded with hydrogenotrophic methanogens (mostly *Methanolinea*) and *clostridium* population. The overall treatment yielded 69.8 m³ per influent COD/L per day with 80% COD removal (Charalambous et al. 2020).

2.4.3 Sugar Industrial Wastewater

India stands among the top five countries in the world in sugar production, and they are the prime trades in India, releasing large amounts of sugar effluents with low BOD, COD, total suspended solids, and chemicals like calcium hydroxide, phosphoric acid, and sodium hydroxide (Sreelekshmy et al. 2020). Sugar industry effluents are enriched with organic and inorganic matters such as carbohydrates, nutrients, oil and grease, chlorides, sulfates, and heavy metals. Inappropriate treatments and disposal lead to severe environmental pollution. Conventional methods such as bioenergy, bioproducts, and MFC are developed to utilize the wastewater as the feedstock.

Combined energy generation and wastewater treatment implemented using *Clostridium butyricum* and sugar industry effluents produced a cell potential of 800 mV, with a power density of 8,000 mW m⁻² (Sreelekshmy et al. 2020). *Bacillus subtilis* NG220 was employed to produce polyhydroxyalkanoates (PHA). They obtained 5.297 g/L of PHA, with a growth rate of 0.14 g/h/L using sugar wastewater with maltose (1% w/v) and ammonium sulfate (1% w/v), and it accumulated 51.8% (w/w) of biomass (Singh et al. 2013a). The study by Salem et al. (2017) investigated the efficiency of hydrogen production using sucrose wastewater at different concentrations and immobilized hematite nanoparticles (NPs) and biofilm carriers. Sieved sludge from the wastewater treatment plant is used as the inoculum, and the yield increased up to 0.3 L H₂/g sucrose with the addition of hematite NPs, as compared with the yield of 0.19 L H₂/g sucrose in the suspended medium. Justo et al. (2016) studied beet sugar wastewater as the substrate for the production of biogas. Beet sugar wastewater itself is used as the inoculum, and it yields 235 mL/g COD. The microbial analysis of beet sugar wastewater showed the bacterial genus *Clostridium*, *Rhodobacter*, and archaeal genus *Methanosaeta*.

2.4.4 Oil Factory Effluent

Global palm oil consumption increased to 61.1 million tons in 2015 and is predicted to increase by 50% in 2050 (Yee et al. 2019). Palm oil production was used to produce both solid and liquid wastes by mill processing and plantation. It is estimated that 5–7.5 t of water is required for the 1 t of crude palm oil production, and half of them is discharged as the palm oil mill effluent (POME). POME is the concentrated yellow stream with distinct odor and 95% to 96% water, 0.6–0.7% oil, and 4–5% total solids, with 2–4% suspended solids. POME has high COD and BOD in the rate of 44,300–1,02,696 mg/L and 25,000–65,714 mg/L, and it may lead to severe pollution problems by discharging them without any potential treatment.

Anaerobic digestion is the potential technique employed in the POME wastewater treatment, and it digests the organic contents and simultaneously generates bioenergies, such as biogas, hydrogen, VFA, and methane. Indeed, Lim et al. (2020) showed the VFA accumulation of about 10,500 mg/L as per 43.8% of POME using seed sludge from the palm mill oil. The seed sludge contained both archaea and bacteria. The order of archaea includes *Methanosarcinales*, and the bacterial phylum includes *Proteobacteria*, *Bacteroidetes*, *Firmicutes*, and *Actinobacteria*.

In anaerobic digestion, two-stage fermentation is a unique form where two reactors are employed: acid formers and methane formers. Krishnan et al. (2016) used an upflow anaerobic sludge blanket reactor (UASB) for the first stage and a continuously stirred tank reactor (CSTR) for the second stage for sequential hydrogen and methane production using POME as the substrate at 55°C and pH 5.5. The granular sludge from the POME treating unit acted as an inoculum. A significant rise in hydrogen production up to 175.15 ml H₂/g MLVSS d (MLVSS-mixed liquor volatile suspended solids) with the production rate of 2.1 L/d was observed. VFA composition in the reactor increased to a maximum of 8,800 mg/L at the organic loading rate (OLR) of 125 kg/m³. VFA composition includes butyric acid, valeric acid, acetic acid, and propionic acid, where propionic acid accumulation is slightly higher than other acids. COD removal also increased to 80% at the OLR of 75 kg/m³. The overall performance of two-stage fermentation reached a hydrogen yield of 49.22 ml/g COD and a methane yield of 155.87 ml/g COD at the optimum OLR of 75 g COD/l-d. This two-stage operation fermentation is highly preferable for COD removal and VFA, hydrogen, and methane production using POME as a substrate.

2.4.5 Pulp and Paper Industrial Wastewater

Paper and pulp industry wastewater is low in BOD, dark brown in color due to chromophores in its lignin and phenolic content (Akolekar et al. 2002). The wastewater sludge from the pulp and paper industry contains lavish organic material and creates coloration and toxicity in the water bodies. The presence of organic residues in the sludge makes it a potential substrate for biogas production using anaerobic digestion. During the 1990s, anaerobic digestion has gained more interest in treating the sludge from the pulp and paper industry (Puhakka et al. 1992; Rintala and

Puhakka 1994). The energy trapped in the organic matter can be transferred to methane to produce vehicle fuels like biogas or electricity (Karlsson et al. 2011). The use of anaerobic digestion has many advantages over conventional methods, like sludge volume reduction by 30–70%, methane production, rate of pathogen destruction, nonsophisticated equipment requirement, cost-effectiveness with low capital and operating cost, and applicability in different scales (Ekstrand et al. 2013; Zwain et al. 2013). Various anaerobic bacteria used for the digestion process that produces biogas, including methane, can be exploited in this method.

The anaerobic digestion of paper sludge was improvised by codigestion methods to increase the biogas yield. The results by Priadi et al. (2014) indicated that the paper sludge and the cow manure mixture yielded 18-folds higher methane (269 mL/g VS) compared to the paper sludge (14.7 mL/g VS) treatment. Moreover, Lin et al. (2011) also suggested that codigestion of pulp and paper sludge along with the monosodium glutamate waste liquor enhances methane yield.

The production process followed in the paper and pulp industries significantly influenced raw materials on methane production (Ekstrand et al. 2013). The carbon-nitrogen ratio is crucial in the AD since it dramatically affects the yield and an influential factor to impact the anaerobic bacterial growth. The optimal range of the C:N ratio for significant biogas production would be between 20/1 and 30/1 (Li et al. 2011).

2.4.6 Sago Industrial Wastewater

Sago industries process the tubers of tapioca, *Mannihot utilisema*, to produce the edible starch called sago. A vast quantity of water (20,000 to 30,000 L) is required to process a ton of sago, where an equal amount of highly organic, foul-smelling, acidic wastewater is released. Various anaerobic technologies, including conventional anaerobic treatment, high-rate treatment such as anaerobic filters, and fluidized beds, have been used to treat sago wastewater. Production of methane, ethanol, and biogas used sago industrial wastewater as the substrate.

Ethanol was retrieved from the treated waste of sugary or starchy crops such as corn, sugarcane, barley, wheat, wood, and paper pulp industries. Cassava became an alternative for corn and sugarcane for its low cost and high yielding capacity. Instead of using raw feedstocks, liquid waste from sago industries was employed for its zero-cost carbon source (Cremonez et al. 2016). *Saccharomyces cerevisiae* is isolated from batter and molasses used as the microbial inoculum for ethanol production from sago industrial wastewater. The wastewater was saccharified by adding hydrochloric acid (HCl) and sulfuric acid (H_2SO_4) and allowed to ferment under anaerobic conditions for 16–18 days at 28°C. *S. cerevisiae* from molasses outpaced the *S. cerevisiae* isolate from the batter, with an increased ethanol recovery with 100% purity (Subashini et al. 2011).

The sago wastewater treated in an anaerobic fluidized bed reactor yielded 59–66.3 L/day of biogas to remove 82% of the COD (Saravanane et al. 2001). Elaiyaraju and Partha (2012) developed an anaerobic batch reactor set up to monitor the formation of biogas using sago wastewater. Two reactors with different feed inputs were set up (750 mL and 1,250 mL feed), and the biogas generated from the reactors was found to be 3393 mL/L

and 3068 mL/L, respectively. The liberated biogas was analyzed, and it was found that about 65–70% was methane, and the remaining 20–25% was CO₂. The screened sludge sample consisted of *Methanosarcina mazei* and *Methanothrix soehngenii*. Banu et al. (2006) reported that anaerobically treated sago industrial wastewater using the hybrid reactor generated 30.7 m³/d of biogas within 5.9 h, eliminating 83% of the COD.

Furthermore, the wastewaters from sago industries, local waste, and textile industries added in the ratio of 17:33:50 in the single reactor and produced biogas around 2.8 L in 17 days with maximum COD removal (Kowsalya and Poovitha 2018). Taken together, this method is considered as cost-effective when compared to other conventional methods of treatment, because when the wastewaters are combined, there is no requirement of chemicals for the pretreatment, and the end product biogas serves as a valuable source of energy.

2.4.7 Brewery Industrial Wastewater

Brewery industries are prominent in the country's economy, being a large consumer of water, liberating 70% of water as wastewater (Valta et al. 2015). This wastewater constitutes yeast and leftover grains, which are a primary pollutant to the environment. The wastewater also consists of nitrogen, phosphorus, and other organic matter; hence, it is unfit for different applications (Dvořák et al. 2014). Sivagurunathan et al. (2015) investigated hydrogen production from beverage wastewater using heat-treated compost as the inoculum. They produced energy at the rate of 641 kJ/L-d, with efficiency to replace 24% of the electricity of the beverage industry. The screened compost consisted of eight bacterial groups, namely, *Clostridium butyricum*, *C. tyrobutyricum*, *C. celerecrescens*, *C. pasteurianum*, *C. acetobutylicum*, *Klebsiella oxytoca*, *Selenomonas lacticifex*, and *C. perfringens*.

Brewery wastewater treated in anaerobic membrane bioreactor had biogas production of 0.53 L/g and, simultaneously, COD removal of 98% (Chen et al. 2016). *Chlorella protothecoides* was one of the known microalgae for bio-oil production. Anaerobically treated brewery water is used for the cultivation of *C. protothecoides* and yields a cell density of 1.25–1.84-fold. This study concluded that anaerobic brewery wastewater would act as the economical medium for *C. protothecoides*-based biodiesel production (Darpito et al. 2015).

Di Biase et al. (2018) estimated biogas production at a maximum of 0.34 m³-CH₄ kg-COD⁻¹ at 18 d HRT using brewery wastewater as the substrate. Brewery wastewater is highly suitable for hydrogen production with its physicochemical properties and residual sugars; besides, COD and nitrogen support anaerobic digestion (Arantes et al. 2017; Hay et al. 2017). *Enterobacter* and *K. pneumoniae* were used as the inoculum for the hydrogen production using brewery wastewater, and it yielded 0.80–1.67 mol mol⁻¹ glucose (Estevam et al. 2018).

2.4.8 Distillery Industrial Wastewater

In ethanol production units, large amounts of fermentation residue and wastewater are produced. Bioethanol industries release 9–18 gallons of waste stream called

vinasse during bioethanol distillation, disturbing the environment by polluting nearby water bodies. Central Pollution Control Board, India (2009–2010), reported that distillery wastewater contains toxic phenolic compounds of lignin, furfural, and hydroxymethylfurfural that may lead to recalcitrance and less degradability. The presence of different sugars like sucrose, glucose, xylose, and hemicellulose makes it meritorious for bioenergy production (Kamalaskar et al. 2010).

Vinasse is acidic and enriched with organic matter (COD = 50 – 150 g/L). The tequila industry–released vinasse was treated by anaerobic digestion using anaerobic sludge from the brewery wastewater used as inoculum. Hydrogen and methane are produced at a rate of 38.3 H₂-ml/gVSS-h and 24.3 CH₄-ml/gVSS-h, respectively, along with removing 83% volatile solids (VS).

The wastewater contained sucrose used for hydrogen production using microorganisms such as *Fusiform bacilli* and *Clostridium* species in the fermentation process (Salem et al. 2017). Interestingly, iron and nickel nanoparticles act as enhancers in ferredoxin-dependent hydrogenase activity and increased hydrogen generation (Gadhe et al. 2015). Likewise, Malik et al. (2014) used distillery wastewater as a substrate in the concentration of 110 g/L with iron oxide nanoparticles of 50 mg/L at pH 6 and obtained 380 mL of hydrogen (62.14% hydrogen content). Different bio-reactors such as biofilm-based reactor, hematite NPs–based reactor, and granular-based reactor operated to better hydrogen production and for COD reduction. As compared with other reactors, the granular-based reactor and hematite NPs–based reactor yield 0.39 L-H₂/g- sucrose, with an efficiency of 75% and 57.7%. The hematite NPs–based reactor acted better than granular-based reactors in COD reduction and achieved 76% COD reduction. Biofilm-based reactor showed the lowest productivity of 0.1 L-H₂/g- sucrose, with an efficiency of 19%.

Alcohol wastewater was treated for hydrogen production using an upflow anaerobic sludge blanket (UASB) and yielded 125 mL H₂/g COD (Poontaweegeratigarn et al. 2012). While under thermophilic conditions (55°C), hydrogen produced 130 ml H₂/g COD. Further, alcohol wastewater added with fermentation residue subjected to hydrogen production yielded maximum at the rate of 1,390 ml H₂/g MLVSS (Intanoo et al. 2014). Liquid waste left over from starch-based feedstocks is called stillage. Stillage is usually acidic, with high total solids (TS 11.4%), volatile solids (VS 10.4%), and organic matter (COD 203 g/L), and limited alkalinity and nitrogen (<1 %). The biogas is produced via anaerobic codigestion to compensate for the drawbacks, like low alkalinity and nitrogen. Cassava stillage treated by anaerobic sequencing batch reactor under thermophilic condition (55°C) yielded methane of about 220 L/kg COD and removal of total COD and soluble COD in the range of 91–87%, attained in the HRT of ten days (Luo et al. 2010).

2.4.9 Biodiesel Industrial Wastewater

Biodiesel industries used to discharge large amounts of wastewater (20–120 L) during the wet washing process (Daud et al. 2015), and it has a high composition of oil, grease, methanol, soap, and glycerol. It constitutes the vast contents of COD, BOD, and suspended solids with a varied range of pH.

Crude glycerol is the primary by-product of biodiesel, where every 100 lbs of biodiesel produced have leftover of 10 kg of glycerol. Crude glycerol constitutes 50–60% glycerol, 12–16% alkali soaps and hydroxide, and 15–18% methyl ester (biodiesel and 2–3% water (Oh et al. 2011). Processing crude glycerol for methane production via AD is economical, and it is a recycled process to utilize heat and electricity for biodiesel plants. Immobilized biofilm-forming *B. amyloliquefaciens* CD16 synthesized 120 L H₂/L CG during 120 days of continuous fermentation (Manish Kumar and Khushboo Khosla 2017). *B. thuringiensis* strain EGU45, non-biofilm-forming bacteria, produced 100 L H₂/L CG (Prakash et al. 2018a). Similarly, crude glycerol codigested by *Klebsiella sp.* generated 9.8 L H₂/g substrate, with 44% of the total biogas (Chookaew et al. 2014).

The production of lipids and carotenoids is mainly by yeast strains, *Rhodotorula glutinis*, and *R. mucilaginosa*. Cells cultured in the medium containing glycerol waste fraction and potato wastewater increased the biosynthesis of lipids to 10.5–15.2 g/100g_{d.w.(dry weight)}, with an average yield of carotenoids about 230 µg/g_{d.w.} as compared with the control medium (7.1–9.8 g/100g_{d.w.}) (Kot et al. 2019). Crude glycerin is another by-product of biodiesel production. Chookaew et al. (2014) studied hydrogen production from crude glycerin using MFC or microbial electrolysis cell. They reported that it yielded 0.55 mol H₂/mol of glycerin under the conditions of COD at 0.55 kg/m³ d pH 7 and 35°C. Two-stage anaerobic sequencing batch reactors process with 6.5%, 63.5%, and 30% of hydrogen, methane, and carbon dioxide, respectively, using biodiesel wastewater with glycerin fraction (Tangkathitipong et al. 2017).

2.5 MICROORGANISMS INVOLVED IN ANAEROBIC DIGESTION

Wastewater contains diverse microbial species to metabolize different substances present in it, and it is essential to characterize and segregate them to increase high productivity and reduce harmful effects (De Rossi et al. 2017). The process involves the participation of numerous anaerobic and facultative anaerobic species of microorganisms, such as hydrolytic, acid-forming, acetogenic, and methanogenic microbes (Lim et al. 2018).

Among a variety of microorganisms, such as archaea, bacteria, fungi, and algae population, bacteria are prominent in the anaerobic digestion of wastewater (Li et al. 2020). Bacterial species of *Chloroflexi*, *Firmicutes*, *Proteobacteria*, *Acidobacteria*, *Synergistetes*, and *Actinobacteria* phylum are prominent in methane production using wood vinegar wastewater. *Firmicutes* and *Proteobacteria* are symbiotic in nature and well-known methanogens. They can potentially assimilate carbohydrates and polycyclic aromatic hydrocarbons as carbon sources (Cheng et al. 2013). *Synergistetes* and *Actinobacteria* play a significant role in the degradation of organic acid and glucose (Honda et al. 2013). *Chloroflexi* and *Proteobacteria* are used to degrade phenols and yield volatile organic acids (Rosenkranz et al. 2013; Enaime et al. 2020). The distillery wastewater-fed MFC is abundant with the microbial community of *Bacteroidia* (52%) among the bacterial community (Ha et al. 2012).

The class *Halanaerobiales* are the prime hydrolyzers, and *clostridia* are strong fermenters in municipal wastewater treatment (Guo et al. 2015). The oil mill effluent digester is enormous, with a population of *deltaproteobacteria* and *gammaproteobacteria* species (Enaime et al. 2020). The order *Clostridiales* (*Firmicutes*) was dominant among the four full-scale anaerobic digesters of energy crops, manure, and food waste (De Vrieze et al. 2014). The dry batch anaerobic codigestion of food waste and cardboard are prominent with the order *Clostridiales* (Capson-Tojo et al. 2017). The order *Bacteroidales* (*Bacteroidetes*) are abundant in the studies of 43 household biogas digesters (Rui et al. 2015) and four full-scale anaerobic digesters (De Vrieze et al. 2014). *Bacteroidaceae* was the dominant family among the fermentation system (Guo et al. 2015). The fermentation of lipid-rich wastewater with oils and long-chain fatty acids (LCFA) is predominant with *Synergistaceae*, *Thermobaculaceae*, and *Syntrophophaceae*. *Synergistaceae* are used to degrade LCFA to VFA but are unable to degrade glycerol. This bacterial group was concluded as the LCFA degrader (Zhu et al. 2017).

The genera *Clostridium*, *Treponema*, *Eubacterium*, *Thermoanaerobacter*, and *Moorella* play a significant role in acetate production in anaerobic digestion (Guo et al. 2015). Even *Desulfovibrio* species are well-known in the degradation of glycerol and reduction of sulfate (Zhu et al. 2017; Nakasaki et al. 2020). The genera *Acetobacterium*, *Delfovibrio*, *Syntrophomonas*, and *Syntrophorhabdus* are responsible for organic acidification (Pérez Bernal et al. 2017). The genera *Desulfovibrio*, *Anaerolineae* (*Chloroflexi*), and *Syntrophorhabdus* show characteristics of detoxification, degradation of aromatic aldehydes, and aromatic compounds like furfural (Rosenkranz et al. 2013; Li et al. 2020).

The functional consortia of *Methanosacrina* and *Methanosaeta*, together with proliferation with the enzymatic encoding genes (Ack, PTA, ACSS), are evident in the acetoclastic methanogenesis in the anaerobic digester (Guo et al. 2015). *Methanosacrina* helps in acetoclastic methanogenesis for the anaerobic digestion of sewage sludge in methane production (Liu et al. 2016). *Methanoculleus* was a type of methanogen used to produce methane (Li et al. 2013; Enaime et al. 2020). The species *Methanosarcina mazei* and *Methanothrix soehngenii* were used in the anaerobic digestion of sago industrial wastewater for the production of biogas (Elaiyaraju and Partha 2016).

Comparing bacteria and archaea, the presence of fungal and algal community is negligible in the anaerobic digestion of wastewater. The anaerobic digester contained glycerol waste fraction, and potato wastewater used fungal species *Rhodotorula glutinis* *R. gracilis* and *R. mucilaginosa* as the inoculum to produce lipids and carotenoids (Kot et al. 2019). The fungi *R. oligosporus* metabolized the food wastewater to produce chitosan, industrial enzymes, adsorbents, and animal feed (Nitayavardhana and Khanal 2010; Wikandari et al. 2012; Ferreira et al. 2013). The freshwater microalgae *Chlorella sorokiniana* was used to remediate agro-industrial wastewater and methane produced in the range of 518 mlg/COD (Hernández et al. 2013).

The different microorganisms involved in the anaerobic digestion of wastewater to produce bioenergy and value-added products are detailed in the following Table 2.2.

Table 2.2 List of Microorganisms Involved in the Production of Bioenergy and Bioproducts Using Wastewater as the Substrate

S. No	Microorganisms Involved	Type of Industrial Wastewater	Bioreactor Type	Products	Yield	Reference
1	Anaerolineaceae, Clostridium, Desulfovibrio, Rikenellaceae, Treponema, Leptospirales, Synergistaceae, and Syntrophaceae	Lipid-rich wastewater	Fed-batch anaerobic digestion	Methane	400 mL L ⁻¹ d ⁻¹	Nakasaki et al. (2020)
2	Anaerolineae, Aminicenantes, and Acetobacterium	Wood vinegar wastewater	UASB reactor	Methane	2,000–2,500 ml	Li et al. (2020)
2	Methanosarcinales, Proteobacteria, Bacteroidetes, Firmicutes, and Actinobacteria	POME	Sequencing batch reactor	VFA	10,500 mg/L total VFA	Lim et al. (2020)
3	Clostridium butyricum	Sugar industry effluent	-	Power generation	8,314 mW m ⁻²	Sreelekshmy et al. (2020)
4	Rhodotorula glutinis, R. gracilis, and R. mucilaginosa	Glycerol waste fraction and potato wastewater	-	Lipids and carotenoids	10.5–15.2 g/100 gd.w	Kot et al. (2019)
5	B. thuringiensis strain EGU45	Crude glycerol	Continuous culture digestion	Hydrogen	65.5–73.0 L/L CG	Prakash et al. (2018a)
6	B. amyloliquefaciens CD16	Crude glycerol from the biodiesel industry	Continuous culture digestion	Hydrogen	165 L/L CG	Prakash et al. (2018b)
7	Enterobacter and K. pneumoniae	Brewery wastewater	Batch anaerobic reactor	Hydrogen	0.80–1.67 mol H ₂ mol ⁻¹ glucose	Estevam et al. (2018)
8	Fusiform bacilli and Clostridium species	Sucrose wastewater	CSTR bioreactor	Hydrogen	5.9 mol-H ₂ /mol-sucrose	Salem et al. (2017)
9	Clostridium, Desulfovibrio, and Treponema	Glycerol-rich lipid wastewater	UASB	Methane	92 ± 5 mL-CH ₄ /gVS	Zhu et al. (2017); Nakasaki et al. (2020)

(Continued)

Table 2.2 (Continued)

S. No	Microorganisms Involved	Type of Industrial Wastewater	Bioreactor Type	Products	Yield	Reference
10	<i>C. butyricum</i> , <i>C. tyrobutyricum</i> , <i>C. celerecrescens</i> , <i>C. pasteurianum</i> , <i>C. acetobutylicum</i> , <i>Klebsiella oxytoca</i> , <i>Selenomonas lacticifex</i> , and <i>C. perfringens</i>	Brewery industrial wastewater	Immobilized cell reactor	Hydrogen	20 g/L _{hexose equivalent}	Sivagurunathan et al. (2015)
11	<i>Chlorella protothecoides</i>	Anaerobically treated brewery water	Anaerobic digestion	Bio-oil	17.40 ± 0.07 to 43 ± 2% total FAME content	Darpito et al. (2015)
12	<i>Klebsiella</i> sp.	Crude glycerol	UASB	Hydrogen	242.15 mmol H ₂ /L/d	Chookaew et al. (2014)
13	<i>Bacillus subtilis</i> NG220	Sugar wastewater	–	poly β-hydroxybutyrate	5.297 g/L	Singh et al. (2013a)
14	<i>Chlorella sorokiniana</i>	Agro-industrial wastewater	Photobioreactors	Methane	517.5 mL CH ₄ g COD ⁻¹ added	Hernández et al. (2013)
15	<i>R. oligosporus</i>	Food wastewater	Aerobic and microaerobic conditions	Chitosan, industrial enzymes, adsorbents, and animal feed	0.38–0.47, 0.19–0.22, and 0.31–0.38 g/g on glucose, xylose, and a mix of sugars consisting of cellobiose, glucose, xylose, arabinose, galactose, and mannose	Wikandari et al. (2012)
16	<i>Methanosarcina mazei</i> and <i>Methanothrix soehngenii</i>	Sago wastewater	Anaerobic codigestion	Biogas	Gas composition CH ₄ 80% and CO ₂ 20%	Elaiyaraju and Partha (2012)
17	<i>Plasticumulans acidivorans</i>	Wastewater from wastewater treatment plant	Sequencing-batch bioreactor fed with acetate	PHA	89 % (w/w) PHA	Jiang et al. (2011)

2.6 GENETIC ENGINEERING IN WASTEWATER MANAGEMENT

The production of bioenergy and bioproducts from wastewater depends on the microorganisms involved in it (Srivastava et al. 2018). Theoretically, different species of microorganisms prefer different types of substrates for the efficient production of biofuels under anaerobic conditions. However, under experimental conditions, some inhibitors present in the wastewater cause toxicity to microbial growth and result in low product yield. It is, therefore, vital to employ genetic engineering approaches to transform microorganisms to adapt to the adverse conditions of the wastewater. For strain improvement and increase in the efficiency of production, random chemical mutagenesis, gene shuffling, and UV exposure are commonly used. To target specific genes or pathways, methods like silencing or overexpressing genes and introducing new genes from other microorganisms are in practice to optimize and improve production (Prelich). For example, the yeast *S. cerevisiae* transformed by the deletion of the GPD2 gene (glycerol 3-phosphate dehydrogenase) and overexpression of the GLT1 gene (glutamate synthase) improved with 4% sugar consumption capacity for minimum glycerol concentration. It increased the rate of NADH to NAD⁺ cofactor. It also acquired the efficiency to grow under high temperatures and high ethanol (Abreu-Cavalheiro and Monteiro 2013).

E. coli is one of the most preferred species for metabolic engineering techniques to regulate the pathway and adoption process (Huffer et al. 2012). A study has shown that a genetically engineered *E. coli*, by introducing the overexpression of genes from *Z. mobilis* (for ethanol production) and gene from *Acinetobacter baylyi* strain ADP1 for the enzymes wax ester synthase/acyl-CoA:diacylglycerol acyltransferase, increased the simultaneous production of biodiesel and ethanol (Lin et al. 2013). Another study demonstrated that *E. coli* engineered by the addition of acyl-acyl carrier protein thioesterase allowed it to utilize glycerol as feedstock and improved the free fatty acid (FFA) production overexpression of NAD⁺ kinase and transhydrogenase enzymes. This engineered strain yielded 83% of the theoretical value (g FFAs/g glycerol) with crude glycerol as the substrate (Wu et al. 2014). Metabolic engineering has been well-illustrated in a study with *E. coli* MG1655 by combining genes from *C. acetobutylicum* (thlA, adc), *E. coli* (atoDA), and *C. beijerinckii* (adh) to improvise the isopropanol biosynthesis pathway. It generated increased isopropanol production by using the liquid stream of acetic acid released as a by-product of syngas production. The development of synthetic microbial cells by modern biotechnology techniques has increased the utilization of different resources to produce bioenergy, solvents, and bioproducts.

2.7 CHALLENGES AND FUTURE PROSPECTS

Wastewater is a vital source to produce many environmentally friendly fuels, like biogas and biodiesel. AD is a complex mechanism with different parameters. Many physical and chemical factors are involved in the optimization of overall anaerobic

digestion. To increase the productivity, we have to control the parameters. The organic matter involved in the anaerobic digestion is used to promote the preferable environment for the optimum metabolic functioning of the microorganisms in its bioprocessing. Wastewater is a complex organic matter with loads of microorganisms and decomposed residues. Wastewater as the organic source for anaerobic digestion is advantageous while, at the same time, also challenging to digestors. Productivity may increase or decrease as per the composition of wastewater. Quality is the great challenge we are facing in anaerobic digestion. Even after many refinements and compression, biogas still contains some amount of impurities. Even though the gaseous mixture is suitable for its usage in kitchen stoves, water boilers, and lamps, the generated biofuels may corrode the metal parts of the engine if utilized to power automobiles, which might lead to increased maintenance cost. We should focus on the purity and quality of the biogas and bioproducts. Maintenance of temperature is challenging in the presence of a mixture of microorganisms. Microbial methanogenesis occurs in the temperature between 2 and 100°C (Magonigal et al. 2004). The growth of mesophilic and thermophilic microbes is highly responsible for the metabolic degradation of organic matter (Scaglia et al. 2014). Screening of the microbial composition in wastewater is effective in performing and controlling the parameters for the successive anaerobic digestion. We can improvise the anaerobic digestion using wastewater by designing the digesters with advanced features and controls (Daud et al. 2015). In the future, the application of anaerobic digestion in the treatment of wastewater could prove extremely useful to humankind. Wastewater treatment using anaerobic digestion has various advantages, such as reducing greenhouse gas emissions by capturing the methane gas that might otherwise be lost in the atmospheric gases. It also contributes to climate change mitigation by replacing fossil fuel usage. Apart from environmental benefits, various economic benefits are associated with using anaerobic digestion in waste treatment technologies. When food wastes are incorporated into anaerobic digesters, savings are increased twofold by reducing energy costs via on-site production. Food and beverage processing facilities can also leverage the same benefits on-site, but the introduction of food waste into wastewater treatment facilities has become increasingly popular in recent years.

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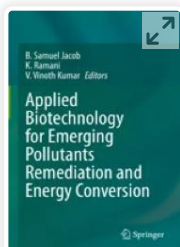
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Metabolic Engineering Approaches for Bioenergy Production

[Reghunathan Sarath](#), [Rajathirajan Siva Dharshini](#),
[Ramachandran Srinivasan](#) & [Mohandass Ramya](#) 

Chapter | [First Online: 11 May 2023](#)

55 Accesses

Abstract

Bioenergy has already proven to be the most efficient source of energy in terms of production and environmental factors. Considering the rapid depletion of the fossil fuel backup available, bioenergy will be a major source of energy in the upcoming generation. Currently, available bioenergy types are capable of producing power at a limited amount, which can be solved using recent molecular techniques. The native microbial populations are highly efficient with different

mechanisms for the energy conversion. Microbes with industrial applications also have limitation and inhibitory factors in them. Metabolic engineering is the tool to manipulate industrial microbes for maximum utilization and energy production. The strain development plays a vital role in bioenergy production from feedstocks. Removing and altering the pathway mechanism improves the application of the strains in industries. In this chapter, we summarized the recent advancement of metabolic engineering and synthetic biology approaches for enhancing bioenergy production in industrially important strains. Gene mutagenesis is an efficient strategy to generate strains with highly desired products. Here, we provide an overview of conventional and recent approaches such as CRISPR/Cas system, Intron-mediated targeting, Antisense RNA, and other strategies for strain improvement.

Keywords

Bioenergy Fossil fuel depletion

Metabolic engineering Strain improvement

Reghunathan Sarath and Rajathirajan Siva Dharshini contributed equally to this work in all attributes.

Reghunathan Sarath performed conceptualization and interrupted the draft. Rajathirajan Siva

Dharshini drafted the manuscript and revised it.

Mohandass Ramya designed sections and supervised the manuscript. Ramachandran



Chapter

Marine Natural Products and Chemistry

From Origin to Pharmaceuticals

By *Jeyapragash Danaraj, Saravanakumar Ayyappan*

Book [Marine Biochemistry](#)

Edition	1st Edition
First Published	2022
Imprint	CRC Press
Pages	20
eBook ISBN	9781003303909

ABSTRACT

This chapter discusses the significance of marine natural products for therapeutics and the sources for new biological activities and chemical structural diversity. Marine natural products emerged in the late 19th century, and biotechnology appeared as a field that provided the direction to undertake marine sources for drug development after 1980. From previous findings, it shows a clear picture that the marine environment



Climate Change Impact on Groundwater Resources pp 257–278 | [Cite as](#)

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Climate Change Impacts of Nitrate Contamination on Human Health

[Jeyaragash Danaraj](#), [Uthirakrishnan Ushani](#), [Sybiya Vasantha Packiavathy](#), [Jeba Sweetly Dharmadhas](#), [Tamilarasan Karuppiyah](#), [S. Anandha Kumar](#) & [E. S. Aooj](#)

Chapter | [First Online: 25 August 2022](#)

242 Accesses

Abstract

Global climate change has become a major concern in recent years as it threatens human health by altering the hydrobiological systems and their water resource quality with increased nitrate concentration, which is considered to be a paradigmatic pollutant in groundwater, based on the climatic forecasts of temperature and precipitation patterns for the years 2021 and 2050. The consequences of decreased water availability and increased nitrate concentration are premature death and serious health issues such as colorectal cancer, thyroid disease, and neural tube defects in human beings. Therefore, nitrate pollution in groundwater is a universal problem and has been the major focus of researchers' agenda for

ALGAL FUNCTIONAL FOODS AND NUTRACEUTICALS

BENEFITS, OPPORTUNITIES AND CHALLENGES

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Nanometal Oxides in Horticulture and Agronomy

Nanomaterial-Plant Interactions

2023, Pages 203-218

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Chapter 11 - Role of metal oxide nanoparticles in the plant/rhizosphere microbiome

Jeyapragash Danaraj¹, Rajiv Periakaruppan^{2,3}, Yosuva Mariasingarayan⁴, Subasankari Kumaresan⁵

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Abstract

Nanotechnology has become an essential part of developing sustainable agriculture and its various industrial applications and its interaction with the environment has raised a serious concern owing to its release directly to the environment. All metal and metal oxide nanoparticles influence the plant growth and communities, resulting in the decrease in their growth and development. Generally, the metal and metal oxide nanoparticles either enhance or inhibit the plant growth and development.

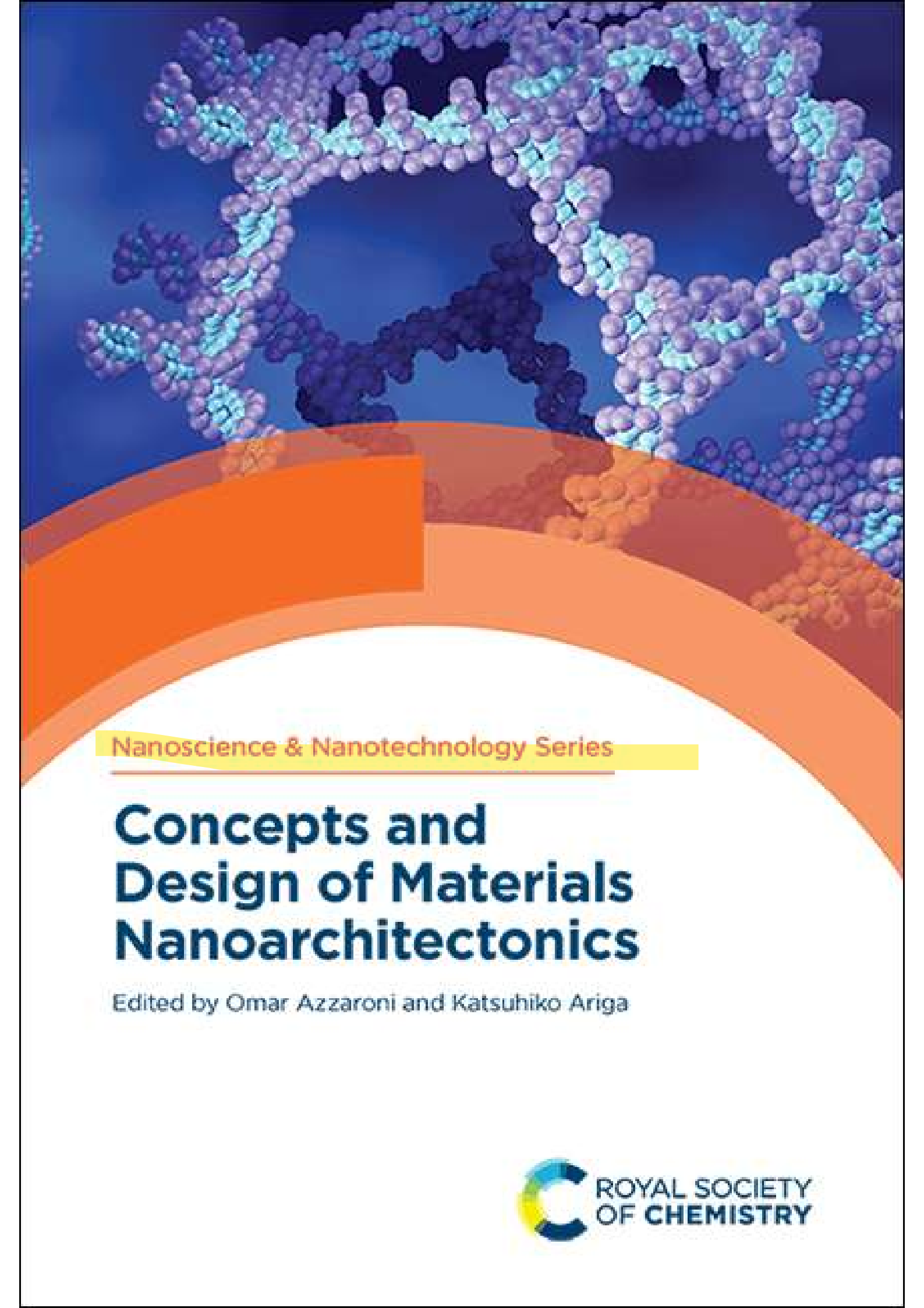
Green-synthesized nanoparticle-based polymer nanocomposites: synthesis, characterizations, and applications

Antony V. Samrot¹, Subramanian Saigeetha², Nagarajan Shobana³ and Kumar Chandrasekaran⁴

¹*School of Bioscience, Faculty of Medicine, Bioscience and Nursing, MAHSA University, Selangor, Jenjarom, Malaysia* ²*Department of Biotechnology, School of Biosciences and Technology, Vellore Institute of Technology, Vellore, Tamil Nadu, India* ³*Department of Biotechnology, School of Bio and Chemical Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India* ⁴*Centre for Ocean Research (DST—FIST Sponsored Centre), MoES—Earth Science & Technology Cell, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India*

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The top half of the cover features a complex, multi-colored molecular structure (purple, blue, and cyan) against a dark blue background. Below this, a large, stylized orange arc curves across the middle of the page, framing the title area.

Nanoscience & Nanotechnology Series

Concepts and Design of Materials Nanoarchitectonics

Edited by Omar Azzaroni and Katsuhiko Ariga

Chapter Seven - Nanomaterials as a tool for soil remediation in sustainable agriculture

Sumit Chaturvedi ^a, R. Govindaraju ^b, P.S. Vijayakumar ^c, K. Elango ^d, M. Kannan ^e  

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Abstract

Present agriculture faces multiple challenges, such as declining crop yields per unit of factor utilized, increased biotic and abiotic stresses, including nutrient deficiency, environmental pollution and changing climatic pattern. The nanotechnology has offered promising applications for efficiency centric management for sustainable development of agriculture to feed the ever-increasing population of the world. The unique properties of nanoparticles facilitate better efficiency than their bulk material. The present trend of injudicious applications of agri-inputs has deteriorated the soil quality with pollutants and contaminants. Nanotechnology offers unique opportunities in agriculture with increased efficacy, reduced cost, and large-scale applications. Application in soil health, nutrition of crops, pest management, remediation of contaminated sites etc. can be promising tool. The scientific reports to date indicate that nanotechnology is an efficient, fast, and cost-effective alternative to traditional technologies. However, little is known about the mechanisms, its life cycle and safety in ecosystems. It is necessary to make deep studies on evaluating the effect of nano materials at ecosystem level particularly its impact on soil health, microorganisms, food quality and human health to prevent any adverse impact.



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Keywords

Nanomaterials; Soil; Contamination; Remediation; Agriculture

Narendra Kumar Sharma
Aditya Arya *Editors*

High Altitude Sickness – Solutions from Genomics, Proteomics and Antioxidant Interventions

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Narendra Kumar Sharma • Aditya Arya
Editors

High Altitude Sickness – Solutions from Genomics, Proteomics and Antioxidant Interventions

Editors

Narendra Kumar Sharma
Department of Bioscience and
Biotechnology
Banasthali Vidyapith
Tonk, Rajasthan, India

Aditya Arya
National Institute of Malaria Research, Indian
Council of Medical Research
New Delhi, India

ISBN 978-981-19-1007-4 ISBN 978-981-19-1008-1 (eBook)
<https://doi.org/10.1007/978-981-19-1008-1>

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Serum and Plasma Proteomics for High Altitude Related Biomarker Discovery

9

Aditya Arya and Amit Kumar

Abstract

Serum and plasma are widely used biological fluids for a large variety of biochemical and pathological tests which have been used since historical times for diagnosis and prophylactic analysis. High altitude physiology and related pathologies are geographically localized socio-economic issues of a large set of population. In the last few decades, considerable research has been done to explore the underlying proteomic changes in serum and plasma of humans as well as in the model organisms. Recent studies have led to the emergence of a number of potential prophylactic and therapeutic targets which enable better and timely diagnosis, effective therapy, and also susceptibility testing of high altitude related illness. As proteome is highly dynamic in time and space, and serum or plasma is known to reflect the proteomic changes in various organs. Although analysis of plasma or serum is an invasive approach, yet the specificity of plasma-based markers holds great promise in diagnostics. In this chapter, we will discuss general approaches to use plasma and serum proteome, followed by examples of potential biomarkers or indicators of hypobaric-hypoxia-induced perturbations.

Keywords

Serum · Plasma · Biomarker · High altitude pathophysiology · Hypobaric hypoxia

A. Arya (✉)

National Institute of Malaria Research, Indian Council of Medical Research, New Delhi, India

A. Kumar

Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

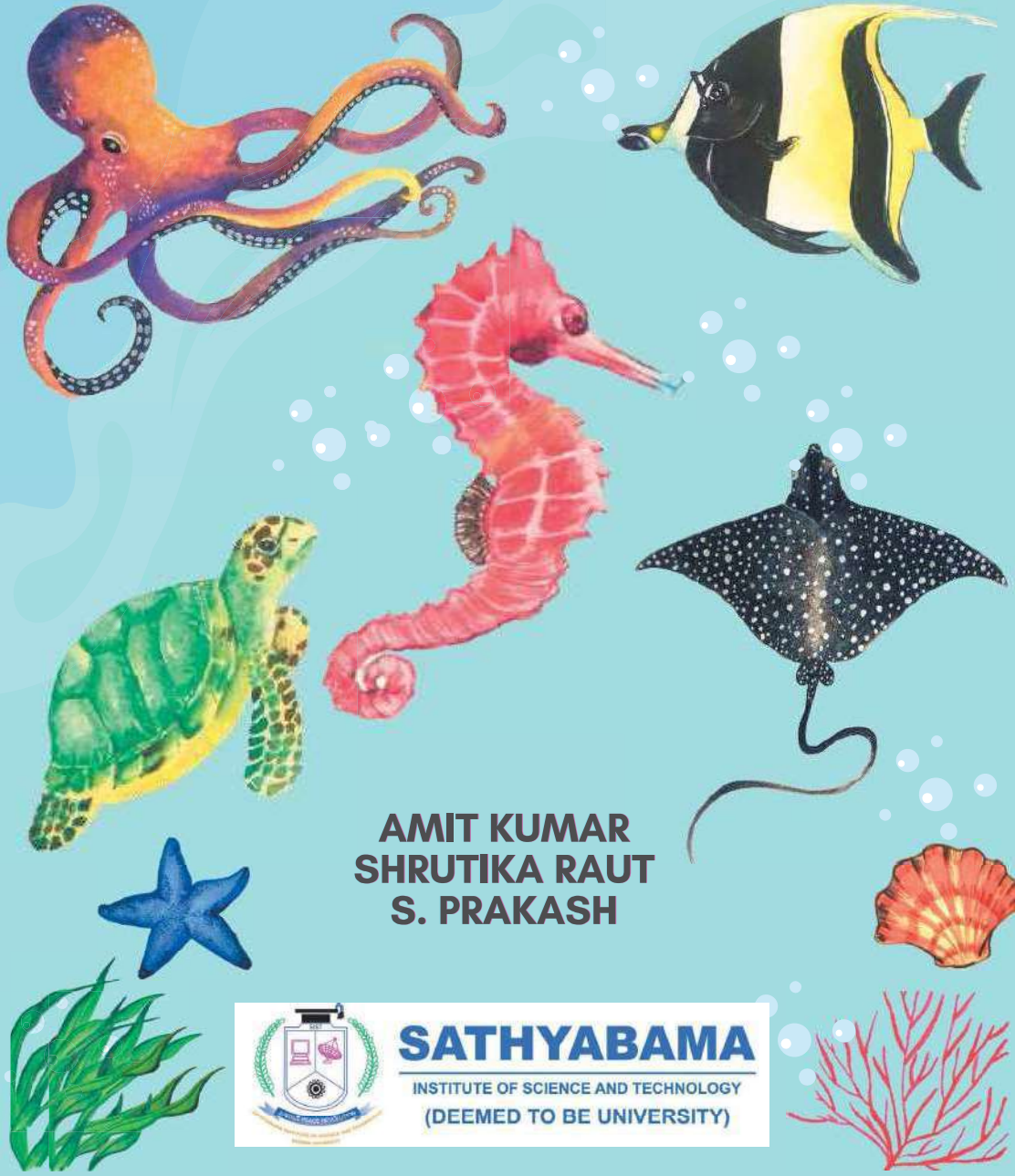
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N. K. Sharma, A. Arya (eds.), *High Altitude Sickness – Solutions from Genomics, Proteomics and Antioxidant Interventions*,
https://doi.org/10.1007/978-981-19-1008-1_9

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FIELD IDENTIFICATION GUIDE

COMMON MARINE AND COASTAL LIFE OF COVELONG, CHENNAI



**AMIT KUMAR
SHRUTIKA RAUT
S. PRAKASH**



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

**Field identification guide to common
marine and coastal life of Covelong,
Chennai**

Amit Kumar

Shrutika Raut

S. Prakash



SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)



ISBN No.: 978-93-83409-76-1

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First Edition: August 2022

Citation: Kumar, A., Raut, S., & S. Prakash 2022. Field identification guide to common marine and coastal life of Covelong, Chennai. Sathyabama Institute of Science and Technology, Chennai. pp. 1-161.

Front and back cover image: Illustrations made by Shrutika Raut.

Author affiliations:

Centre for Climate Change Studies, Sathyabama Institute of Science and Technology, Rajiv Gandhi Salai, Chennai 600119.

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Chapter 9

Antioxidant activity of marine bacterial pigments

S. Bharathi¹, S. Gowri Lakshmi² and M. Radhakrishnan³

¹Research Department of Microbiology, Sri Sankara Arts and Science College (Autonomous), Kanchipuram, Tamil Nadu, India, ²Department of Zoology, PSG College of Arts & Science (Autonomous), Coimbatore, Tamil Nadu, India, ³Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

9.1 Introduction

Pigments are colored molecules with different chemical formulas that can absorb a specific wavelength of light and reflect the rest in the visible spectrum of light (380–750 nm) (Afra et al., 2017). The pigments can be classified as natural or synthetic. Synthetic pigments are produced in industries that use high concentrations of petroleum compounds and heavy metals that have been found to be toxic, allergic, and carcinogenic; this leads to organ damage in humans and harmful to the environment. Synthetic pigments are used extensively because of their increased stability, wide range of spectra, and low cost (Aroumougame, 2021).

Synthetic colorants have been gradually replaced in the pharmaceutical, food, textile, and cosmetic industries by natural pigments which are ecofriendly and nontoxic (Chiba et al., 2006). Natural pigments are synthesized by living organisms such as plants and microorganisms. Colored substances such as yellow, bright red, and orange produced by plants are called plant pigments, which are essential to control photosynthesis, growth, and development of the plants. The different plant growth pigments are chlorophyll, carotenoids, lycopene, and anthocyanin (Sudhakar et al., 2016). Pigments help plants in dispersion of seeds and pollen grains and act as shields for plants against the harmful ultraviolet (UV) and visible light. Under stress conditions, plants synthesize flavonoids and quinones, which are vital because they have the ability to convert light into chemical energy (Tanaka et al., 2008).

Bacterial pigments have attracted more attention than plant pigments, since microbial pigments can be produced rapidly irrespective of seasonal and geographic changes and for their bioactive potential (Venil et al., 2014). Nowadays, research is focusing on the production of coloring material

using microbes. Lycopene is produced by *Streptomyces chrestomyceticus* subsp. *rubescens*. Lutein and zeaxanthin are produced by *Flavobacterium* sp. A wide variety of pigments have been produced from *Rhodococcus*, *Thermomonospora*, *Kitasatospora*, *Nocardia*, *Streptomyces*, *Microbispora*, and *Streptosporangium*. Various species of Phycmycetes fungi, including *Penicillium sclerotiorum*, *Neurospora crassa* (Ascomycetes), and *Rhodotorula aurantiaca* (Deuteromycetes) are prominent producers of β -carotene (Joshi et al., 2003). Yeasts such as *Phaffia rhodozyma*, *Cryptococcus* sp., *Yarrowia lipolytica*, and *Rhodotorula* act as a potential source of microbial pigments. The red pigment astaxanthin, which is produced by animals, is seen rarely in microorganisms, including *Phaffia rhodozyma* (Andrewes et al., 1976). Marine algae *Dunaliella salina*, which belongs to Chlorophyta produces carotene pigment (Joshi et al., 2003).

9.2 Pigments from marine bacteria

The marine ecosystem is considered to be the most important ecosystem that is yet to be explored because of its immeasurable, undiscovered, and fascinating mystery, embodying the proverb “Known is a drop, unknown is an ocean.” The pigments that are produced by marine bacteria include carotene, phenazine, melanin, pyrrole, quinones, and violacein, which have remarkable anticancer, antimicrobial, photoprotective, and immunosuppressive properties (Sogin et al., 2019). A survey has shown that microorganisms from marine environments produce yellow (31.3%), orange (15.2%), brown (9.9%), and red or pink (5.4%) pigments (Aroumougame, 2021). This shows that marine bacteria could be utilized for bioactive pigments (Table 9.1).

Microbial symbionts in polar animals

32

Baskaran Abirami¹, Manikkam Radhakrishnan¹ and Parli V. Bhaskar²

¹Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India; ²National Centre for Polar and Ocean Research, Ministry of Earth Sciences, Vasco-da-Gama, Goa, India

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Introduction

Earth's ecology is driven by microbial ecology; still the biogeography and diversity of microbial communities is not well understood (Curtis & Sloan, 2004). Studies of symbiotic relationships of microbes with the environment and other organisms reveal their ongoing diversification and distance-based isolation. The primary task in identification of microbial diversification is unraveling the influences of isolation from contradictory effects of environmental selection (Banks et al., 2014). Zones surrounding Earth's geographical North and South poles are termed polar regions or frigid zones. Cool summers and cold winters are characteristics of these zones. Consistent daylight, foggy and damp weather, timid cyclones with snow or rain are characteristics of polar summer, while consistent

Chapter 6

Production, Cost Analysis, and Marketing of Citric Acid



Bharathi S and Radhakrishnan M

Abstract Citric acid is the most widely used organic acid in the world, with applications in the food, pharmaceutical, and beverage sectors. This chapter discusses the microbial synthesis of citric acid, methods of fermentation, commercial strain, fermentation media including carbon source, nitrogen source, phosphorus source, trace elements, and fermentation conditions including pH, temperature, aeration, recovery, extraction, cost analysis, and marketing of citric acid.

Keywords Citric acid · Fermentation · Commercial strain · Cost analysis and marketing of citric acid

6.1 Introduction

Citric acid (2-hydroxypropane-1,2,3-tricarboxylic acid) gets its name from the Latin word citrus, which refers to a tree bearing lemon-like fruit. Citric acid is composed of three carboxylic functional groups (Gargul et al. 2019) with pKa values of 3.1, 4.7, and 6.4, respectively. The molecular weight of this tricarboxylic acid is 210.14 g/mol (Max et al. 2010). In plants and animals, citric acid is found to be present in trace quantities since it is the primary metabolite obtained from the tricarboxylic cycle (or Krebs cycle) (Tong et al. 2019) (Fig. 6.1).

Karls Scheel from England was the first person to isolate citric acid from Italian lemon juice in 1874. In 1893, Wehmer first demonstrated the accumulation of citric acid from *Citromyces* (now *Penicillium*) in the presence of sugars and inorganic salts. Currie, an American, pioneered the industrial manufacture of citric acid from *Aspergillus niger* in 1917.

Bharathi S (✉)

Research Department of Microbiology, Sri Sankara Arts and Science College (Autonomous), Kanchipuram, Tamil Nadu, India

Radhakrishnan M

Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

Symbiotic microbes from corals

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S. Bharathi¹ and Manikkam Radhakrishnan²

¹Research Department of Microbiology, Sri Sankara Arts and Science College (Autonomous), Kanchipuram, Tamil Nadu, India; ²Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

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Introduction

Corals are immovable invertebrate marine animals belonging to the phylum Cnidaria and class Anthozoa (Norton, 2006). There are two types of corals: stony and soft corals. Stony corals are the most common types of coral that possess polyps attached to hard surface known as calyx which is formed due to secretion of calcium carbonate. These stony corals are also called as reef building scleractinian corals (Vanwonderghem and Webster, 2020). It has been predicted that scleractinian corals have been around since 425 million years ago that ramified in to 1500 species, and they act as the important builder of coral reef ecosystems worldwide (Pollock et al., 2018). Soft corals including species in subclass Alcyonaria or Octocorallia do not form reefs but are often found in coral reef ecosystem. They are made up of numerous little polyps stabilized by sclerites found in between the



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Chapter 17 - Microbial symbionts from Algae

Rajasekar Thirunavukkarasu¹, Sujith Pushparaj², Mary Shamy Arokiaarajan¹,
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Abstract

Macroalgae are a varied collection of photosynthetic organisms that play an important role in aquatic environments. Macroalgae, like other eukaryotic organisms, have a diverse community of associated microorganisms that play a

Endosymbiotic interactions of actinobacteria with the insects

36

Venugopal Gopikrishnan¹, Manikkam Radhakrishnan¹, Parathasarathy Krupakar¹,
Kaari Manigundan¹, Baskaran Abirami¹ and Sridhar Reshma²

¹Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India; ²Department of Biotechnology, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

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Introduction

Most commonly used antibiotics in medical field is mainly derived from natural products or specialized metabolites made by microorganisms, specifically actinobacteria and filamentous fungi (Chevrette & Currie, 2019; Gholami-Shabani et al., 2019; Hutchings et al., 2019; Lyu et al., 2020). Still, the antimicrobial resistance between pathogens is uncontrolled and well-documented, destruction in antibiotic efficacy (Colavecchio et al., 2017; Richardson, 2017). The speediness of resistance development in the medical field raises questions about how the microbes that make antibiotics preserve their advantageous use over evolutionary time and underscores a need to understand the chemical ecology of microbially formed specialized metabolites.

The actinobacteria contains high GC bacteria, one of the large families with an extensive variety of niches. Representatives of the group can be found in a diversity of habitats, which include soil, rhizosphere, and marine and freshwater systems. There are several important human and animal pathogens with a limited number being pathogenic to plants. The vast majority of actinobacteria are important saprophytes capable of breaking down a wide range of plant and animal debris in the process of decomposition. Some genera such as *Streptomyces* and *Micromonospora* are renowned for their

BIOPROSPECTING OF EARTHWORM CAST ASSOCIATED ACTINOBACTERIA FOR PLANT GROWTH PROMOTING PROPERTIES

Karthika Varthini R¹, Kameswaran A¹, Gayathri V¹, Radhakrishnan³, Manigundan Kaari³,
Kasem Soyong² and Gopikrishnan V^{3*}

¹*Department of Biotechnology, Rajalakshmi Engineering College, Thandalam,
Chennai, Tamil Nadu, India*

²*Department of Plant Production Technology, Faculty of Agricultural Technology, King Mongkut's
Institute of Technology, Landkrabang, Bangkok, Thailand*

³*Centre for Drug Discobiochar Development, Col.Dr.Jeppiaar Research Park, Sathyabama Institute of
Science and Technology, Chennai, India*

**Corresponding author: gopivtk@gmail.com*

ABSTRACT

Earthworm cast and guts are potential sources of high biotechnological interest because of its great diversity of compounds exhibiting a broad spectrum of biological activities. Today, researchers are focusing on novel microbes in unusual and unexplored ecosystems. Actinobacteria are the ubiquitously distributed bacteria and the richest source for bioactive secondary metabolites including antibiotics. The present study designed to isolate the actinobacteria from earthworm cast for its antimicrobial and plant growth promoting properties. Totally 15 actinobacterial colonies were isolated from earthworm cast of Tiruvallur agricultural area, Tamil Nadu, India. All the actinobacterial cultures were screened for antimicrobial activity against one or more test pathogens eg: *Staphylococcus aureus*, *Escherichiacoli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Candida albicans* and *Ralstonia solanacearum*. All the cultures were also screened for Indole Acetic Acid (IAA), Phosphate (P) solubilisation, Extracellular enzyme activities like amylase and lipase. Optimization, characterization and taxonomy also done for the potential strain. Morphologically different colonies were isolated and sub-cultured for screening. In antimicrobial activity, among 15 isolates, EWCA5, 6 and ECA3, 16, 18 were showed antimicrobial activity against one or more tested pathogens eg: *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Candida albicans* and *Ralstonia solanacearum*. Out of 5 isolates, strain EWCA5 showed activity against maximum pathogens and was selected as a potential strain for further screening. EWCA5,9,11 and ECA9 showed Siderophore, extracellular enzyme activities like amylase and lipase. In optimization, carbon, mineral and nitrogen sources increased the activity and also bio-fertilizer production. So, the study revealed that the strain EWCA5 earthworm cast associated actinobacteria will be an imperative resource for biofertilizer applications and also for bio-prospecting that could produce novel bioactive metabolites useful for agriculture applications.

Keywords: Earthworms, antimicrobial activity, taxonomy



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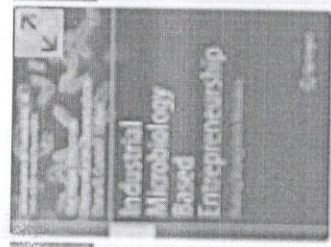
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Abstract

Microbiologists can use entrepreneurial microbiology, a multidisciplinary field that includes the investigation, discovery, and monetisation of living things, food, plants, and biological



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Mass Multiplication, Production Cost Analysis and Marketing of Pectinase

[Kumaran Subramanian](#), [Vijayalakshmi Periasmy](#), [Mahmoud Kandeel](#) & [Vidhya Rekha Umapathy](#)

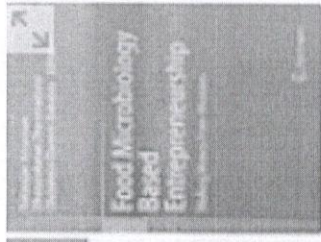
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Part of the [Microorganisms for Sustainability](#) book series (MICRO, volume 42)

Abstract

An enzyme with numerous industrial and commercial uses is pectinase. The widespread use of the investigation, discovery, and monetisation of living things, food plants, and biological



[Food Microbiology Based Entrepreneurship](#) pp 401–410 | [Cite as](#)

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Nanoparticles and Its Application in Food Packaging

[Abel Saka](#), [Kumaran Subramanian](#), [JuleLeta Tesfaye](#), [Lamessa Gudata](#), [N. Nagaprasad](#) & [Krishnaraj Ramaswamy](#) 

[Chapter](#) | [First Online: 01 January 2023](#)

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Abstract

Nano-equipment is the study as well as application of arrangements within choice of 1–100 nanopatterns in width. The meaning of nanotechnology is be contingent on instigate “nano” that is the Greek term to clue dwarf. In supplementary method languages, the term “nano”

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CHAPTER

Concepts of Minimal Intervention: Cavity Design Modifications, Minimally Invasive Preparation Techniques, ART and SDF

Nikhil Marwah, Sivakumar Nuvvula, Dhanraj Kalaivanan, Debarchhana Jena, Deval Kumar Arora, Lalitha Jairam

CHAPTER OUTLINE

- ◆ Principles of Minimal Intervention
- ◆ Minimally Invasive Preparation Techniques
- ◆ Atraumatic Restorative Treatment
- ◆ Cavity Design Modifications
- ◆ Silver Diamine Fluoride

The term minimal intervention is relatively new in dentistry and has been introduced to suggest to the profession that it is time for change in the principles of operative dentistry. Preservation and maintenance of good oral health is the prime objective of every pediatric dentist. Dental caries is the most common childhood disease and multiple etiological factors, including biological, genetic, nutritional, socioeconomic, cultural, and environmental, etc., contribute for it. Treatment of dental caries dependent on the stage of caries progression. Minimally invasive dentistry (MID), has been introduced as a new approach for addressing caries and carious lesion through minimally invasive technique and the preservation of tooth. The original approach to the treatment of caries was purely surgical. It was thought that the only effective method of eliminating the disease was to completely remove all of the demineralized areas of tooth structure and rebuild it with an inert restoration that would simply obturate the cavity. The margin of the cavity had to be placed on a so-called caries-free surface to avoid the risks of further plaque accumulation that could lead to recurrence of the disease. This led to the development of a standardized system of intervention regardless of the size and extent of the original lesion. Even the smallest area of demineralization required the removal of a standard amount of sound tooth structure to prevent progression. Cavity designs were classified and standardized, and sound natural tooth structure was sacrificed in the name of geometric perfection to accommodate the shortcomings of the restorative material. A number of problems arise from this approach. First, it fails to recognize that cavitation is essentially a symptom of a bacterial disease. Second, it denies the ability of the tooth structure to remineralize and heal. Once tooth structure is removed, for whatever reason, it cannot be remineralized, and the original form, anatomy, esthetics and strength are lost forever.

The concept of preventive dentistry was developed along with the early understanding of demineralization, but, with the poor understanding of remineralization at that time, the full cycle was not appreciated. The philosophy of minimal intervention dentistry has now arisen in an attempt to combine all the present knowledge of prevention, remineralization, ion exchange, healing, and adhesion with the object of reducing carious damage in the simplest and least invasive manner possible, reducing procedural time, pain, stress and anxiety of the child patients.

PRINCIPLES OF MINIMAL INTERVENTION

The surgical approach has been proven to be inefficient and destructive and is obviously maximally interventionist. A recent policy document produced for the World Dental Federation suggested that there are four basic principles that must be applied to fulfill the description of minimal intervention dentistry.

1. **Control the disease through reduction of cryogenic flora:** Only in the absence of disease will restorative dentistry succeed. This is why control of the disease is the primary focus, and only when such control has been achieved, will it be possible to offer long-term repair of the damage. Correct diagnostic procedures must be carried out for any at-risk patient to determine the potential for carious activity. Modification of the oral microflora is essential in the initial stage, and a number of oral lavages are available to modify the balance of the oral flora although chlorhexidine is probably the most effective of these.
 - *Diagnosis of initial carious lesion:* The purpose is to detect visual changes in color, translucency and structure of the enamel, level of demineralization,

Development of Gallium Silicon Titanium Alloys for Dental Implants

Tharanikumar Sivakumar, Chandrasekaran Krithika
and Nandikha Tharanikumar

Abstract

The aim of this study is to synthesize a new metallic aluminum and vanadium-free titanium alloy biomaterial for better osseointegration and implantation in the physiological system. The *in vitro* and *in vivo* methods were used to examine their biological compatibility, evaluated quantitatively and qualitatively. Results of Ga-Si-Ti alloy showed a higher ultimate tensile strength, yield strength and a higher percentage of elongation and more or less equal to Young's modulus when compared with the Ti and Ti-Ga alloy. *In vivo* study, a PA view of whole-body radiography all groups exhibited a substantial difference in the linear bone density of newly formed bone. Ga-Si-Ti group showed the highest bone mineral density than Ti and Ti-Ga group in the micro CT *ex vivo* study. The study exhibited a significant difference between the groups and the proportion of cortical bone volume to trabecular bone volume BV/TV in percentage. This is related to the anti-resorptive action of gallium and osteoblastic property of silicon, in addition to the benefits of commercial pure-Ti alloy.

Keywords: gallium, silicon titanium, osteoporosis, aluminum, vanadium, toxicity of Ti-Al-V micro CT, Histomorphometry

1. Introduction

1.1 Background

While the pride of humankind exists in a manner that helps different lives, having scientifically achieved the capability to replace the lost body parts along with their functions is considered to be the upfront of modern scientific civilization. The impact of the missing body parts and their dependence results in physical and psychosocial distress. The best assistance one can offer is to diminish, if not eliminate such an inability. In this direction, loss of teeth due to injury or any other pathology may lead to partial or complete edentulousness, that affects the psychosocial status and the functional mastication for which dental implants are preferred.

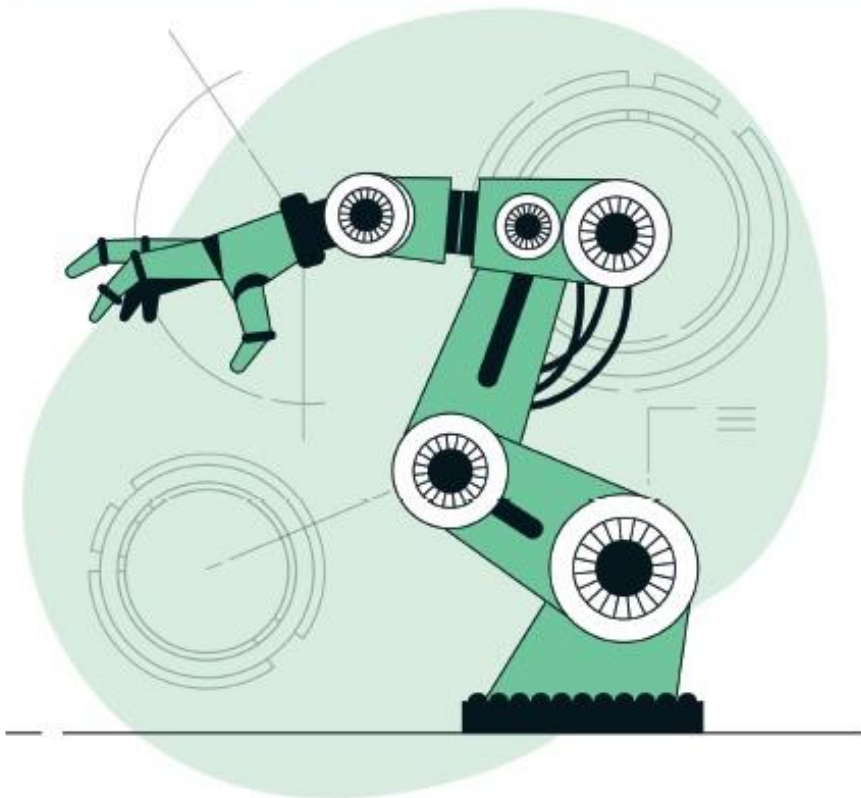
Study by the AAOMS reveals a 69% incidence of one tooth edentulous in the age group of 35–44 years [1]. Also, when people reach the age of 75 years, a minimum of

3.4.6 Supporting Document

Monograph on Prediction of HAM or Spam using Machine Learning

Monograph on Prediction of HAM or Spam Using Machine Learning

Monograph on Prediction of HAM or Spam Using Machine Learning



Yuvasneha.S and Dr. Rekha Chakravarthi

About Authors



Yuvasneha S is currently working as Assistant Professor in the Department of Computer Science Sathyabama Institute of Science and Technology, Chennai. She received her Bachelor's degree in Computer Science from Madras University, Chennai in 2020 and she received Master's degree in Computer Science from Anna Adarsh College for Women, Chennai in 2022.



Dr. Rekha Chakravarthi is currently working as Professor in the Department of Electronics & Telecommunication Engineering, Sathyabama Institute of Science and Technology, Chennai. She has 21 years of teaching and Research experience in Image processing and soft computing techniques. She has completed her doctoral research in "Development of Congestion detection and control techniques in Wireless Sensor Networks." She has published 35+ research papers indexed in Web of Science/Scopus/other databases. She is a reviewer in Biomedical Research, Journal of Engineering Science and Technology (JESTEC), International Journal of Advances in Engineering Research (IAER) and International Journal of Science & Technology (IJST).



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About Authors



Vinodhini.K is currently working as Assistant Professor in the Department of Computer Science Sathyabama Institute of Science and Technology, Chennai. She received her Bachelor's degree in Computer Application from Madras University, Chennai in 2020 and she received Master's degree in Computer Science from Anna Adarsh College for Women, Chennai in 2022.



Dr. Rekha Chakravarthi is currently working as Professor in the Department of Electronics & Telecommunication Engineering, Sathyabama Institute of Science and Technology, Chennai. She has 21 years of teaching and Research experience in Image processing and soft computing techniques. She has completed her doctoral research in "Development of Congestion detection and control techniques in Wireless Sensor Networks." She has published 35+ research papers indexed in Web of Science/Scopus/other databases. She is a reviewer in Biomedical Research, Journal of Engineering Science and Technology (JESTEC), International Journal of Advances in Engineering Research (IJAER) and International Journal of Science & Technology (IJST).

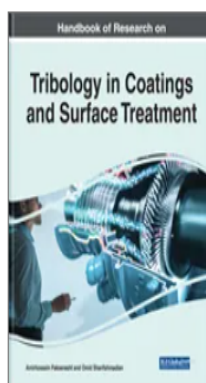


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Recent Advancements in Wear-Resistant Coatings Prepared by PVD Methods

Kamalan Kirubakaran Amirtharaj Mosas, Dinesh Kumar Devarajan, Subhenjit Hazra, Gobi Saravanan Kaliaraj

Source Title: [Handbook of Research on Tribology in Coatings and Surface Treatment](#)

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Abstract

Physical vapor deposition (PVD) technologies are widely used to produce wear and corrosion resistant coatings for a variety of industrial applications. In recent years, there has been remarkable interest in the development of novel wear resistant coatings prepared through PVD methods, which helps to reduce friction and wear, as a result of recovering energy losses up to 30% due to friction and economy loss due to wear. This chapter provides comprehensive data of recent progress in wear resistant coatings prepared using PVD methods, starting with the introduction of it needs, significance, physiochemical properties, and the selection criteria of wear resistant coatings. The applications, physical, and chemical properties of superhard materials such as diamond like carbon (DLC), titanium nitride (TiN), chromium nitride (CrN), and tantalum nitride (TaN) are also presented.

Chapter Preview

[Top](#)

Properties Of Hard Wear Resistant Coatings

The properties of hard wear resistant coatings can be categorized into three ways:

1. Structural and microstructural properties (roughness, thickness, crystal structure, morphology, texture, chemical composition, and surface topography).
2. Physical and chemical properties (density, magnetic, electrical, optical and thermal properties, oxidation and corrosion resistance).
3. Mechanical properties (adhesion, stresses, hardness, wear, fracture toughness, and friction).

Key Terms in this Chapter

Epitaxy: The well-defined orientation of coating growth with respect to the substrate orientation.

Lamellar: A type of microstructure composed of fine and alternative layers in the form of lamellae.

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Chapter 8

Recent Advancements in Wear-Resistant Coatings Prepared by PVD Methods

Kamalan Kirubakaran Amirtharaj Mosas

 <https://orcid.org/0000-0002-6514-9063>

*FunGlass – Centre for Functional and Surface Functionalized Glass, Alexander Dubček University of
Trenčín, Slovakia*

Dinesh Kumar Devarajan

Sathyabama Institute of Science and Technology, India

Subhenjit Hazra

Sathyabama Institute of Science and Technology, India

Gobi Saravanan Kaliaraj

Sathyabama Institute of Science and Technology, India

ABSTRACT

Physical vapor deposition (PVD) technologies are widely used to produce wear and corrosion resistant coatings for a variety of industrial applications. In recent years, there has been remarkable interest in the development of novel wear resistant coatings prepared through PVD methods, which helps to reduce friction and wear, as a result of recovering energy losses up to 30% due to friction and economy loss due to wear. This chapter provides comprehensive data of recent progress in wear resistant coatings prepared using PVD methods, starting with the introduction of it needs, significance, physiochemical properties, and the selection criteria of wear resistant coatings. The applications, physical, and chemical properties of superhard materials such as diamond like carbon (DLC), titanium nitride (TiN), chromium nitride (CrN), and tantalum nitride (TaN) are also presented.

DOI: 10.4018/978-1-7998-9683-8.ch008

Methods of Microstructural Characterization of Coatings

A. M. Kamalan Kirubakaran✉, D. Dinesh Kumar, K. Gobi Saravanan, Subhenjit Hazra

Book Editor(s): Sarfraj Ahmed, Vinayak S. Dakre

First published: 16 January 2022

<https://doi.org/10.1002/9781119818878.ch3>

Summary

This chapter describes the microstructural characterization of coatings prepared through physical vapor deposition (PVD) route. Coatings prepared through PVD are extensively used to enhance the tribological performance of forming tools, cutting tools, and machine components. In such applications, the microstructure of coatings are the most important factors widely used to evaluate the product and materials property. Recently, considerable attention has given to focus on the microstructure at the micro/nano level to clarify and to study the influence of microstructure in tribological performance of the coating. The primary characterization techniques used for the microstructural analysis of the coatings are X-ray diffraction (XRD), Raman spectroscopy, scanning electron microscopy (SEM) coupled with energy dispersive X-ray spectroscopy (EDS), atomic force microscopy (AFM), transmission electron microscopy (TEM), and X-ray photoelectron spectroscopy (XPS). These techniques are particularly useful in assisting the development of novel coatings by studying their microstructure at different scales.

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Tribological Properties of Carbon-Based Coatings

D. Dinesh Kumar✉, P. Kuppusami✉, Gobi Saravanan Kaliaraj, Siva Sankar Sana,
A.M. Kamalan Kirubaharan

Book Editor(s): Sarfraj Ahmed, Vinayak S. Dakre

First published: 16 January 2022

<https://doi.org/10.1002/9781119818878.ch6>

Summary

The ongoing industrial revolution demands advanced tribological coatings for enhancing the performance of mechanical components by minimizing friction and wear-related losses. Recently, carbon-based coatings have been widely studied for many tribology applications. The functionality of the carbon-based coatings can be achieved by controlled modification of sp^2/sp^3 hybridization ratio or hydrogen content during the deposition process. Amorphous carbon (a-C) coatings and hydrogenated a-C (a-C:H) or diamond-like carbon (DLC) coatings provide ultralow friction behavior due to the enrichment of sp^2 hybridized carbon features. Similarly, hydrogen-free carbon coatings with tetrahedral sp^3 bonded networks (70%) show higher wear resistance behavior. Crystalline diamond coatings with enriched sp^3 hybridized carbon features like microcrystalline diamond (MCD) and ultra/nanocrystalline diamond (U/NCD) coatings exhibit superhardness (50–100 GPa) and remarkable wear resistance behavior. Though these coatings provide superior tribo-mechanical properties at low-temperature (<100°C), tribological properties, however, rapidly deteriorate at elevated temperatures which limit their applications in different operating conditions. To overcome these limitations, researchers have developed duplex structures of suitable metallic and/or ceramic materials doped/embedded in an a-C matrix. This chapter reviews the recent innovations that have reported on all the aspects of carbon-based coatings.

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Bioactive Coatings for Biomedical Applications

Gobi Saravanan Kaliaraj ✉, D. Dinesh Kumar, A.M. Kamalan Kirubaharan

Book Editor(s): Sarfraz Ahmed, Vinayak S. Dakre

First published: 16 January 2022

<https://doi.org/10.1002/9781119818878.ch8>

Summary

Artificial implants have gaining interest to repair or replace the defect parts in the human system. Majorly, orthodontic and orthopedic implant materials are playing predominant role in replacing teeth with endosseous parts in oral as well as orthopedic applications such as endosseous implants, fracture fixation, total joint arthroplasty, and ankle fracture replacement. For this, several metallic materials, namely, stainless steel, titanium and its alloy, Ni-Cr, Co-Cr, and Mg-based alloy, have been commercially used. Other non-metallic materials such as ceramics, polymers, and metallic glasses have also explored in implant fixation to improve performance and durability of implants.

Among various materials classifications in biomedical industries, implants used for load bearing applications (femoral heads, knee implant, and ankle prosthesis) have shown significant attention due to dynamic load and more possibilities, and wear debris formation hinders the potential implant functioning. The improvement of surface properties and load bearing ability of implants are mainly related to surface topography, roughness, and its stability in hostile environment. Surface coatings with smooth surface provide better functionality in articulating surfaces, and its surface texture improves the tribological properties which became more popular in biomedical field for the past few decades.

In this chapter, recent advancements in development of bioactive coatings and its role in wear-resistant for various articulating surfaces (hip, knee, ankle, and spinal implants) will be discussed by describing root cause of short span of artificial joints using metallic implants. Furthermore, corrosion resistance and biocompatibility of surface modified materials are also discussed in detail.

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Green Synthesis of Iron Oxide Nanoparticles for Biomedical Applications



Kunal Biswas¹ and Manab Deb Adhikari²

¹Centre for Nanoscience & Nanotechnology, International Research Centre, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai, India

²Department of Biotechnology, University of North Bengal, Darjeeling, West Bengal, India

Synonyms

Bioimaging; Biomedical; Green synthesis; Iron oxide nanoparticles; Nanotechnology

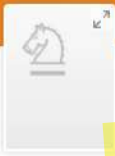
Definition

The use of green chemistry to make iron oxide (FeO) nanoparticles avoids the toxicity issues that come with regular chemical synthesis. The hydrodynamic size and magnetic properties of these nanoparticles make them ideal for several biomedical applications such as biosensor, MRI contrast agent, and theranostics in a sustainable and effective manner.

Introduction and Background

Significance of Iron (Fe) Element at Bulk and Nanoscale

Nanotechnology has played a significant role in playing a ubiquitous entity in applications ranging from electronics to biological applications (Gibney et al. 2021). In the subject, the significance of scale really matters the most. It is studied extensively that the behavior of an element at the bulk scale differs from the behavior of matter at the nanoscale. It is well understood that at the nanoscale, the material properties shift from classical physics to quantum mechanical ways. In the subatomic scale of the element, the predominant force is the quantum mechanical phenomenon, which governs the intricate nature of the element (Polsterová et al. 2020). The quantum mechanical phenomenon of the material along with the unique physicochemical properties of the matter makes the nanoscaled application drastically different from its bulk counterparts. In this case, iron (Fe) has received wide-scale attention owing to its inherent magnetic attributes (Munoz et al. 2021). The underlying unique properties of iron (Fe) element at the nanoscale invite different significant applications which escalate the impact of its magnetic-based property induction more pronounced toward the selected target.



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Singapore Pte Ltd. 2024

Hardcover ISBN

978-981-99-7847-2
Due: 19 January 2024

Softcover ISBN

978-981-99-7850-2
Due: 19 January 2025

eBook ISBN

978-981-99-7848-9
Due: 19 January 2024

Series ISSN

1869-8433

Series E-ISSN

1869-8441

Edition Number

1

Number of Pages

XVI, 573

Number of Illustrations

6 b/w illustrations, 150
illustrations in colour

Topics

[Nanoscale Science and
Technology, Materials Science,
general, Biological and Medical
Physics, Biophysics](#)

Chapter 8

Integration of Technology and Nanoscience in Precision Agriculture and Farming

Rakshi Anuja Dinesh

Sathyabama Institute of Science and Technology, Chennai, India

Jayashree Shanmugam

Sathyabama Institute of Science and Technology, Chennai, India

Kunal Biswas

Sathyabama Institute of Science and Technology, Chennai, India

ABSTRACT

In addition to other cutting-edge computer technologies, the internet of things (IoT), artificial intelligence (AI), and others have been used in agriculture. However, there is currently increased focus on the use of such technologies. It is now possible to monitor the agricultural environment and ensure high-quality production through cutting-edge IoT technologies in amalgamation with nanoscience. Nanotechnology is the branch of science that deals with manipulating materials on a nanoscale. By encountering problems that cannot be solved conventionally, working with the smallest particles imaginable inspires hopes for enhancing agricultural productivity. By releasing fixed nutrients, efforts are made to restore soil fertility in the management aspects. Nano biosensors and satellite systems are used to assess the input needs for crops in controlled conditions for agriculture and precision farming, and the necessary amounts are then delivered at the correct moment. These disadvantages can be addressed by various cyber-physical systems, that is briefly explained in this chapter.

DOI: 10.4018/978-1-6684-7879-0.ch008

ORAL PRESENTATION (virtual mode)**PROSPECTS OF MULTI-WALLED CARBON NANOTUBE-BASED THERAPY TO CANCER AND THE BRAIN BEYOND THE BLOOD-BRAIN BARRIER: A REVIEW**

^{1*} Sandhya, S., ¹Thyagarajan R, ² Kunal Biswas

Corresponding author: kunalbiswas.irc@sathyabama.ac.in

¹Department of Biotechnology, Sathyabama Institute of Science and Technology, Chennai-600119, Tamil Nadu, India.

² Centre for Nanoscience & Nanotechnology, International Research Centre, Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-600 119, Tamil Nadu, India.

The most common type of central nervous system tumour that affects people of all ages is a brain tumour, which recently exceeded leukaemia as the leading cause of cancer-related mortality. There are currently few effective therapies for tumours and disorders related to the central nervous system. The lack of treatment is because of the challenges given by medication insolubility, poor distribution across cells, lack of selectivity, failure to pass cellular barriers, and blood-brain barrier (BBB). The blood-brain barrier (BBB) is a covert barrier that guards the brain, enables only a narrow range of substances to enter the brain, and contributes to the regulation of brain homeostasis. The BBB is made up of several molecular parts and transport mechanisms, which in turn provide facilities for drug efflux or blockages to drug entrance into the brain. Effective treatments for brain tumours are still difficult to find because of the BBB's low permeability and high selectivity to conventional anticancer medications.

Multi-walled carbon nanotubes (MWCNTs) have various unique properties that make them good candidates for drug delivery to the brain and cancer. Thus, to address this challenge in the treatment of brain tumours, effective drug delivery modification and unique therapeutic approaches are required in addition to the usual treatments. These characteristics include good electronic properties, a remarkable ability to penetrate the cell membrane, high drug-loading and pH-dependent therapeutic unloading capacities, thermal properties, a large surface area, and ease of molecular modification. MWCNTs might deliver drugs with great effectiveness, increased specificity, and reduced adverse effects. CNTs have mostly been used to treat cancer, although a few research have concentrated on employing MWCNTs to treat and diagnose disorders of the central nervous system.

Here, we evaluate the present status of *in vitro* and *in vivo* studies on CNT-based tumour-targeted drug delivery systems (DDS), photodynamic therapy (PDT), and photothermal therapy for the treatment of cancer (PTT). In the meanwhile, we examine the state of the art of *in vivo* and *in vitro* studies of CNT-based medication delivery to the brain.

ORAL PRESENTATION (virtual mode)

FULLERENE AS A THERAPEUTIC APPROACH IN LUNG CANCER TREATMENT: A REVIEW

^{1*}Britlin Deva Jebasta Newton, ¹Bavanilatha Muthiah, ²Kunal Biswas

¹Department of Biotechnology, Sathyabama Institute of Science and Technology,
Jeppiaar Nagar, Chennai-119, Tamilnadu, India.

²Centre for Nanoscience & Nanotechnology, International Research Centre,
Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-600 119,
Tamilnadu, India.

Corresponding author: kunalbiswas.irc@sathyabama.ac.in

Globally, cancer is one of the major causes of mortality in recent years. Lung cancer is one of the most common types of cancer due to increased smoking and pollution. Chronic obstructive pulmonary diseases also increase the risk of lung cancer. Currently available cancer treatment options include surgical treatment, chemotherapy, radiation therapy, or an amalgamation of these methods based on the stage of cancer. The traditional cancer treatment options caused complications and the adverse effect such as chemoresistance. However, the rapid development of new technologies offers new opportunities to improve the efficiency of cancer treatments.

Nanotechnology has been increasingly studied as a potential cancer treatment in recent years. The nanocarriers are useful in targeted drug delivery for cancer treatment. Fullerenes are allotropes of carbon made up of carbon atoms arranged with 20 hexagons and 12 pentagons, with fused rings and conjugated double bonds. They are highly symmetrical and extremely stable. C₆₀ fullerenes can pass through cell membranes and blood-brain barriers. They are bioresorbable and readily enter cells. Due to its cage-like structure and adaptability, it is useful as a drug delivery system. Nanoconjugates of fullerene and anticancer drugs are proven to be more effective at reducing toxicity, enhancing efficacy, and controlling drug release.

According to *in vivo* analysis, C₆₀ fullerenes have significant antioxidant activity, neutralising excess ROS in cells and potentially inhibiting some cell receptors. C₆₀FAS therapy has shown a reduction in tumour volume in mice models with Lewis lung cancer. Fullerene and Doxorubicin nanoformulation has shown a considerable decrease in tumour growth and improvement in the average lifespan of the animals to a greater extent. Additionally, Fullerene-based nanocomplexes have shown a significant amount of anti-cancer potential for improving alkaloid berberine's effectiveness against lung cancer. The C₆₀ fullerene being a part of the C₆₀-cis-pt nanocomplex has enhanced cis-pt entry and intracellular accumulation, boosting the cytotoxic effect of the drug on lung cancer cells. Recently, fullerene nanoformulation demonstrated the regeneration of lung epithelial cells that were treated with apoptosis-inducing molecules, implying its potential for Acute respiratory distress syndrome therapy. The present study compiles and analyses the uses of fullerene in the treatment of lung cancer.

POSTER PRESENTATION (virtual mode)**IN VITRO EVALUATION OF COBALT ZINC FERRITE
CYTOTOXICITY AND CYTOCOMPATIBILITY UTILISING A
HEPATOCYTE CELL LINE: A REVIEW**

^{1*}Mithrinthaa.S., ¹Sudha.s, ²Kunal Biswas

^{1*} Department of Biotechnology, Sathyabama Institute of Science and Technology,
Jeppiaar Nagar, Chennai-119, Tamil Nadu, India.

² Centre for Nanoscience & Nanotechnology International Research Centre, Sathyabama
Institute of Science and Technology, Jeppiaar Nagar, Chennai-119, Tamil Nadu, India.

*Corresponding author Contact mail ID: kunalbiswas.irc@sathyabama.ac.in

Magnetic nanoparticles (NPs) show significant potential in biomedical applications such as hyperthermia, biosensors, magnetic resonance imaging (MRI), and drug delivery. Magnetite (Fe₃O₄) has been the most studied magnetic nanoparticle over the years. It has gotten simpler in recent years to create new, more potent varieties of magnetic NPs. Due to their intriguing magnetic and electrical characteristics with outstanding chemical and thermal stability, spinel ferrite nanoparticles (NPs) are significant. We have explored the crystal structure, dielectric, transport, and magnetic characteristics of cobalt zinc ferrite as a follow-up to our searches for suitable magnetic candidates for multiferroic composite structures. However, the inadequate understanding of these NPs' biological responses may ultimately limit their potential for use in biomedicine. To ensure that magnetic NPs have positive effects in the field of biomedicine, it is therefore vital to investigate their biological fate and potential harmful response. Toxicological studies with a hepatocyte cell line. Finding a viable alternative *in vitro* model to accurately predict the *in vivo* toxicity is therefore essential. Human cell lines are good *in vitro* models and sensitive tools for high-throughput toxicity screening, with the potential to reduce animal use in toxicity studies. The creation of mechanistic data that may be used for toxicity evaluations using cell lines is a possibility. To investigate the cytotoxicity and cytocompatibility of NPs, we have used extensively utilized *in vitro* cell culture models, liver (HepG2) cells. As a result, this review was carried out to assess the toxicity of the complex of Cobalt Zinc Ferrite nanoparticles on liver cells.

Toxicity of fullerene and its interaction with biosystems: A review

Britlin Deva Jebasta Newton^{1*}, Bavanilatha Muthiah¹, Kunal Biswas²

*Presenting author's email: britsam1977@gmail.com

¹ Department of Biotechnology, Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-119.

² Centre for Nanoscience & Nanotechnology, International Research Centre, Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-600 119.

Corresponding author's email: kunalbiswas.irc@sathyabama.ac.in\

Abstract

Fullerene is an allotrope of carbon. It is bioresorbable and readily enters cells, making it a promising candidate in therapeutic. It also has amphiphilic and self-assembling properties, which are highly desired for effective drug delivery and tumour imaging. With such tremendous biomedical applications, toxicity is a major concern. Fullerenes can cause acute and long-term tissue damage by passing through biological barriers such as the blood-alveolus, blood-brain, and blood placenta. Fullerene has a negative impact on the liver and can alter the expression of its genes. Despite the cardiotoxic effects of some Carbon nanomaterials, fullerene has shown cardio-protective benefits against doxorubicin-induced cardiotoxicity.

In vivo analysis using freshwater fish, *Anabas testudineus*, fullerene C60 has shown genotoxicity even at sublethal concentrations. Even with radiation exposure, the interaction of fullerene and bacteria has shown negative genotoxicity. One of the potential risks of long-term fullerene exposure is the ability of both undoped and doped C60 fullerene to trigger inflammatory responses. The present study emphasizes the various aspects of the toxicity of fullerene.

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Effect of Multi Walled Carbon Nanotube on various bio interphase and its impact on lipid metabolism

Sandhya Selvakumar¹, Thyagarajan Rajendiran¹, Kunal Biswas^{2*}

¹ Department of Biotechnology, Sathyabama Institute of Science and Technology, Chennai-600119, Tamil Nadu, India

² Centre for Nanoscience & Nanotechnology, International Research Centre, Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-600 119.

*Corresponding author's email: kunalbiswas.irc@sathyabama.ac.in

Abstract

Multi-walled carbon nanotubes (MWCNTs) are carbon-based nanomaterials that have gained significant appeal in nanotechnology. They are highly coveted for usage in the industrial, environmental, and medicinal fields because of their remarkable one-dimensional hollow nanostructure and distinctive physicochemical features. Despite their extensive use, limited information is known about how they affect the environment and living organisms. The first stage in determining the biosafety and biocompatibility of nanoparticles is to determine their toxic concentration in humans. Therefore, it is critical to have precise knowledge about how MWCNTs affect specific organs in order to determine their effectiveness and potential implications on health. Numerous metabolic processes can be hindered by a high nanoparticle concentration in different organs. Recent research demonstrated that exposure to MWCNT could cause lipid accumulation in different biosystems. However, the mechanisms linking MWCNT exposure and lipid accumulation remain poorly understood. This study focuses on the recent research on the toxicity of MWCNT and its potential impact on lipid metabolism in various organ systems (bio-interphase).

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Evaluation of cobalt zinc ferrite nanomaterials towards biological macromolecules on mesenchymal stem cell: A review

Mithrinthaa Shankar ^{1*}, Sudha Sri Kesavan ¹, Kunal Biswas ^{2*}

Presenting author: Mithrinthaa S

*Presenting author's email: mithshan.09@gmail.com

¹ Department of Biotechnology, Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-119, Tamil Nadu, India

² Centre for Nanoscience & Nanotechnology International Research Centre, Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Chennai-119, Tamil Nadu, India

*Corresponding author's email: kunalbiswas.irc@sathyabama.ac.in

Abstract

Nanomaterials are currently the topic of significant research due to their vast range of potential uses in biological, optical, and electronic sectors. In biological applications, the magnetite phase is preferred over the maghemite phase because of increased magnetization saturation and magnetic susceptibilities. Cobalt-zinc ferrite, a magnetic compound with the same crystalline structure as magnetite, is more resilient to oxidation and hence more appealing for long-term applications, such as in electronics and biological research. Due to their small size, which allows them to reach nearly every part of the body, including the circulatory system and cells, these nanoparticles are constantly being researched in the biological and medical fields. Mesenchymal stem cells, which have therapeutic potential, were used to study the biological effects of different SPIONs. The findings showed that SPIONs have a potent potential to cause oxidative damage to lipids, proteins, and DNA in tagged cells. In this, we exclusively focus on biological macromolecule damage in mesenchymal stem cells and the cytotoxicity effect of cobalt zinc ferrite.

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UNCOVERING THE TOXICOLOGICAL PROPERTIES OF REDUCED GRAPHENE OXIDE (rGO) OVER *Pyricularia oryzae*.

Rakshi Anuja Dinesh^{1*}, Jayashree Shanmugam¹ and Kunal Biswas^{2*}

¹ Department of Biotechnology, Sathyabama Institute of Science and Technology, Chennai, 600119, Tamil Nadu, India.

² Centre for Nanoscience and Nanotechnology, International Research Centre, Sathyabama Institute of Science and Technology, Chennai, 600119, Tamil Nadu, India.

^{*} Presenting author: Rakshi Anuja Dinesh.

^{*} Corresponding author: Rakshi Anuja Dinesh and Kunal Biswas

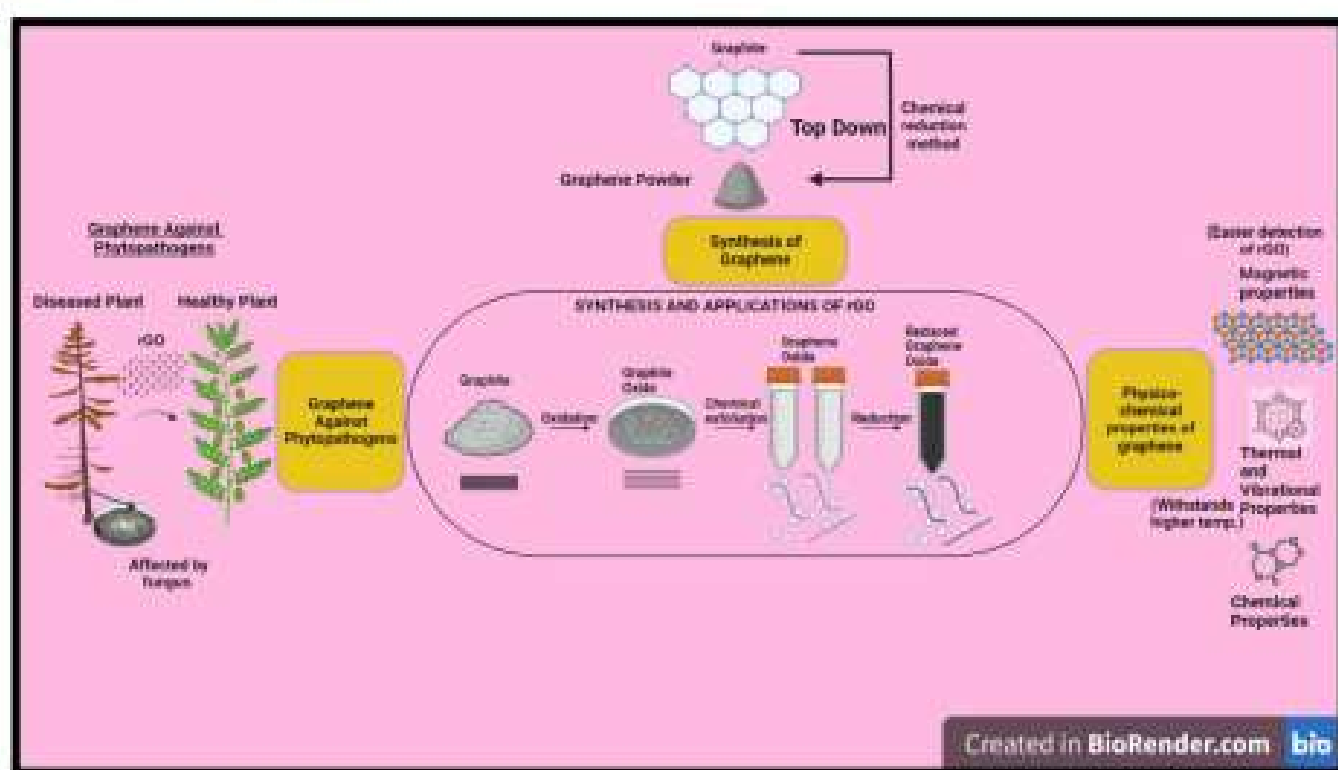
Corresponding author mail id: rakshising@gmail.com, kunalbiswas.irc@sathyabama.ac.in

Abstract

In recent years, fungal phytopathogens variating to become resistant to synthetic pesticides and antagonist micro-organisms are causing a huge loss in agricultural production. A fungal species that cause disease in rice crop plants is *Pyricularia oryzae*, it is a fast-growing pathogen that is resistant to several synthetic and bio methods of controlling them. Nanotechnology is an evolving field, where it uses nanomaterials for solving many problems in this fast-paced world. Graphene is one such nanomaterial that has a rough surface and is irregular according to its SEM image because of which it can disrupt the fungal cell wall. Along with this, its physicochemical properties will enhance its application. With the toxicological investigations of fungus, graphene family nanoparticles, especially reduced graphene oxide can be developed as a nano-fertilizer against rapidly growing fungal phytopathogens. This study aims at finding the exact toxic concentration from 5 µg/ml to 100 µg/ml of reduced graphene oxide over the fungal phytopathogens. The study will also uncover the toxicity pathway of rGO over the same which will help us devise a potential fertilizer against other resistant fungi.

Keywords: Reduced graphene oxide, toxicology, *Pyricularia oryzae*, physicochemical properties, graphene, fungal phytopathogens.

GRAPHICAL ABSTRACT



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Rhodamine Chemistry and Applications

Rhodamine dyes square measure wide used as fluorescent probes thanks to their highly visible light quantum yield and photo-stability. though minute quantities of significant metal ions square measure necessary for the living organisms. They play important roles in biological, environmental, and chemical systems, however, excessive amounts have a harmful impact on the organisms. the event of chemo-sensor for sensing and recognition of environmentally and biologically vital ions. The probes square measure priceless for the dynamics of organic phenomenon, supermolecule expression, and molecular interactions in advanced living systems. they're usually used as scaffolds in biological labeling and stimulant visible-light imaging. This book mentioned within the context of the structural options of rhodamine derivatives organized in keeping with their fluorescent core scaffold and with their representative applications.



Dr. M. Rajasekar is currently working as Scientist-C in the Centre for Molecular and Nanomedical Sciences, International Research Centre, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai since 2018. He has delivered several invited scientific lectures in various National/International Symposium and Conferences



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Dr. M. Rajasekar is currently working as Scientist-C in the Centre for Molecular and Nanomedical Sciences, International Research Centre, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai since 2018. He has delivered several invited scientific lectures in various National/International Symposium and Conferences



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Monograph on Heterocyclic Chemistry

Monograph on the 9, 9' - Spirobifluorene

Spirobifluorene (SBF) is one of the most commonly utilized scaffolds in the construction of Organic Semi-Conductors (OSCs) for organic electronics. In the last ten years, new generations of SBF positional isomers have been surfaced in the literature. The various substitution places have enabled the tailoring of important electrical properties for the future construction of materials. These new generations of organic semiconductors have shown great promise to the field of electronics, particularly when utilized as a host material for Thermally Activated Delayed Fluorescence OLEDs. We present these new generations of SBF compounds, as well as the impact of positional isomerism on electrical characteristics and device performance, in this featured article. We show how distinct structural and electrical characteristics drive and can be adjusted to the electrochemical and photophysical properties of SBF regio-isomers. Such research lays the groundwork for organic electronic material design.



Dr. M. Rajasekar is currently working as Scientist-C in the Centre for Molecular and Nanomedical Sciences, International Research Centre, Sathyabama University, Chennai since 2018. He was born (1984) in the village of Agatheripattu, Tiruvannamalai district in Tamil Nadu, India, and his main research interest in the area of organic chemistry.



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M. Rajasekar

Monograph on the 9, 9' - Spirobifluorene

Gel chemistry is formed by small molecules self-assembling under the influence of various non-covalent interactions. It can be easily perturbed, which allows for careful tweaking of their properties. They are kinetically confined, and following production, they usually do not demonstrate time variable changes in material properties. When exposed to external stimuli such as temperature, pH, light, enzyme, redox, and chemical analytes, such materials may become switchable, leading to the reconfiguration of the gel matrix into a different type of network. The transformations allow gel-to-gel transitions while the changes in the molecular aggregation result in alteration of physical and chemical properties of the gel with time. Here, we discuss various methods that have been used to achieve gel-to-gel transitions by modifying a pre-formed gel material through external perturbation. The dynamic modification of gels allows the construction of an array of gels with various properties from a single material which eventually extends the limit of applications of the gels.



Dr. M. Rajasekar is currently working as Scientist-C in the Centre for Molecular and Nanomedical Sciences, International Research Centre, Sathyabama University, Chennai since 2018. He served as a doctoral committee member for graduate students, and reviewer for various international journals published by ACS, RSC, Wiley, and Elsevier.



Dr. M. RAJASEKAR
K. RAJASEKAR

Recent Development in Gel Chemistry

Nowadays, dendrimers are branched molecules with well-defined lengths, shapes, molecular weights, and monodispersity in comparison to linear polymers. The dual effect of the chromophores luminescence and the morphology of the synthesized dendrimers has drawn a lot of interest to the design of dendrimers with different chromophores. Furthermore, the stimuli-responsive systems can sequester the drug molecules under a preset set of parameters and release them in a different environment by either an exogenous or an endogenous stimulus. The addition of photoresponsive moieties to different dendrimer components, such as the core, branches, magnifies the importance of the dendrimer in several related sectors of nanotechnology, such as sensors, photoswitches, electronic gadgets, and drug delivery systems. This book focused on photoresponsive /glycoside dendrimer structure and their biomaterial applications.



Dr. M. Rajasekar is currently working as Scientist-C in the Centre for Molecular and Nanomedical Sciences, International Research Centre, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai since 2018. He has delivered several invited scientific lectures in various National/International Conferences

Recent Achievements of Photoresponsive Dendrimers and Applications

Dr. M. Rajasekar



Nowadays, numerous domains such as biology, physiology, environmental sciences, and pharmacology, have made extensive use of fluorescence sensors for ions and neutral analytes. Fluorescence sensors have been developed for roughly 150 years. A varied assortment of fluorescence sensors has been developed recently for the identification of species that are significant to biology and the environment. Despite the advancements in this area, a number of issues and difficulties persist. This book discusses the history and offers a broad outline of the progress in the study of fluorescence sensors, often known as sensors. This will be accomplished by emphasizing a few innovative and exemplary works from numerous international groups that have made significant contributions to this field. The fundamental ethical considerations elaborate in developing sensors for particular analytes, problems and roadblocks encountered in the field, and potential future research avenues are all explored. The future of sensor technology is quite promising in both established and new technologies.



Dr. M. RAJASEKAR



Dr. M. Rajasekar is presently working as Scientist-C in the Synthetic Organic and Medicinal Chemistry lab, Centre for Molecular and Nanomedical Sciences, International Research Centre, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai since 2018. He was granted for many International patents.

FLUORESCENT-BASED CATION SENSORS FOR BIOMEDICAL APPLICATIONS





Chapter 29 - Biodegradation of microplastics and synthetic polymers in agricultural soils

Kamarajan Rajagopalan¹*, Johnson Retnaraj Samuel Selvan Christyraj¹*, Subbiahanadar Chelladurai Karthikeyan¹, Madesh Jeevanandam², Harsha Ganesan³, Melinda Grace Rossan Mathews¹, Jackson Durairaj Selvan Christyraj¹

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Abstract

Microplastics and synthetic polymers are some of the most significant pollutants in agricultural soil. According to the US National Oceanic and Atmospheric Administration declaration, when the plastic fragment is less than 5mm, it is considered to be microplastic. The presence of microplastics has been detected ubiquitously in the agricultural soil. The environmental release of microplastics has increased unaccountably, whereas the help of advanced and updated technologies can stop the accumulation of plastics. The advanced bioremediation and natural process of biodegradation is an effective environmental safety process to eliminate the plastic fragments from the agricultural soil. However, understanding the biodegradation process of microplastics and synthetic polymers in agricultural soil is a challenge due to the multifactorial process such as abiotic effects, hydrolysis, fragmentation, heat, UV rays, and enzymatic degradation under anaerobic condition. The yield of the biodegradation process provides Environmental Protection Agency (EPA), glycol, carbon source, and the production of green gases. Whereas, the micro- and nanosize particles of plastics have mixed with natural fertilizers and that can cause a severe impact on the production of biogas. In this chapter, we have included the severe direct and indirect effects, identification techniques, and advance perspectives to eliminate the plastic fragments from the agricultural soil.

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Keywords

Plastics; depolymerization; sustainable agriculture; microplastics; biotic degradation

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CLASSIFICATION OF LAND USE AND LAND COVER CHANGES USING REMOTE SENSING AND GIS IN PONDICHERRY COAST

K. Nagamani^{1†}, S. Packialakshmi², Prabhu Dass Batvari³,
B. Anuradha⁴ and R. Santhi Devi⁵

^{1†}Center for Remote Sensing & Geoinformatics, Sathyabama
Institute of Science & Technology, Chennai, India.

² Department of Civil Engineering, Sathyabama Institute of
Science & Technology, Chennai, India.

³ Center for Earth and Atmospheric Science, Sathyabama
Institute of Science & Technology, Chennai, India.

⁴ Chennai Institute of Technology, Chennai, India.

⁵ Bharathi Women's College(A), Chennai, India.

ABSTRACT

Coastal land use and land cover changes are important due to varying natural and anthropogenic activities/causes in and around Pondicherry, so it is very much needed to study about the changes and its consequences. In understanding of this circumstance, it is vital to review decisions made and expansions undertaken pertaining to the coast from time to time. The information of coastal land use / land cover is significant in understanding the changes in land use and land cover in regular period of intervals for proper management of natural resources, their utilization, conservation and management. In the present study assesses with the land use and land cover classification for the period from 1990 to 2018 in and around Pondicherry, India using remote sensing and GIS.

Keywords: Coastal, land use and land cover, dynamics, Pondicherry .

INTRODUCTION

Land use referred to as man's activities and the various uses which are carried on and. Land cover is referred to as

Investigations on Rare Earth Elements in Sediments from South Vellar Estuary along Bay of Bengal and Palk Strait, Tamil Nadu, India

Puliyakurichi Mookkan Velmurugan, Krishnan Vijayaprabhakaran, Periyathambi Thangappan Devika and Mohammad Suhail Meer

Abstract

The rare earth elements (REEs) in the sediments of the South Vellar estuary on the eastern coast of India were measured using thermal ionization mass spectrometry (TIMS). Lanthanides (La-Lu) and a number of other elements (Cr, Ni, Zn, Pb, Ag, Co, Cd, and V) were studied in bed sediment samples. The estuary's total REE content (REE) ranges from 73.30 to 360.50 g/g. Continental weathering has a substantial impact on the distribution of REEs. Using factor analysis on the elemental data, two important groups of elements were identified: (a) LREEs, HREEs, Pb, Ag, and Cd, revealing an association with river detritals; and (b) Co, Ni, Zn, Cr, and V, indicating complex estuary processes. Because of the silicate weathering of crustal materials and the resultant increase in LREEs in detritals, LREEs are more enriched than HREEs. We get to the conclusion that 30% of HREE flux and 70% of LREE flux to the Bay of Bengal are provided by the estuarine system.

Keywords: Bay of Bengal, rare earth element, sediment, South Vellar Estuary, TIMS

1. Introduction

Rare earth elements (REEs) are frequently employed as geochemical tracers for provenance studies due to their distinct and chemically coherent behavior [1]. Extensive studies have been reported on the distribution of REE in sediments, suspended particulate matter, and natural waters. Our understanding of REE distribution in the sediments has advanced significantly. For instance, earlier research had found that "REEs as a group are insoluble elements, exhibiting limited fractionation throughout the earth surface processes." The premise is that the REE are fractionated and mobilized during weathering in all climatic conditions in estuaries [2]. In addition, organic compounds, colloidal particles, and Fe-Mn oxyhydroxides may serve as hosts for REE and their presence in sediments may affect the total concentration of REE.