

**DEEP LEARNING
AT
SATHYABAMA INSTITUTE AT SCIENCE AND TECHNOLOGY**

by

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REGISTER NO:43739025**



**DEPARTMENT OF BIOINFORMATICS
AND DATA SCIENCE SCHOOL OF
BIOCHEMICAL ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO
BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved by AICTE JEPPIAAR
NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119**

March - 2024



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
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DEPARTMENT OF BIOINFORMATICS AND DATASCIENCE

BONAFIDE CERTIFICATE

This is to certify that this Intern Report is the bonafide work of V Suriyapriya (43739025) who carried out an internship on "Deep Learning" from September 2023 to November 2023

—

Internal Guide

External Guide (if Applicable)

Head of the Department

Submitted for Viva-voce Examination held on: 15/05/2024

Internal Examiner

External

DECLARATION

I, **SURIYAPRIYA V** hereby declare that the Internship report entitled Deep Learning done by me under under the guidance of **Mrs.R.SUDHA** at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of a Master of Science degree in Bioinformatics and data science.

DATE:29/04/2024

PLACE: Chennai

SURIYAPRIYA.V

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to the Board of Management of SATHYABAMA for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to Dr.REKHA CHAKRAVATHI M.E., PH.D. DEAN OF ARTS AND SCIENCE for providing me necessary support and details at the right time during the progressive review.

I wish to express my thanks to all Teaching and Non-Teaching staff members to the Department of Bioinformatics and Data Science who were helpful in many ways
For the completion of Internship

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DEEP LEARNING INTERNSHIP

CHAPTER-1

1.1 ABSTRACT

- This report delves into deep learning, a rapidly evolving AI discipline transforming multiple industries. Inspired by the human brain, deep learning equips computers to learn from extensive data and make intricate decisions. Covering key concepts like neural networks, CNNs, and the report explores practical applications across computer vision, healthcare, finance, and autonomous systems. Deep learning excels in tasks like image and speech recognition, language translation, disease diagnosis, and self-driving cars. It also addresses challenges such as data scarcity, interpretability, and adversarial attacks, while spotlighting ongoing advancements. Ultimately, this report is vital for understanding deep learning's impact and potential in technology and society.

CHAPTER-2

1.2 INTRODUCTION:

- In the late 1980s, neural networks became a prevalent topic in the area of Machine Learning (ML) as well as Artificial Intelligence (AI), due to the invention of various efficient learning methods and network structures. While neural networks are successfully used in many applications, the interest in researching this topic decreased later on. After that, in 2006, “Deep Learning” (DL) was introduced by Hinton et al, which was based on the concept of artificial neural network (ANN). Deep learning became a prominent topic after that, resulting in a rebirth in neural network research, hence, sometimes referred to as “new-generation neural networks”. This is because deep networks when properly trained, have produced significant success in a variety of classification and regression challenges.
- Nowadays, DL technology is considered one of the hot topics within the area of machine learning, artificial intelligence as well as data science and analytics, due to its learning capabilities from the given data. In terms of working domain, DL is considered a subset of ML and AI, and thus DL can be seen as an AI function that mimics the human brain’s processing of data.

CHAPTER-3

1.3 DEEP LEARNING:

- DL is considered a subset of ML and AI, and thus DL can be seen as an AI function that mimics the human brain's processing of data. The worldwide popularity of "Deep learning" is increasing day by day. It uses Artificial Neural Networks (ANN) to work on datasets and perform tasks.
- A typical neural network is mainly composed of many simple, connected processing elements or processors called neurons, each of which generates a series of real-valued activations for the target outcome. Neurons mimic the functioning of the human brain.
- DL technology uses multiple layers to represent the abstractions of data to build computational models. While deep learning takes a long time to train a model due to a large number of parameters, it takes a short amount of time to run during testing as compared to other machine learning algorithms.

CHAPTER-4

1.4 PURPOSE OF INTERNSHIP:

- Deep learning offers numerous benefits, including the ability to tackle complex problems like image recognition and natural language processing, and opportunities for innovation and addressing societal challenges.

1.4.1 Feature Extraction

- Deep learning models possess the ability to extract meaningful features from raw data without the necessity of manual feature engineering, which is advantageous, especially in scenarios with complex and high-dimensional input data like image and speech processing. For instance, deep convolutional neural networks (CNNs) are capable of learning hierarchical features from pixel values in image classification tasks, eliminating the need for manually crafting features beforehand.

1.4.2 Understanding Data

- Deep learning models can learn intricate representations of data, leading to insights and understanding that may not be apparent through traditional methods. Techniques such as feature visualization and attribution methods help interpret and understand the inner workings of deep learning models.
- Understanding data can uncover hidden patterns, relationships, and insights that can inform decision-making and drive innovation.

1.4.3. Solve Complex Problems

- Deep learning excels at solving complex problems that are difficult for traditional algorithms to tackle. By learning deep learning techniques, you gain the ability to address challenging tasks such as image recognition, natural language understanding, and autonomous decision-making.

CHAPTER-5

1.5 OBJECTIVES OF DEEP LEARNING:

- Deep learning, a subset of artificial intelligence (AI), is driven by a set of fundamental objectives aimed at enabling machines to emulate human-like learning and decision-making processes. By eliminating the need for manual feature engineering, deep learning models aim to extract meaningful features directly from raw data, enabling more efficient and effective processing of complex information. Furthermore, deep learning endeavors to develop models that can make accurate predictions, classify data, and generate insights based on learned patterns, facilitating tasks such as image recognition, natural language understanding, and autonomous decision-making.

1.5.1 Pattern Recognition

- Deep learning seeks to develop models capable of recognizing patterns and structures within data, enabling tasks such as image recognition, speech recognition, and natural language understanding.

1.5.2 Scalability and Efficiency:

- Deep learning seeks to develop scalable and efficient algorithms that can handle large volumes of data and complex computations.
- This objective involves optimizing model architectures, developing parallel computing techniques, and leveraging hardware accelerators to improve performance and efficiency.

1.5.3 Feature Learning and Extraction:

- Deep learning seeks to automatically learn and extract relevant features from raw data.
- By learning hierarchical representations of features, deep learning models can capture intricate patterns and relationships in the data

CHAPTER-6

6.1 SCOPE OF DEEP LEARNING:

- The scope of deep learning spans numerous fields, revolutionizing data interpretation and interaction. As a subset of AI, it harnesses complex neural networks to learn from vast data sets, driving innovation across domains like computer vision, natural language processing, healthcare, and finance. From foundational principles to cutting-edge applications, deep learning transforms industries, enabling automation, enhancing decision-making, and unlocking new avenues for innovation. Join us on this journey through the dynamic landscape of deep learning as it shapes the future of technology and society.

6.1.1 Computer Vision

- Deep learning has made significant strides in computer vision tasks, including image classification, object detection, image segmentation, and facial recognition.
- Scope includes applications in autonomous vehicles, surveillance systems, medical imaging, augmented reality, and quality control in manufacturing systems, medical imaging, augmented reality, and quality control in manufacturing.

6.1.2 Natural Language Processing (NLP)

- Deep learning has revolutionized NLP tasks such as sentiment analysis, language translation, named entity recognition, and text generation.
- Scope includes applications in virtual assistants, chatbots, sentiment analysis for customer feedback, language translation services, and document summarization.

6.1.3 Healthcare

- Deep learning is used in medical image analysis for tasks such as tumor detection, MRI image segmentation, and pathology detection.
- The scope includes applications in disease diagnosis, personalized medicine, drug discovery, and predictive analytics for patient outcomes.

CHAPTER-7

7.1 DEEP LEARNING ALGORITHMS

- Deep learning algorithms form the cornerstone of modern artificial intelligence, enabling computers to learn from data and make intelligent decisions without explicit programming.
- These algorithms, inspired by the structure and function of the human brain, are designed to automatically learn intricate patterns and representations from vast amounts of complex data.
- Unlike traditional machine learning methods, deep learning algorithms excel at handling high-dimensional data, such as images, text, and speech, by leveraging hierarchical architectures composed of multiple layers of interconnected nodes called neurons.
- Through a process known as training, deep learning models adjust their internal parameters, known as weights, to minimize the difference between predicted and actual outcomes, thus optimizing their ability to generalize to new, unseen data. With their remarkable capabilities in tasks such as image recognition, natural language processing, and autonomous decision-making, deep learning algorithms have revolutionized numerous industries, driving innovation and shaping the future of technology.

7.1.1 Convolutional Neural Networks (CNNs):

- CNNs are primarily used for image recognition and classification tasks. They consist of multiple layers of convolutional filters followed by pooling layers to extract hierarchical features from images.

7.1.2 Recurrent Neural Network (RNNs):

- RNNs are designed to work with sequential data, such as time series or natural language. They have loops within their architecture to allow information to persist making them suitable for tasks like speech recognition and machine translation.

7.1.3 Long Short Term (LSTM) Network:

- LSTMs are a special kind of RNN designed to overcome the vanishing gradient problem. They have a more complex structure that allows them to capture long-term dependencies in sequential data better.

7.1.4 Gated Recurrent Units (GRUs):

- GRUs are another type of RNN that addresses some of the shortcomings of traditional RNNs. They have fewer parameters than LSTMs and are often used in scenarios where computational resources are limited.

7.1.5 Autoencoders:

- Autoencoders are neural networks trained to reconstruct their input. They consist of an encoder network that compresses the input into a latent space representation and a decoder network that reconstructs the input from this representation. They are used for tasks like dimensionality reduction, data denoising, and anomaly detection.

7.1.6 Generative Adversarial Networks (GANs):

- GANs consist of two neural networks, a generator, and a discriminator, that are trained simultaneously in a competitive manner. The generator tries to generate synthetic data that is indistinguishable from real data, while the discriminator tries to differentiate between real and fake data. GANs are used for tasks like image generation, style transfer, and data augmentation.

7.1.6 Deep Reinforcement Learning (DRL):

- DRL combines deep learning with reinforcement learning principles to learn policies for sequential decision-making tasks. Deep Q-Networks (DQN) and Proximal Policy Optimization (PPO) are popular algorithms in this domain, used for applications like game playing, robotics, and resource management.

CHAPTER-8

8.1 CONCLUSION:

- Deep learning has revolutionized artificial intelligence by enabling machines to learn complex patterns and representations directly from data. Its ability to automatically discover intricate features from raw inputs has led to remarkable advancements in various domains, including computer vision, natural language processing, and robotics.
- Despite its successes, challenges such as interpretability, data efficiency, and ethical considerations remain, highlighting the need for ongoing research and responsible deployment.
- In conclusion, deep learning stands at the forefront of artificial intelligence, promising continued breakthroughs and transformative applications in the years to come.

ACHIEVEMENT: Attached Completion Certificate



CHAPTER-9

MINI PROJECT

9.1 ABSTRACT

- Drug repurposing has emerged as a transformative approach in pharmaceutical innovation, offering a strategic alternative to traditional drug discovery methods. This abstract delves into the intricacies of drug repurposing, exploring its underlying principles, diverse methodologies, and substantial advantages.
- The fundamental principle of drug repurposing lies in the recognition that existing drugs, originally developed for specific indications, possess untapped therapeutic potential across a spectrum of diseases. Leveraging this potential requires a multidisciplinary approach, combining insights from pharmacology, genomics, bioinformatics, and clinical data analysis.
- Various computational techniques play a pivotal role in drug repurposing efforts. Bioinformatics approaches analyze large-scale omics data to identify potential drug-disease associations, while network-based methods uncover hidden connections between drugs, targets, and diseases. High-throughput screening assays enable rapid testing of drug libraries against new targets, facilitating the identification of promising candidates for repurposing.
- In conclusion, drug repurposing is a game-changer in pharmaceutical innovation, providing a cost-effective, efficient, and clinically impactful strategy for tackling unmet medical needs.

CHAPTER-10

10.2 AIM:

- Drug repurposing has emerged as a promising avenue to address the challenges of traditional drug discovery, offering a targeted and efficient strategy for identifying novel therapeutic uses for existing drugs. This abstract aims to delve into the intricacies of precision in drug repurposing, focusing on the specific aims and methodologies employed to achieve successful outcomes.
- The primary aim of precision drug repurposing is to systematically identify and validate new therapeutic indications for existing drugs with a high degree of specificity and efficacy. This involves leveraging advanced computational techniques, including bioinformatics, network analysis, and machine learning algorithms, to prioritize potential drug-disease associations based on molecular mechanisms, genetic profiles, and clinical data.
- One key aspect of precision drug repurposing is the identification of target-specific repurposing opportunities, where drugs are matched with diseases based on shared molecular pathways or targetable biomarkers. This approach allows for the rational selection of candidate drugs with the highest likelihood of success in a specific patient population or disease subtype.
- It is to optimize the drug repurposing process by integrating diverse data sources and methodologies to enhance the predictive power and reliability of candidate selection. This may include the integration of multi-omics data, electronic health records, drug databases, and clinical trial data to generate comprehensive profiles of drug candidates and their potential therapeutic effects across different disease contexts.

CHAPTER-11

11.1 INTRODUCTION:

- Colorectal cancer (CRC) is the third most common diagnosis and second deadliest malignancy for both sexes combined. CRC has both strong environmental associations and genetic risk factors.
- The incidence of new cases and mortality has been steadily declining for the past years, except for younger adults (younger than 50 years), possibly related to an increase in cancer screening and better therapy modalities.
- Approximately 5% of all CRCs are attributed to two inherited syndromes, Familial Adenomatous Polyposis, and Lynch syndrome.
- The change of the normal colonic epithelium to a precancerous lesion and ultimately an invasive carcinoma requires an accumulation of genetic mutations either somatic (acquired) and/or germline (inherited) in an approximately 10 to 15-year period. Chromosomal instability, mismatch repair, and CpG hypermethylation are the major pathways to CRC.
- The most important prognostic colon cancer indicator is the pathological stage at presentation. All new CRC cases should be universally screened for DNA mismatch repair/microsatellite status, and RAS/BRAF mutational testing when considering for prognostic and predictive of chemotherapy efficacy.
- In almost all patients, a diagnostic or screening colonoscopy is required for tissue biopsy pathological confirmation of colon carcinoma.

CHAPTER-12

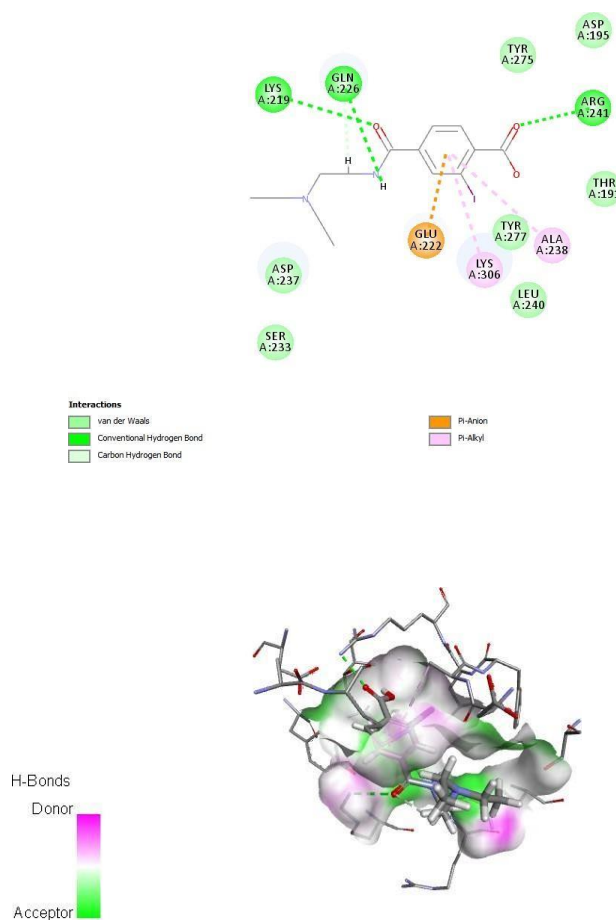
12.1 METHODOLOGY:

- Docking 6FBT with the structures 5KR7 and 6DQ4 involves computational simulations to predict their potential interactions. This process aims to determine the binding affinity and mode of interaction between 6FBT and each of these structures. By docking these molecules, researchers can gain insights into whether 6FBT could effectively target these proteins or vice versa. These insights are valuable for understanding potential therapeutic applications or guiding further research in drug development.

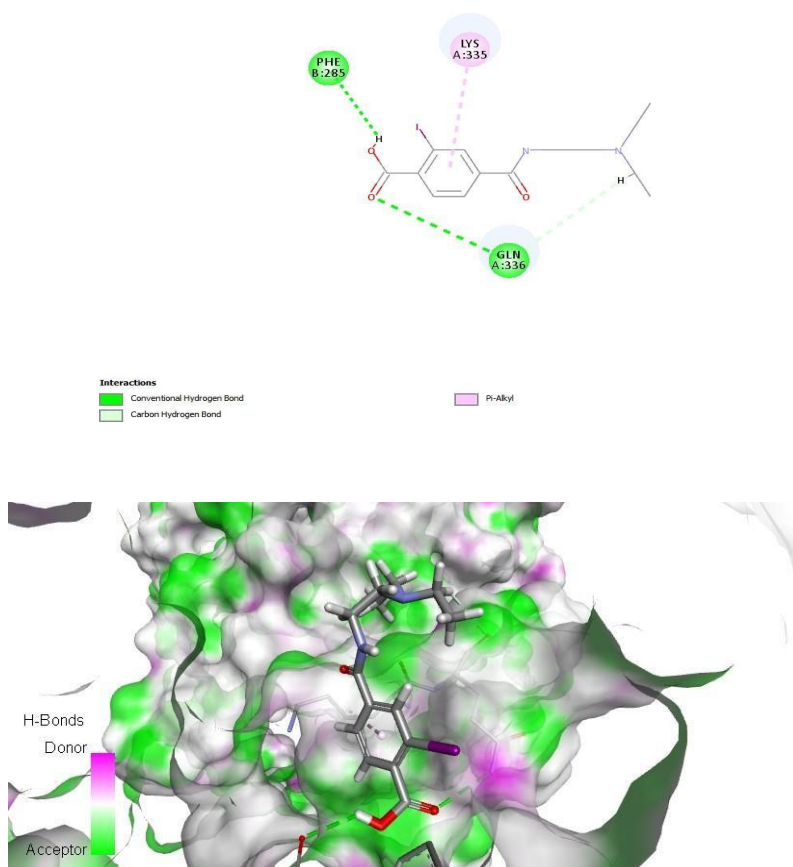
CHAPTER-13

13.1 RESULT:

- The 2D and 3D structures illustrate the interactions between the residues of the protein and its native structure, revealing the binding affinity of these residues with the protein.



2D and 3D Structure of 5KR7



2D And 3D Structure of 6QD4

CHAPTER-14

14.1 DISCUSSION:

- Genetic variations, such as the ARG20 variant in the KDM4C gene, can affect protein function. In the context of KDM4C, this variant might alter the enzyme's activity, stability, or interaction with other molecules. For instance, a single amino acid change could disrupt the enzyme's catalytic site, impairing its ability to demethylate histone proteins properly. Alternatively, it could affect how the enzyme binds to its substrate or regulatory proteins, thereby influencing its function. Understanding the functional impact of the ARG20 variant is crucial because it provides insights into how this genetic variation might contribute to colon cancer. If the variant enhances KDM4C activity, it could promote the expression of genes involved in cancer progression. Conversely, if it reduces KDM4C activity, it might dysregulate gene expression in a way that promotes tumorigenesis.
- KDM4C has been implicated in various cancers, including colon cancer. Its role in cancer often involves regulating gene expression by demethylating histone proteins, which are crucial for controlling chromatin structure and gene transcription. In colon cancer, dysregulation of gene expression contributes to tumor development, growth, and metastasis. Research has shown that KDM4C expression is elevated in colon cancer tissues compared to normal colon tissues. Moreover, increased KDM4C expression has been associated with poor prognosis in colon cancer patients, suggesting that it plays a role in disease progression.
- Drug Development: Targeting KDM4C with drugs could be a promising approach for colon cancer therapy. By selectively inhibiting or modulating KDM4C activity, it might be possible to disrupt cancer-promoting pathways specifically in colon cancer cells while sparing normal cells. This targeted approach could potentially lead to more effective treatments with fewer side effects compared to traditional chemotherapeutic agents. Developing drugs that specifically target KDM4C requires a deep understanding of its structure, function, and regulation. Scientists can use techniques such as structural biology, high-throughput screening, and

computational modeling to identify compounds that interact with KDM4C and modulate its activity. These compounds can then be further optimized to enhance their potency, selectivity, and pharmacokinetic properties.

CHAPTER-15

REVIEW ARTICLE

INTEGRATING SYSTEM BIOLOGY WITH MACHINE LEARNING: UNLOCKING BIOLOGICAL INSIGHTS

15.1 INTRODUCTION:

Systems biology is a comprehensive strategy aimed at understanding the overall characteristics of biological systems, covering both their static and dynamic features. It combines various datasets from different omics fields to establish connections among diverse biological components, using network-based analyses and machine learning techniques. Integrating systems biology and machine learning holds great potential for advancing drug development and personalized treatments by unraveling biological processes and predicted phenotypic outcomes. Numerous applications arise from merging these fields in biology and medicine, including personalized medicine, biomarker discovery, drug development, understanding disease mechanisms, and predicting drug responses.

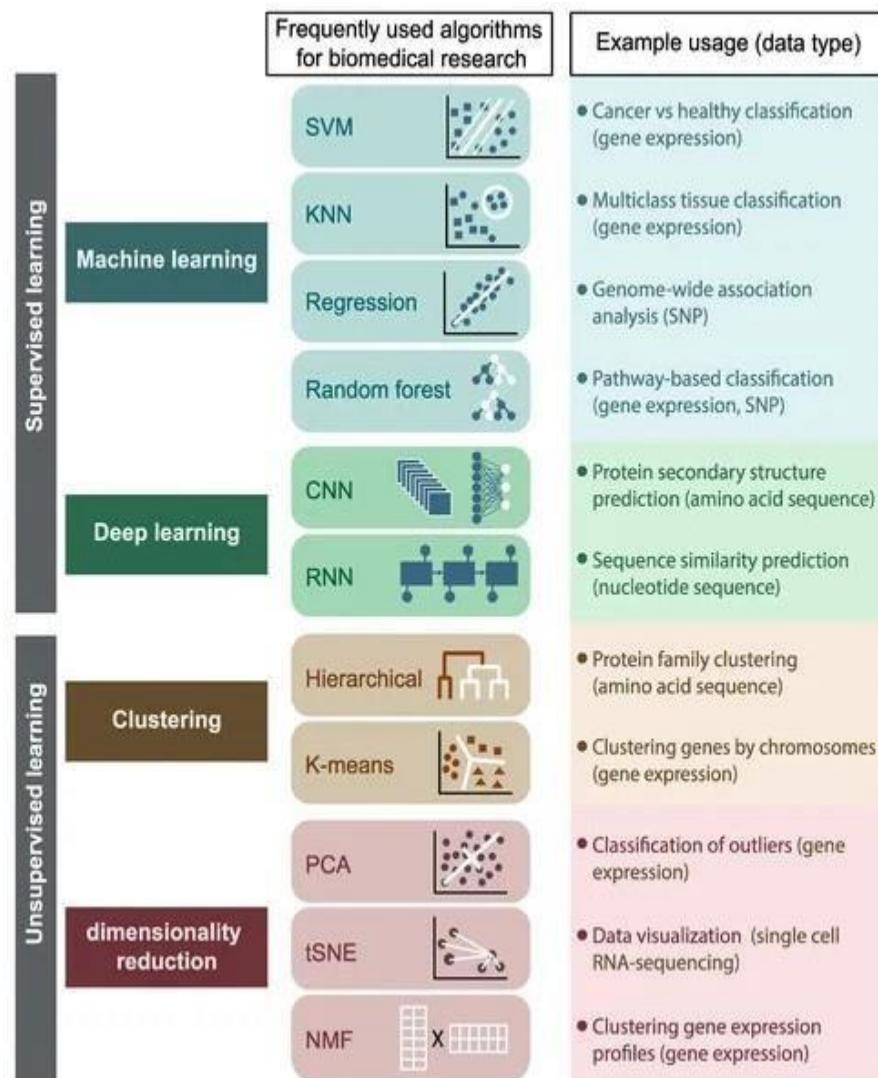
15.2 EMERGING TRENDS IN INTEGRATIVE ANALYSIS:

The expanding and diverse nature of biological data requires a broad array of modeling and analysis techniques within systems biology. Machine learning methods have grown as powerful tools for handling multidimensional datasets alongside biological networks, scrutinizing intricate interactions, and modeling biological systems. ML techniques in network biology can be categorized into those that infer network architectures and those that integrate existing network architectures with biological data measurements. Various techniques including support vector machines (SVM), transfer learning, single-cell RNA sequencing based ML, non-negative matrix factorization (NMF), regression, principal component analysis (PCA), and deep neural networks have been employed for these purposes. Moreover, ML methods have been combined with established

network structures to analyze diverse biological datasets. These tools have been used for various purposes such as anticipating the effectiveness of drugs, simulating how drugs may react, building network profiles based on protein-protein interaction networks, predicting potential side effects and combinations of drugs, investigating characteristics of metabolic networks, and deducing metabolic pathways.

15.3 Simulating Cellular Signaling Pathways

Diabetes, a metabolic condition necessitating careful management of blood sugar levels, has seen notable technological advancements, particularly in artificial pancreas systems and predictive modeling, with assistance from machine learning. These innovations have revolutionized diabetes care by offering personalized solutions for patients. Machine learning and data mining have become increasingly popular, particularly in diabetes research and services predicting blood glucose levels. However, there is a lack of comprehensive reviews outlining current trends in modeling options and strategies for predicting blood glucose levels in type 1 diabetes. This initiative provides a concise overview of modeling procedures and strategies in machine learning and hybrid systems for predicting blood glucose dynamics in type 1 diabetes. It will delve into machine-learning methods relevant to artificial pancreas controllers (closed-loop systems), personalized profile modeling, decision support systems tailored to individuals, and applications for blood glucose alarms. Ultimately, this effort seeks to evaluate and discuss prevailing trends in machine learning applications within these specific contexts.



15.4 Integration of Omics Data for Systems Biology

It's interesting to see how biomedical studies are evolving with the advancement of modern high-throughput omics measurement platforms. These platforms are enabling a more integrative approach toward understanding biological systems, and it's fascinating to see how researchers are utilizing the data to gain a deeper insight into various aspects of our biology. Various omics sources like genetics, proteomics, and metabolomics are integrated using machine learning-based predictive algorithms to unravel complex biological processes. It's fascinating to see how machine learning methods are helping researchers discover new biomarkers through the analysis of integrated omics data. These biomarkers have the potential to greatly improve disease prediction, patient stratification, and the overall

advancement of precision medicine. The fundamental principles of molecular biology govern the transmission of genetic information within cells, progressing from DNA to mRNA to protein. The comprehensive study of Deoxyribonucleic acid and proteins is termed genomics. The emergence of large amounts of data technologies offers a unique opportunity to explore intricate relationships between various omics data and physical trait outcomes, surpassing single omics evaluations. This section outlines several integrated omics studies employing the method discussed earlier.

15.5 CONCLUSION:

A summary of different physical traits of target-based integrated omics published is provided. Due to the complexity of these techniques, interdisciplinary scientists may find the material daunting, requiring significant time and effort to grasp the intricate mathematical and computational concepts underlying them. Therefore, we propose that machine learning practitioners should actively collaborate within interdisciplinary teams dedicated to multiomics research. Their involvement can aid in selecting appropriate techniques and contribute to the development of effective solutions.

CHAPTER-16

MATLAB

App Building Onramp

With its interactive, do-it-yourself design, App Building Onramp will provide quick video lessons and hands-on activities to help you learn how to use the MATLAB Application Designer to build interactive applications. After completing the application creation process, you can design, develop, and deploy MATLAB applications for a wide range of uses, from advanced computing to data visualization.

Signal Processing with MATLAB

Dive into the world of signal processing using MATLAB with the comprehensive Signal Processing Onramp. This interactive course combines theoretical concepts with hands-on exercises to help you understand and apply various signal-processing techniques using MATLAB. From filtering and spectrum analysis to signal imaging, this Onramp gives you the capabilities to analyze and manipulate signals for a variety of applications.

Image Processing with MATLAB

Unleash the power of MATLAB for image manipulation with our Onramp image editor. This hands-on course is designed to introduce you to the basics of image processing and show you how MATLAB can be used to perform a variety of image analysis tasks. Through interactive tutorials and real-world examples, you will learn techniques such as image enhancement, segmentation, and feature extraction that enable you to efficiently process and interpret images.

MATLAB Programming Techniques

Take your MATLAB skills to the next level with MATLAB Programming Techniques Onramp. This advanced course is designed for experienced MATLAB users who want to improve their programming skills. From optimization and debugging strategies to designing advanced data structures and algorithms, this Onramp covers a wide range of programming techniques to help you write powerful, robust, and maintainable MATLAB.

MATLAB for Data Processing and Visualization

It's a good idea to learn MATLAB for data processing and visualization, especially if you work with numerical data. Here are some things you might want to learn about processing and visualizing data with MATLAB. These MATLAB capabilities enable you to handle a variety of data processing and visualization tasks, making it a powerful tool for data analysis and visualization.

Machine Learning with MATLAB

MATLAB is a versatile machine-learning environment that contains rich built-in tools, functions, and documentation. Gaining knowledge of MATLAB machine learning will enable you to apply various machine-learning techniques to real-world problems.

Image Processing Onramp

With an interactive, do-it-yourself approach, Image Processing Onramp offers short video courses and hands-on exercises to help you understand and use MATLAB image processing concepts. Complete the image processing onramp for a thorough understanding of image processing principles and methods. You will also gain hands-on experience using MATLAB to develop image processing algorithms.

Solving Nonlinear Equations with MATLAB

Unleash the power of MATLAB to solve complex nonlinear equations with Nonlinear Equation Solving Onramp. This self-paced course is designed to give you the skills you need to effectively handle nonlinear equations using the extensive computing capabilities of MATLAB. Through guided exercises, you will learn various numerical methods and techniques for finding solutions to nonlinear equations in various scientific and engineering applications.

Deep Learning with MATLAB

Explore the advancement of deep learning with MATLAB with Deep Learning Onramp. This interactive course provides a thorough introduction to deep learning concepts and shows how to use MATLAB to build, train, and deploy deep neural networks. Whether you're new to deep learning or want to deepen your knowledge, this Onramp gives you the skills to tackle complex problems.

Statistics Onramp

Dive into the world of statistical analysis and data interpretation with MATLAB Statistics Onramp. This interactive learning experience provides a comprehensive overview of statistical concepts, from basic descriptive statistics to advanced data modeling techniques. By learning the statistical capabilities of MATLAB, you can analyze data, generate meaningful insights, and make informed decisions in a variety of fields.

MATLAB Fundamentals

Learn the basics of MATLAB programming from the ground up with MATLAB Fundamentals Onramp. Designed for beginners, this interactive course provides a structured learning path covering basic MATLAB syntax, data types, control flow, and function writing. Whether you're new to programming or transitioning from another language, this Onramp provides a solid foundation for your MATLAB journey.

Reinforcement Learning Onramp

Reinforcement Learning Onramp for MATLAB is a comprehensive introductory course that teaches you how to use MATLAB to build reinforcement learning algorithms and the principles of reinforcement learning.

Computer Vision Onramp

Computer vision is where knowledge from the real world meets digital data. Data from multiple cameras and sensors can be combined to create a digital reconstruction. In this course, you will use object recognition to find, track, and count turtles in a video.

Deep Learning Onramp

Deep Learning Onramp is an interactive, self-paced course that uses MATLAB to teach you how to apply and understand deep learning concepts through short video tutorials and hands-on activities. After completing the Deep Learning Onramp, we will have a thorough understanding of deep learning theories and methods and hands-on experience building and improving deep learning models in MATLAB.

Object-Oriented Programming Onramp

Journey through object-oriented programming (OOP) principles with the MATLAB object oriented programming onramp. This interactive course combines concise video tutorials with hands-on exercises to teach you the basics of OOP in MATLAB. By the end of this Onramp, you will have a good understanding of how to use OOP concepts to create modular and reusable code in MATLAB.

Machine Learning Onramp

Journey through object-oriented programming (OOP) principles with the MATLAB objectoriented programming onramp. This interactive course combines concise video tutorials with hands-on exercises to teach you the basics of OOP in MATLAB. By the end of this Onramp, you will have a good understanding of how to use OOP concepts to create modular and reusable code in MATLAB.

MATLAB CERTIFICATES



Course Completion Certificate

Suriyapriya V

has successfully completed **100%** of the self-paced training course

Object-Oriented Programming Onramp



DIRECTOR, TRAINING SERVICES

22 February 2024



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Deep Learning Onramp



DIRECTOR, TRAINING SERVICES

29 February 2024



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MATLAB Onramp

DIRECTOR, TRAINING SERVICES

15 November 2023



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Machine Learning Onramp

DIRECTOR, TRAINING SERVICES

21 December 2023



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Computer Vision Onramp

DIRECTOR, TRAINING SERVICES

22 December 2023

Progress Report

Name: Suriyapriya V
Course: Image Processing Onramp
Progress: 100% complete (as of 5 March 2024)

Chapters

1. Introduction 100%
2. Images in MATLAB 100%
3. Image Segmentation 100%
4. Preprocessing and Postprocessing Techniques 100%
5. Classification and Batch Processing 100%
6. Conclusion 100%

Release: R2023b | Language: English

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Deep Learning with MATLAB


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4 March 2024

Course Completion Certificate

Suriyapriya V

has successfully completed **100%** of the self-paced training course

Statistics Onramp


DIRECTOR, TRAINING SERVICES

1 March 2024



Course Completion Certificate

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MATLAB Fundamentals

DIRECTOR, TRAINING SERVICES

31 March 2024



Course Completion Certificate

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Reinforcement Learning Onramp

DIRECTOR, TRAINING SERVICES

4 March 2024



Course Completion Certificate

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Machine Learning with MATLAB

DIRECTOR, TRAINING SERVICES

7 March 2024



Course Completion Certificate

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Wireless Communications Onramp

DIRECTOR, TRAINING SERVICES

7 April 2024



Course Completion Certificate

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MATLAB for Data Processing and Visualization

DIRECTOR, TRAINING SERVICES

30 March 2024



Course Completion Certificate

Suriyapriya V

has successfully completed **100%** of the self-paced training course

Solving Nonlinear Equations with MATLAB

DIRECTOR, TRAINING SERVICES

6 April 2024

Course Completion Certificate

Suriyapriya V

has successfully completed **100%** of the self-paced training course

MATLAB Programming Techniques


DIRECTOR, TRAINING SERVICES

28 April 2024

CHAPTER-17

WORKSHOPS

17.1 National Internal Property Awareness Mission



Suriyapriya V

by OfficialTurnitin

Submission date: 28-Apr-2024 11:00PM (UTC+0900)

Submission ID: 2364193204

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Systems biology is a comprehensive strategy aimed at understanding the overall characteristics of biological systems, covering both their static and dynamic features. It combines various datasets from different omics fields to establish connections among diverse biological components, using network-based analyses and machine learning techniques. Integrating systems biology and machine learning holds great potential for advancing drug development and personalized treatments by unraveling biological processes and predicting phenotypic outcomes. Numerous applications arise from merging these fields in biology and medicine, including personalized medicine, biomarker discovery, drug development, understanding disease mechanisms, and predicting drug responses. The expanding and diverse nature of biological data requires a broad array of modeling and analysis techniques within systems biology. Machine learning methods have grown as powerful tools for handling multidimensional datasets alongside biological networks, scrutinizing intricate interactions, and modeling biological systems. ML techniques in network biology can be categorized into those that infer network architectures and those that integrate existing network architectures with biological data measurements. Various techniques including support vector machines (SVM), transfer learning, single-cell RNA sequencing-based ML, non-negative matrix factorization (NMF), regression, principal component analysis (PCA), and deep neural networks have been employed for these purposes. Moreover, ML methods have been combined with established network structures to analyze diverse biological datasets. These tools have been used for various purposes such as anticipating the effectiveness of drugs, simulating how drugs may react, building network profiles based on protein-protein interaction networks, predicting potential side effects and combinations of drugs, investigating characteristics of metabolic networks, and deducing metabolic pathways. Diabetes, a metabolic condition necessitating careful management of blood sugar levels, has seen notable technological advancements, particularly in artificial pancreas systems and predictive modeling, with assistance from machine learning. These innovations have revolutionized diabetes care by offering personalized solutions for patients. Machine learning and data mining have become increasingly popular, particularly in diabetes research and services predicting blood glucose levels. However, there is a lack of comprehensive reviews outlining current trends in modeling options and strategies for predicting blood glucose levels in type 1 diabetes. This initiative provides a concise overview of modeling procedures and strategies in machine learning and hybrid systems for predicting blood glucose dynamics in type 1 diabetes. It will delve into machine learning methods relevant to artificial pancreas controllers (closed-loop systems), personalized profile modeling, decision support systems tailored to individuals, and applications for blood glucose alarms. Ultimately, this effort seeks to evaluate and discuss prevailing trends in machine learning applications within these specific contexts. It's interesting to see how biomedical studies are evolving with the advancement of modern high-throughput omic measurement platforms. These platforms are enabling a more integrative approach toward understanding biological systems, and it's fascinating to see how researchers are utilizing the data to gain a deeper insight into various aspects of our biology. Various omics sources like genetics, proteomics, and metabolomics are integrated using machine learning-based predictive algorithms to unravel complex biological processes. It's fascinating to see how machine learning methods are helping researchers discover new biomarkers through the analysis of integrated omics data. These biomarkers have the potential to greatly improve disease prediction, patient stratification, and the overall advancement of precision medicine. The fundamental principles

of molecular biology govern the transmission of genetic information within cells, progressing from DNA to mRNA to protein. The comprehensive study of Deoxy Ribo Nucleic acid and proteins is termed genomics. The emergence of large amounts of data technologies offers a unique opportunity to explore intricate relationships between various omics data and physical trait outcomes, surpassing single omics evaluations. This section outlines several integrated -omics studies employing methods discussed earlier. A summary of different physical traits target-based integrated-omics studies published is provided. Due to the complexity of these techniques, interdisciplinary scientists may find the material daunting, requiring significant time and effort to grasp the intricate mathematical and computational concepts underlying them. Therefore, we propose that machine learning practitioners should actively collaborate within interdisciplinary teams dedicated to multi-omics research. Their involvement can aid in selecting appropriate techniques and contribute to the development of effective solutions.

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