

SOIL ANALYSIS USING DEEP LEARNING

Submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering

By

CHUNDURI BHARGAV (Reg no:37130089)



**SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

SATHYABAMA

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

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL – 2021



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Bonafide Certificate

This is to certify that this Project Report is the bonafide work of **CHUNDURI BHARGAV (37130089)** who have done the Project work as a team who carried out the project entitled "**SOIL ANALYSIS USING DEEP LEARNING**" under my supervision from December 2019 to April 2020.

Internal Guide

Dr. I. Rexiline Sheeba, M.E, Ph.D

Head of the Department

Dr. T. RAVI M.E, Ph.D

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I, CHUNDURI BHARGAV (37130089) hereby declare that the Project Report entitled “SOIL ANALYSIS USING DEEP LEARNING” done by me under the guidance of Dr. I. REXLINE SHEEBA at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE :

PLACE:

1.CHUNDURI BHARGAV

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to Board of Management of **Sathyabama Institute of Science and Technology** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr. N. M. Nandhitha, M.E, Ph.D**, Dean, School of Electrical and Electronics and **Dr. T Ravi, M.E. Ph.D**, Head of the Department, Dept. of Electronics and Communication Engineering for providing us necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Project Guide **Dr. I. Rexiline Sheeba, M.E. Ph.D**, for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of **Electronics and Communication Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

Soil Analysis is the technique to predict the state of the soil. It is important to exactly determine the rainfall for effective use of water resources, crop productivity and pre planning of water structures. By usage of different data mining methods we can predict rainfall by numerically. We mainly focused on Naive Bayes, K-Nearest Neighbour algorithm, Decision Tree, Neural Network and fuzzy logic are some of the algorithms compared in this paper. From that comparison, it can analyze which method gives better accuracy for this prediction. India is an agricultural country and its economy is largely based upon crop productivity and rainfall. It is important to exactly determine the rainfall for effective use of water resources, crop productivity and pre planning of water structures. Using different data mining techniques it can predict rainfall. Data mining techniques are used to estimate the rainfall numerically. This paper focuses some of the popular data mining algorithms for rainfall prediction. Naive Bayes, K-Nearest Neighbour algorithm, Decision Tree, Neural Network and fuzzylogic are some of the algorithms compared in this paper.

Table of Contents

<u>S.no</u>	<u>Name of Title</u>	<u>Page no</u>
1	Introduction	1
1.1	Existing System	2
1.2	Disadvantages of existing system	2
1.3	Proposed system	3
2	Literature Survey	5
3	Modules	8
3.1	Data collection	8
3.2	Data cleaning	8
3.3	Data transformation	8
3.4	Data selection	9
3.5	Data mining	9
3.6	Data flow diagram	9
3.7	UML diagram	11
3.8	Use case diagram	12
3.9	Sequence diagram	13
3.10	Activity diagram	14
4	Testing	16
4.1	Mysql	16
4.2	Database	18
4.3	Feasibility study	20
4.4	Economic feasibility	22
4.5	Technical feasibility	23
4.6	Social feasibility	23
4.7	System design	24
4.8	Software testing	25
4.9	Network	26
4.10	Requirement Analysis	28

<u>S.no</u>	<u>Name of Title</u>	<u>Page no</u>
4.11	Functional requirements	28
4.12	Non- functional requirements	29
5	Conculsion	30
6	References	31

CHAPTER -1. INTRODUCTION

Soil Analysis is one finest way of testing the soil texture. There is no accurate prediction of rainfall algorithm, even though having 'n' number of algorithms. The better prediction has a potential benefit of preventing casualties and damages caused by natural disasters. Soil Analysis is masterized in drought and rainfall prediction. In this paper, various algorithms have been analyzed. Data mining techniques are efficiently used in soil prediction.

India is an agricultural country and its economy is largely based upon crop productivity and rainfall. For analyzing the crop productivity, soil prediction is require and necessary to all farmers. Soil Analysis is the application of science and technology to predict the state of the soil. It is important to exactly determine the rainfall for effective use of water resources, crop productivity and pre planning of water structures. Using different data mining techniques it can predict rainfall. Data mining techniques are used to estimate the rainfall numerically. This paper focuses some of the popular data mining algorithms for rainfall prediction. Naive Bayes, K-Nearest Neighbour algorithm, Decision Tree, Neural Network and fuzzy logic are some of the algorithms compared in this paper. From that comparison, it can analyze which method gives better accuracy for this prediction

The rainfall plays protagonist role in crop production and vital role in human sustainity. The Sequence of continous dry period or heavy rain going cause big

knock on farmer head. The long-lasting rain fall will cause drowning of ongoing crops and it leads to sedimentation .Thus why predicting rainfall is casted as protagonist in agricultural nations like India, China and etc. Rainfall forecasting related to scientific and technology area, where someone needs deal with train of data of soil sets and realiablity of research is seamless problem right now.

1.1 EXISTING SYSTEM:

Agriculture is the strength of our Indian economy. Farmer only depends upon monsoon to be their cultivation. For getting the good crop production a farmer need to good analysis of soil texture and little familiarity with seasoning. The instant raining and changing of weather will cause many troubles some many related to economic and some are with life. Forecasting the climate is not a easy and impossible task. The main theme in this one is to predict the weather using various data mining techniques. Such as classification, clustering, decision tree and also neural networks.

1.2 DISADVANTAGES EXISTING SYSTEM

- Classification
- Clustering
- Decision tree

1.3 PROPOSED SYSTEM

The rainfall plays protagonist role in crop production and vital role in human sustainability. The Sequence of continuous dry period or heavy rain going cause big knock on farmer head. The long-lasting rain fall will cause drowning of ongoing crops and it leads to sedimentation .Thus why predicting rainfall is casted as protagonist in agricultural nations like India, China and etc. Rainfall forecasting related to scientific and technology area, where someone needs deal with train of data of soil sets and reliability of research is seamless problem right now. Soil Analysis is the application of science and technology to predict the state of the soil. It is important to exactly determine the rainfall for effective use of water resources, crop productivity and pre planning of water structures. Using different data mining techniques it can predict rainfall.

Data mining techniques are used to estimate the rainfall numerically. This paper focuses some of the popular data mining algorithms for rainfall prediction. Naive Bayes, K-Nearest Neighbour algorithm, Decision Tree, Neural Network and fuzzy logic are some of the algorithms compared in this paper. From that comparison, it can analyze which method gives better accuracy for this prediction.

1.4 ADVANTAGES OF PROPOSED SYSTEM

- Numerical Weather Prediction
- Statistical Weather Prediction
- Synoptic Weather Prediction

1.5 PROPOSED SYSTEM ARCHITECTURE

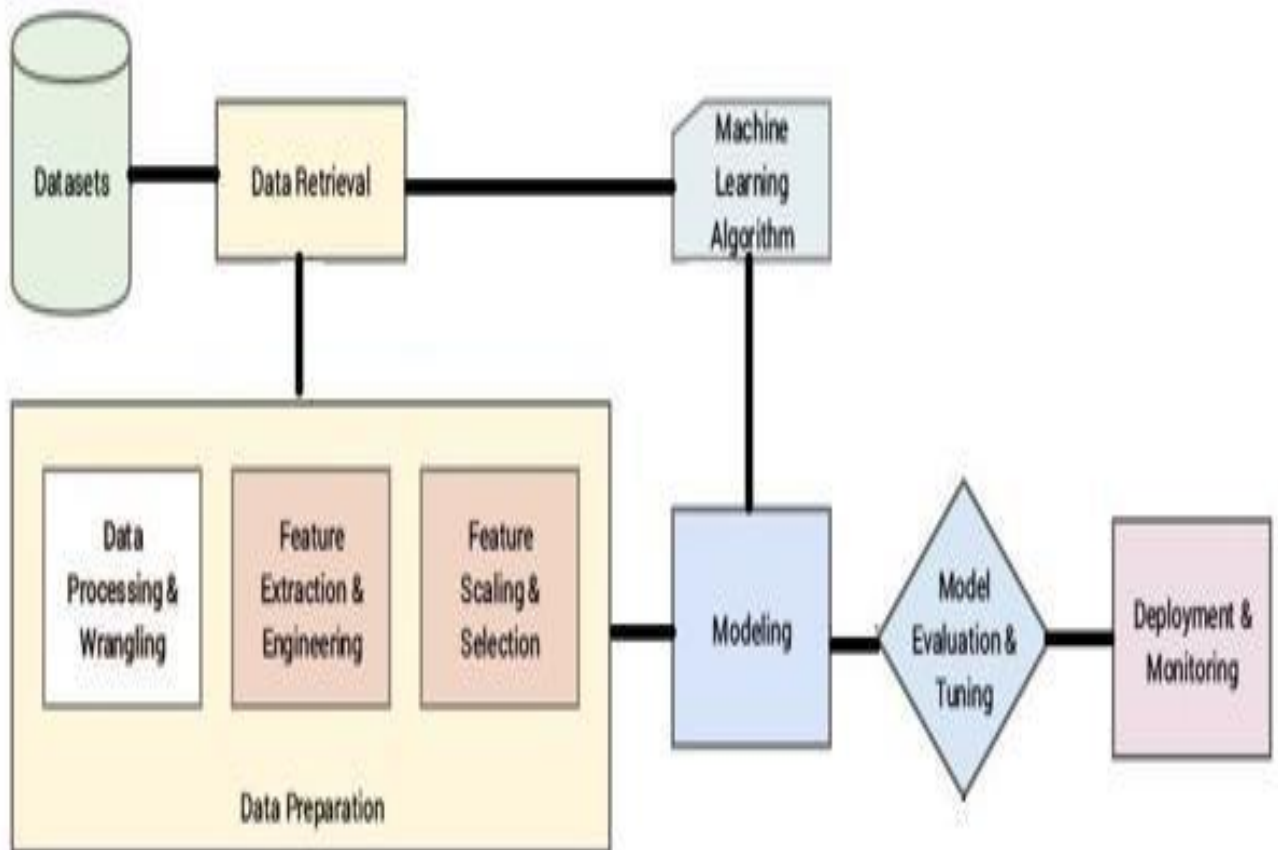


Fig no 1.5.1: proposed system architecture of soil analysis

CHAPTER- 2. LITERATURE SURVEY

2.1 R Shanumugan and Vijaysree Venkatraman – 11th October 2012

Indian Summer Monsoon Rainfall (ISMR) Forecasting using Time

Authors presented a model to forecast Indian Summer Monsoon Rainfall on the basis of monthly and seasonal timescales. To forecast, time series dataset was used, spanning from 1871 till 2014. The dataset was classified in two parts (1) 1871-1960 used as training data, and (2) 1961- 2014 used as test data. Statistical analysis reported the dynamic nature of rainfall in monsoon, which could not be predicted effectively with mathematical and statistical models. So, the authors in this research recommended to use three techniques for this type of prediction: Fuzzy Set, Entropy and Artificial Neural Network. By using these three techniques, a forecasting model is developed to deal with the dynamic nature of the ISMR. In proposed model, fuzzy set theory is used to handle uncertainties which are inherited in dataset. The entropy computational concept was modified in this model and used to provide the input as a degree of membership in the entropy function. That entropy function was referred as Fuzzy Information-Gain (FIG). Then, each fuzzified rule was defuzzified using the ANN. The value of FIG of each fuzzy- set was then used as input into ANN. The proposed model was named as “Fuzzy-Entropy-Neuro Based Expert System for ISMR Forecasting” because it is the integration of fuzzy set, entropy and ANN. To evaluate the performance of proposed model following accuracy measures were used: Standard Deviations (SDs), Correlation Coefficient (CC), Root Mean Square Error (RMSE) and

Performance Parameter (PP). According to results the proposed model is effective and efficient in comparison with other existing models.

2.2 Pradis Sabeti and Drummond Rennie – 25 th April 2014

An Extensive Evaluation of Seven Machine Learning Methods for Rainfall Prediction in Weather Derivatives

The researchers in compared the predictive performance of latest and state of the art method named “Markov chain extended with rainfall prediction” with the other widely used machine learning techniques: Support Vector Regression, Genetic Programming, M5 Rules, M5 Model trees, Radial Basis Neural Networks, and k-Nearest Neighbours. Daily rainfall datasets were collected from 42 cities of two continents, with very diverse climatic features. 20 cities were selected from around the Europe and 22 from around the USA. There were two reasons of choosing two continents for data extraction, first is to perform the experiment on different climates having diverse weather and second was the geographical locations as the selected cities were very far apart from each other. The ultimate goal was to not bias the experiment to particular climate type or for particular geographic location. According to results the accumulating rainfall amounts can bring good results as compared to prediction using daily rainydata. While using the accumulated data, Support Vector Regression, RadialBasis Functions, and Genetic Programming overall performed well however Radial Basis Functions performed better then modern technique of “Markov chain”. For all selected datasets, each technique used the same

parameters so it was not guaranteed that the best possible set of parameters was used for all the techniques. During the experiment, the researchers have noted a relationship between predictive accuracy and climatic attributes such as: volatile nature of rainfall, amount of maximum rainfall and the interquartile range of rainfall. Moreover no significant difference was noted in algorithms' prediction error among the cities of both the continents (USA and Europe). Issue regarding the discontinuity in rainfall data was solved with the help of accumulated rainfall amounts.

2.3 Mathew J. Harrington and Admir Masic – 5 th April 2016

Hybrid Model for Statistical Downscaling of Daily Rainfall

Authors in proposed a hybrid technique to downscale the daily rainfall by integrating two methods: 1) Random Forest, and 2) Support Vector Machine. RF was selected due to its robustness in classification and it was used to predict whether it will be rain or not whereas SVM were selected due to its feature to fit in non-linear data and it was used to predict the amount of rainfall, if it will occur. The proposed model was evaluated by downscaling daily rainfall at three stations, Dungun, Besut, and Kemaman on the east cost of peninsular, Malaysia. Daily rainfall time series data from 1961 till 2000 was collected from Department of Irrigation and Drainage Malaysia. Total of 26 climatic features were collected from National Centre for Environmental Prediction re analysis dataset, which were used as predictors for downscaling the models. To assess homogeneity in rainfall time series, various quality control activities were performed. Histograms for the dataset were created to reflect the problems moreover Student's t test was also used to identify any variance in the means between two segments of dataset which finally found homogeneous at all three locations.

CHAPTER-3. MODULES

Following modules are used in proposed work:

- Data Collection
- Data Cleaning
- Data Selection
- Data Transformation
- Data Mining Stage

3.1 Data Collection

The data used for this work was collected from meteorologist's centre. The case data covered the period of 2012 to 2015. The following procedures were adopted at this stage of the research: Data Cleaning, Data Selection, Data Transformation and Data Mining.

3.2 Data Cleaning

In this stage, a consistent format for the data model was developed which is search missing data, finding duplicated data, and weeding out of bad data. Finally system cleaned data were transformed into a format suitable for data mining.

3.3 Data Selection

At this stage, data relevant to the analysis like decision tree was decided on and retrieved from the dataset. The Meteorological dataset had ten attributes in that were using two attributes for future prediction. Due to the nature of the Cloud Form data where all the values are the same and the high percentage of missing values in the sunshine data both were not used in the analysis.

3.4 Data Transformation

“This is also known as data consolidation”. It is the stage in which the selected data is transformed into forms appropriate for data mining. The data file was saved in Comma Separated Value (CSV) file format and the datasets were normalized to reduce the effect of scaling on the data.

3.5 Data Mining Stage

The data mining stage was divided into three phases. At each phase all the algorithms were used to analyse the meteorological datasets. The testing method adopted for this research was percentage split that train on a percentage of the dataset, cross validate on it and test on the remaining percentage. There after interesting patterns representing knowledge were identified.

3.6 DATA FLOW DIAGRAM

3.6.1 LEVEL-0:

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data

to the system various processing carried out on this data, and the output

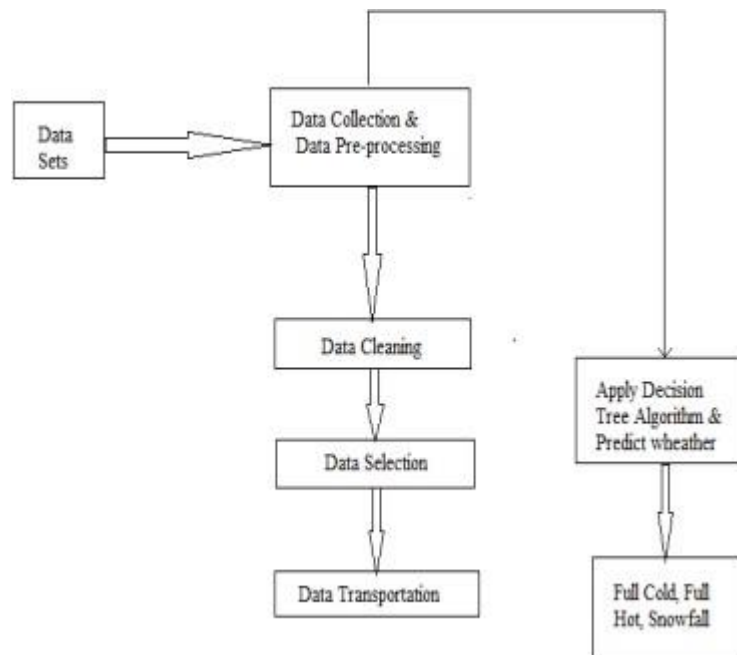


Fig 3.6.1.1: Schematic diagram of level -0

3.6.2 LEVEL-1

The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.

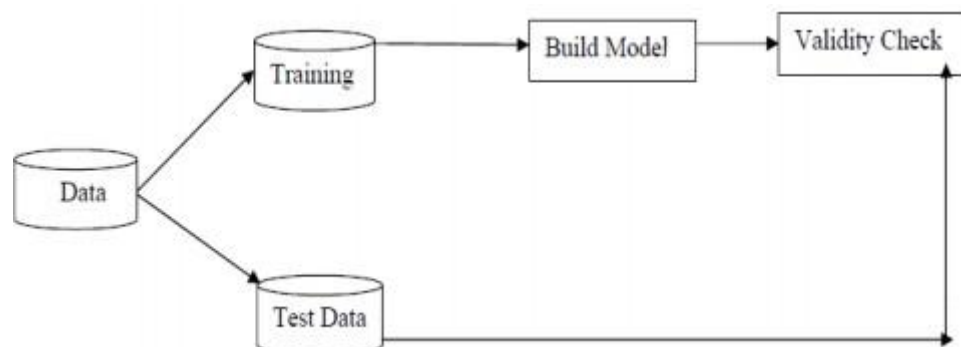


Fig 3.6.2.1: Level-1 schematic diagram

3.6.3 LEVEL-2

DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.

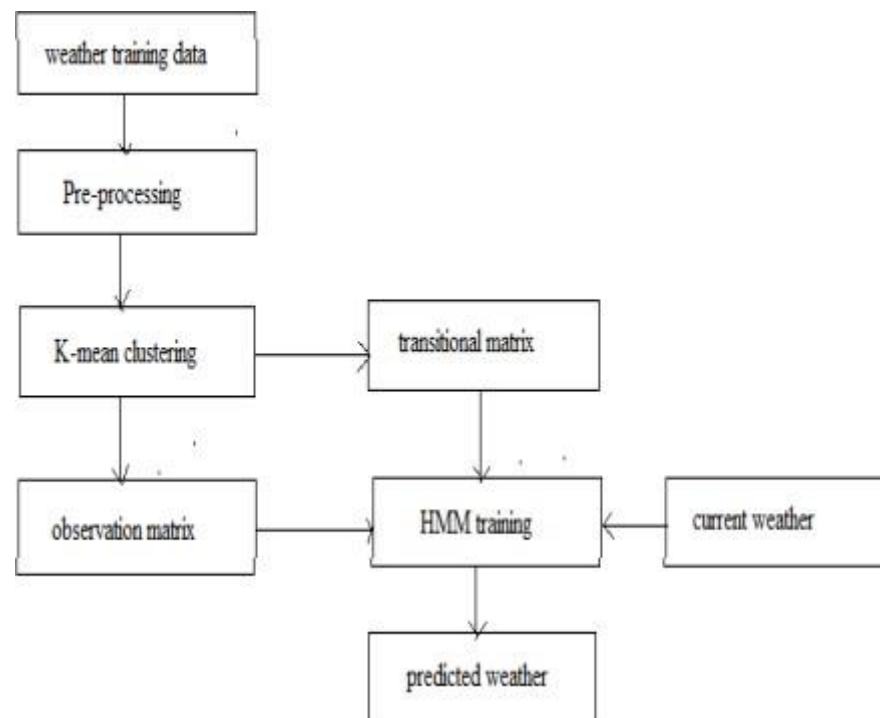


Fig 3.6.3.1: Level-2 schematic diagram

3.6.4 LEVEL-3

DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

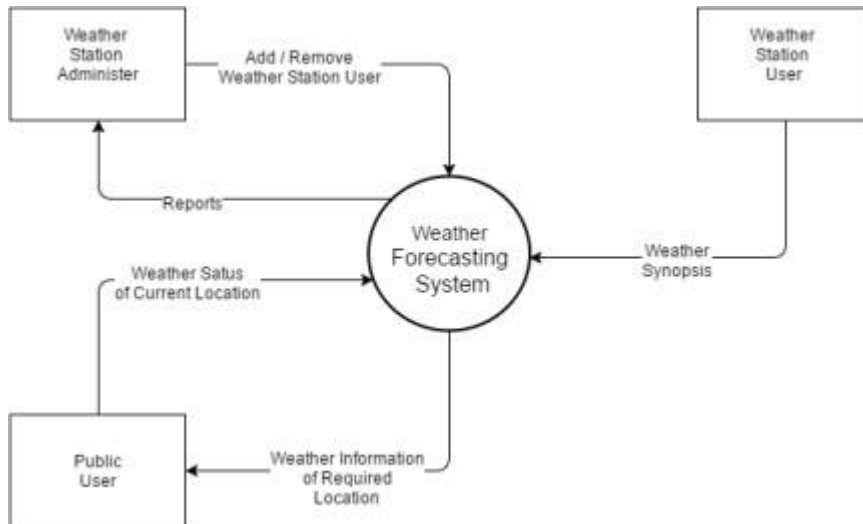


Fig:3.6.4.1 Level-3 schematic diagram

3.7 UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts. Be independent of particular programming languages and development process. Encourage the growth of OO tools market.
3. Support higher level development concepts such as collaborations, frameworks, patterns and components.
4. Integrate best practices.

3.8 USE CASE DIAGRAM:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what

system functions are performed for which actor. Roles of the actors in the system can be depicted.

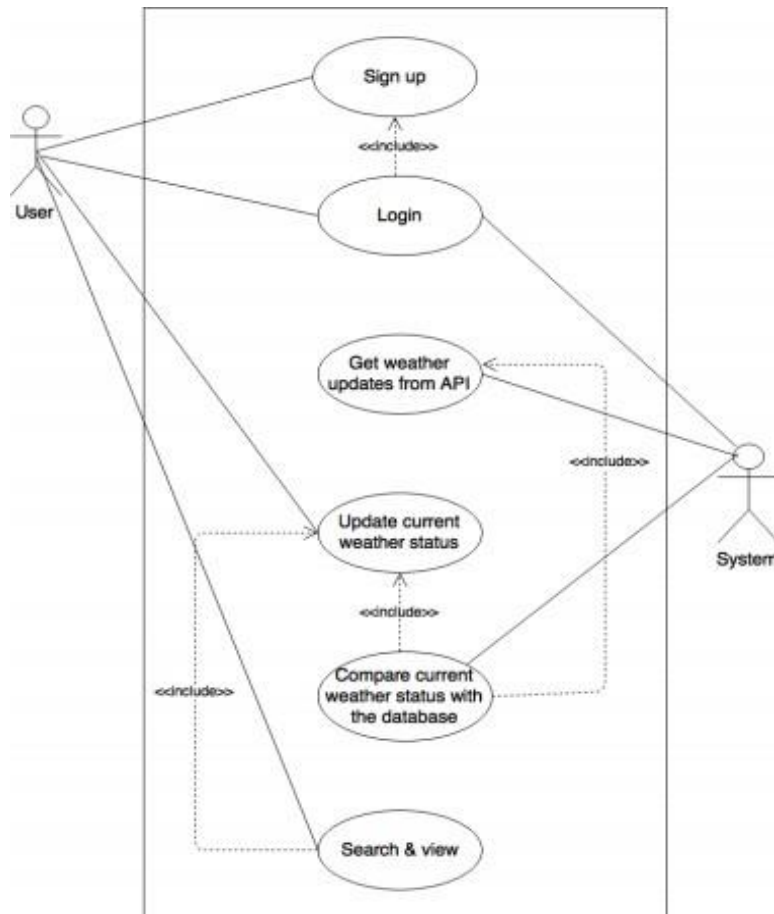


Fig 3.8.1.1 use diagram of analysis

3.9 SEQUENCE DIAGRAM:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are

sometimes called event diagrams, event scenarios, and timing diagrams

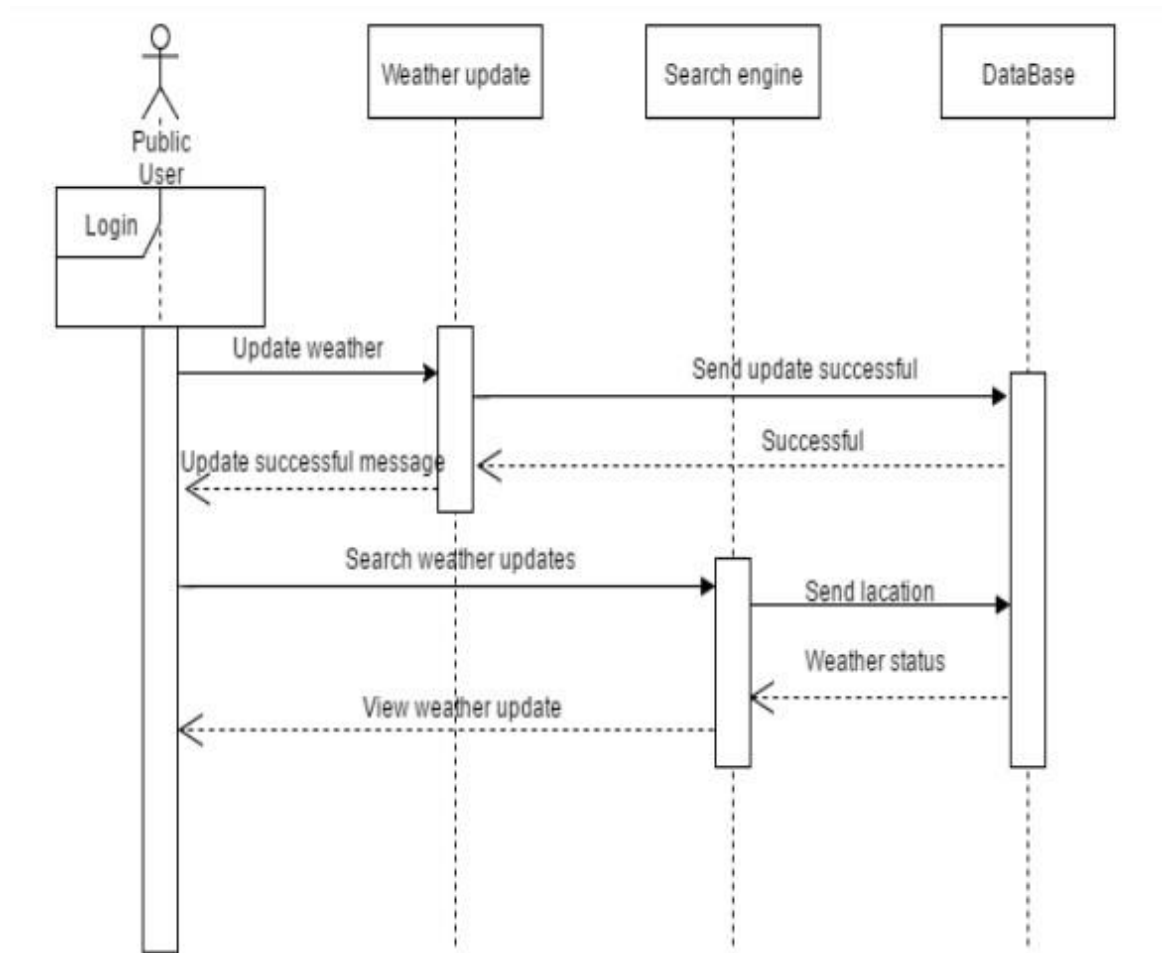


Fig:3.9.1 Sequence diagram for analysis

3.10 ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the

Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

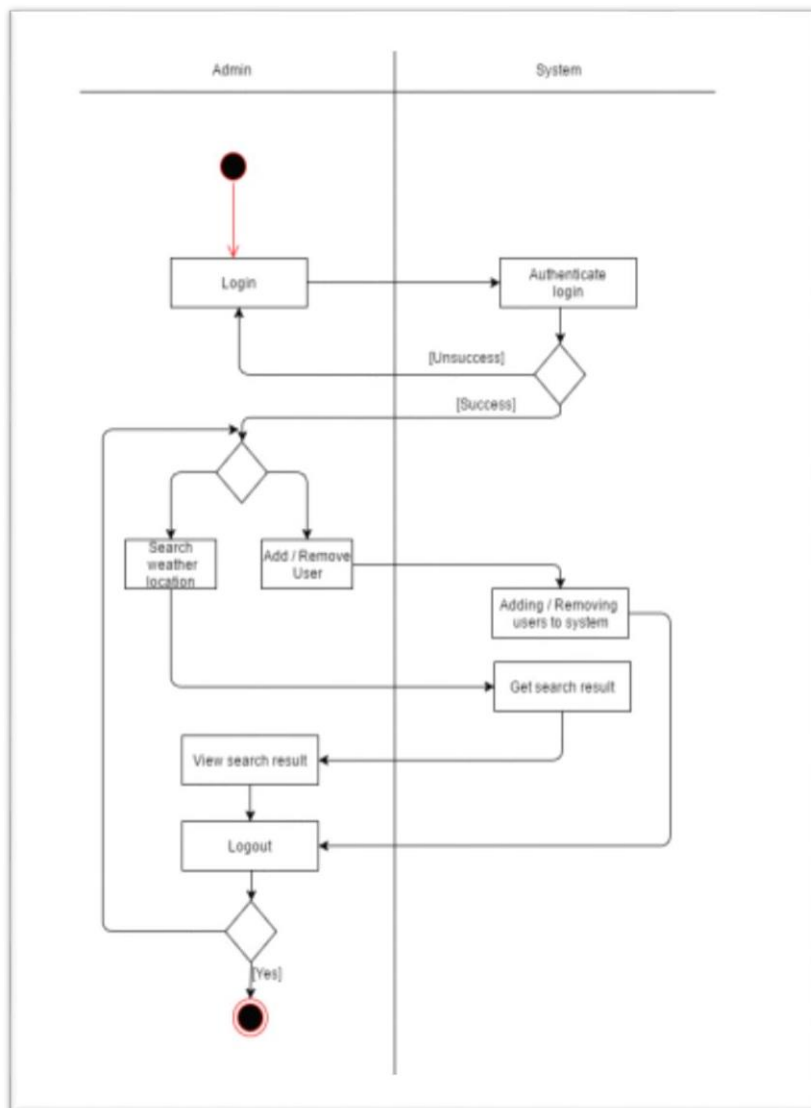


Fig 3.10.1: Activity diagram

CHAPTER- 4. TESTING

MySQL, officially, but also called "My Sequel" is the world's most widely used open-source relational database management system (RDBMS) that runs as a server providing multi-user access to a number of databases, though SQLite probably has more total embedded deployments. The SQL phrase stands Structured Query Language.

The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other 'AMP' stacks).

LAMP is an acronym for "Linux, Apache, MySQL, Perl/PHP/Python." Freesoftware-open source projects that require a full-featured database management system often use MySQL.

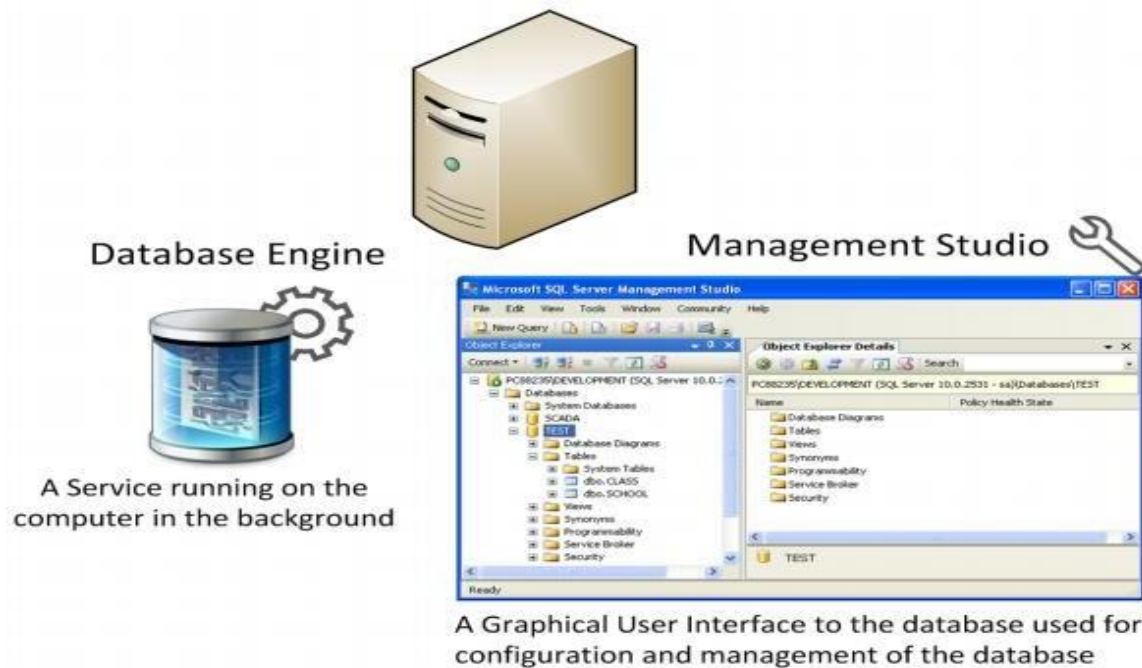
For commercial use, several paid editions are available, and offer additional functionality. Applications which use MySQL databases include: TYPO3, MODx, Joomla, WordPress, phpBB, MyBB, Drupal and other software. MySQL is also used in many high-profile, large-scale websites, including Wikipedia, Google (though not for searches), Facebook, Twitter, Flickr and YouTube. Microsoft is

the vendor of SQL Server. We have different editions of SQL Server, where SQL Server Express is free to download and use. SQL Server uses T-SQL (Transact-SQL). T-SQL is Microsoft's proprietary extension to SQL. TSQL is very similar to standard SQL, but in addition it supports some extra functionality, built in functions, etc.

T-SQL expands on the SQL standard to include procedural programming local variables, and various support functions for string processing, date processing, mathematics, etc. SQL Server consists of a Database Engine and a Management Studio (and lots of other stuff which we will not mention here). The Database engine has no graphical interface - it is just a service running in the background of your computer (preferable on the server). The Management Studio is graphical tool for configuring and viewing the information in the database. It can be installed on the server or on the client (or both).

SQL Server Management Studio can also be used to create a new database, alter any existing database schema by adding or modifying tables and indexes, or analyze performance. It includes the query windows which provide a GUI based interface to write and execute queries.

The vendor of SQL Server. We have different editions of SQL Server, where SQL Server Express is free to download and use. SQL Server uses T-SQL (Transact-SQL). T-SQL is Microsoft's proprietary extension to SQL. TSQL is very similar to standard SQL, but in addition it supports some extra functionality, built in functions, etc.



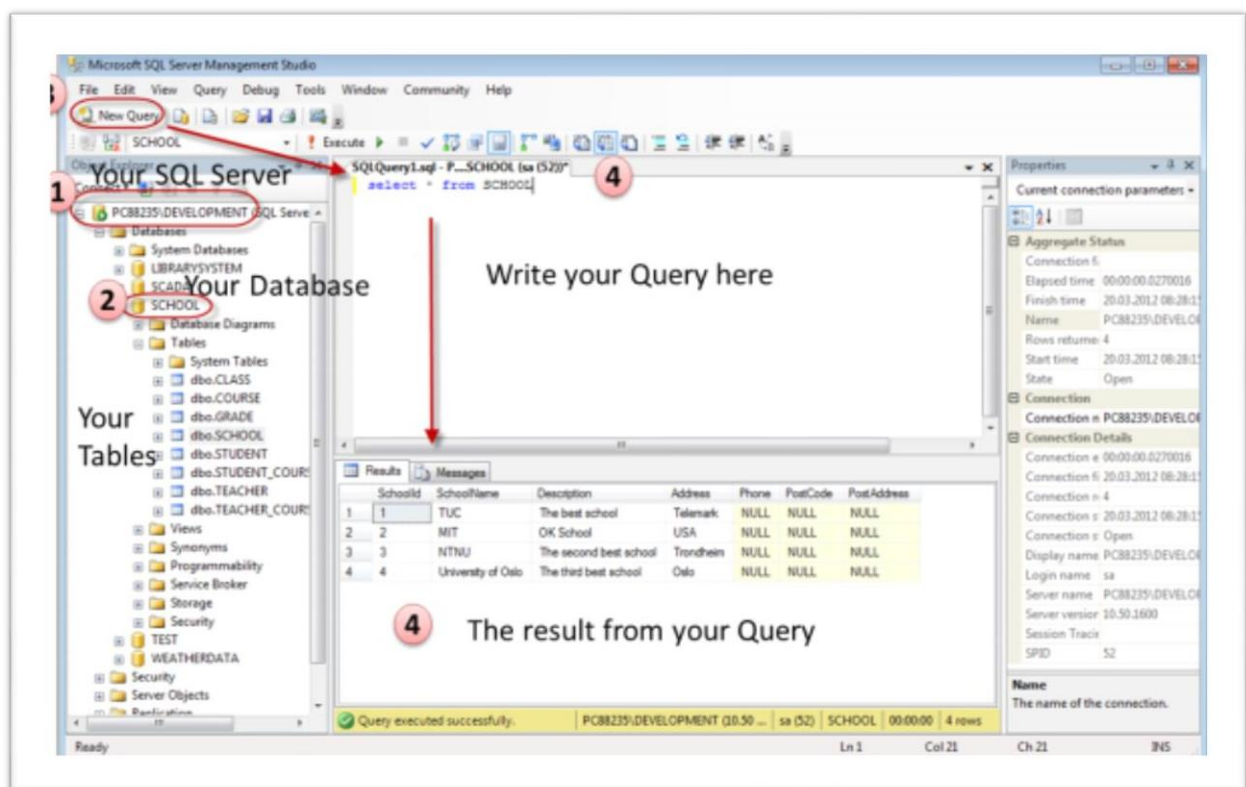
4.1 SQL SERVER MANAGEMENT STUDIO

SQL Server Management Studio is a GUI tool included with SQL Server for configuring, managing, and administering all components within Microsoft SQL Server. The tool includes both script editors and graphical tools that work with objects and features of the server. As mentioned earlier, version of SQL Server Management Studio is also available for SQL Server Express Edition, for which it is known as SQL Server Management Studio Express.

A central feature of SQL Server Management Studio is the Object Explorer, which allows the user to browse, select, and act upon any of the objects within the server. It can be used to visually observe and analyze query plans and optimize the database performance, among others. SQL Server Management Studio can

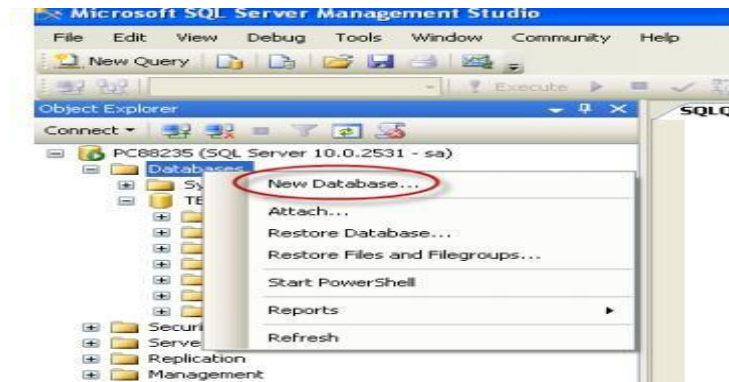
also be used to create a new database, alter any existing database schema by adding or modifying tables and indexes, or analyze performance. It includes the query windows which provide a GUI based interface to write and execute queries.

When creating SQL commands and queries, the “Query Editor” (select “New Query” from the Toolbar) is used (shown in the figure above). With SQL and the “Query Editor” we can do almost everything with code, but sometimes it is also a good idea to use the different Designer tools in SQL to help us do the work without coding (so much).



4.2 Create a new Database

It is quite simple to create a new database in Microsoft SQL Server. Just right-click on the “Databases” node and select “New Database...”



The OLAP Services feature available in SQL Server version 7.0 is now called SQL Server 2000 Analysis Services. The term OLAP Services has been replaced with the term Analysis Services. Analysis Services also includes a new data mining component. The Repository component available in SQL Server version 7.0 is now called Microsoft SQL Server 2000 Meta Data Services. References to the component now use the term Meta Data Services. The term repository is used only reference to the repository engine within Meta Data Services SQL-SERVER database consists of six type of objects,

They are,

1. TABLE
2. QUERY
3. FORM
4. REPORT
5. MACRO

4.2.1 Table

A database is a collection of data about a specific topic.

4.2.2 Views of Table

We can work with a table in two types,

1. Design View
2. Datasheet View

4.2.2.1 Design View:

To build or modify the structure of a table we work in the table design view. We can specify what kind of data will be hold

4.2.2.2 Datasheet View:

To add, edit or analyses the data itself we work in tables datasheet view mode.

4.2.3 Query:

A query is a question that has to be asked the data. Access gathers data that answers the question from one or more table. The data that make up the answer is either dynaset (if you edit it) or a snapshot (it cannot be edited).Each time we run query, we get latest information in the dynaset. Access either displays the dynaset or snapshot for us to view or perform an action on it, such as deleting or updating.

4.3 FEASIBILITY STUDY:

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be

carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

The feasibility study investigates the problem and the information needs of the stakeholders. It seeks to determine the resources required to provide an information systems solution, the cost and benefits of such a solution, and the feasibility of such a solution

The goal of the feasibility study is to consider alternative information systems solutions, evaluate their feasibility, and propose the alternative most suitable to the organization. The feasibility of a proposed solution is evaluated in terms of its components.

4.4 ECONOMICAL FEASIBILITY:

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

4.5 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical

requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

4.6 SOCIAL FEASIBILITY:

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

4.7 SYSTEM DESIGN AND TESTING PLAN

4.7.1 INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur

4.7.2 OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the
- Future.
- Signal important events, opportunities, problems, or warnings.
- Trigger an action.
- Confirm an action.

4.7.3 Test plan:

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Also to assess the feature of a software

item. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process.

4.7.4 Verification

Verification is the process to make sure the product satisfies the conditions imposed at the start of the development phase. In other words, to make sure the product behaves the way we want it to.

4.7.5 Validation

Validation is the process to make sure the product satisfies the specified requirements at the end of the development phase. In other words, to make sure the product is built as per customer requirements.

4.8 Software testing

There are two basics of software testing: black box testing and white box testing.

4.8.1 Black box Testing

Black box testing is a testing technique that ignores the internal mechanism of the system and focuses on the output generated against any input and execution of the system. It is also called functional testing.

4.8.2 White box Testing

White box testing is a testing technique that takes into account the internal mechanism of a system. It is also called structural testing and

glass box testing. Black box testing is often used for validation and white box testing is often used for verification.

4.9 Types of testing

There are many types of testing like

- Unit Testing
- Integration Testing
- Functional Testing
- System Testing
- Stress Testing
- Performance Testing
- Usability Testing
- Acceptance Testing
- Regression Testing
- Beta Testing

4.9.1 Unit Testing

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

4.9.2 Integration Testing:

Integration testing is testing in which a group of components are used to produce output. Also, the interaction between software and hardware is tested in integration testing if software and hardware components have any relation. It may fall under both white box testing and black box testing.

4.9.3 Functional Testing

Functional testing is the testing to ensure that the specified functionality required in the system requirements works. It falls under the class of black box testing.

4.9.4 System Testing

System testing is the testing to ensure that by putting the software in different environments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

4.9.5 Stress Testing

Stress testing is the testing to evaluate how system behaves under unfavorable conditions. Testing is conducted at beyond limits of the specifications. It falls under the class of black box testing.

4.10 REQUIREMENT ANALYSIS

Requirement analysis, also called requirement engineering, is the process of determining user expectations for a new modified product. It encompasses the tasks that determine the need for analysing, documenting, validating and managing software or system requirements. The requirements should be documentable, actionable, measurable, testable and traceable related to identified business needs or opportunities and define to a level of detail, sufficient for system design.

4.11 FUNCTIONAL REQUIREMENTS

It is a technical specification requirement for the software products. It is the first step in the requirement analysis process which lists the requirements of particular software systems including functional, performance and security requirements. The function of the system depends mainly on the quality hardware used to run the software with given functionality.

4.11.1 Usability

It specifies how easy the system must be use. It is easy to ask queries in any format which is short or long, porter stemming algorithm stimulates the desired response for user.

4.11.2 Robustness

It refers to a program that performs well not only under ordinary conditions but also under unusual conditions. It is the ability of the user to cope with errors for irrelevant queries during execution.

4.11.3 Security

The state of providing protected access to resource is security. The system provides good security and unauthorized users cannot access the system there by providing high security.

4.11.4 Reliability

It is the probability of how often the software fails. The measurement is often expressed in MTBF (Mean Time Between Failures). The requirement is needed in order to ensure that the processes work correctly and completely without being aborted. It can handle any load and survive and survive and even capable of working around any failure.

4.11.5 Compatibility

It is supported by version above all web browsers. Using any web servers like localhost makes the system real-time experience.

4.12 NON- FUNCTIONAL REQUIREMENTS

4.12.1 Portability

It is the usability of the same software in different environments. The project can be run in any operating system.

4.12.2 Performance

These requirements determine the resources required, time interval, throughput and everything that deals with the performance of the system.

4.12.3 Accuracy

The result of the requesting query is very accurate and high speed of retrieving information. The degree of security provided by the system is high and effective.

4.12.4 Maintainability

Project is simple as further updates can be easily done without affecting its stability. Maintainability basically defines that how easy it is to maintain the system. It means that how easy it is to maintain the system, analyse, change and test the application. Maintainability of this project is simple as further updates can be easily done without affecting its stability.

CHAPTER – 5. CONCLUSION

Soil analysis is a segmental work that easy to modify researcher work by applying the numerical prediction method. Soil can be analysed by using various data mining techniques especially classification clustering and neural network, decision tree. The aim for improving the classification and prediction performance for the traditional. Soil prediction model is designed and developed in this work. But some limitation of the model is also observed, thus in near future need to be review before use of the proposed technique. and also soil there are some issues and challenges in which better implement of data mining technique should be implemented in field of Soil science.

.

CHAPTER – 6. REFERENCES

- [1] Xiong, Lihua, and Kieran M. OConnor. “An empirical method to improve the prediction limits of the GLUE methodology in rainfallrunoff modeling.” *Journal of Hydrology* 349.1-2 (2008): 115-124.
- [2] Schmitz, G. H., and J. Cullmann. “PAI-OFF: A new proposal for online flood forecasting in flash flood prone catchments.” *Journal of hydrology* 360.1-4 (2008): 1-14.
- [3] Riordan, Denis, and Bjarne K. Hansen. “A fuzzy casebased system for weather prediction.” *Engineering Intelligent Systems for Electrical Engineering and Communications* 10.3 (2002): 139-146.
- [4] Guhathakurta, P. “Long-range monsoon rainfall prediction of 2005 for the districts and sub-division Kerala with artificial neural network.” *Current Science* 90.6 (2006): 773-779.
- [5] Pilgrim, D. H., T. G. Chapman, and D. G. Doran. “Problems of rainfall-runoff modelling in arid and semiarid regions.” *Hydrological Sciences Journal* 33.4(1988): 379-400.
- [6] Lee, Sunyoung, Sungzoon Cho, and Patrick M. Wong. “Rainfall prediction using artificial neural networks.” *journal of geographic information and Decision Analysis* 2.2 (1998): 233-242..
- [7] French, Mark N., Witold F. Krajewski, and Robert R. Cuykendall. “Rainfall forecasting in space and time using a neural network.” *Journal of hydrology* 137.1-4 (1992): 1-31.

- [8] Charaniya, Nizar Ali, and Sanjay V. Dudul. "Committee of artificial neural networks for monthly rainfall prediction using wavelet transform." Business, Engineering and Industrial Applications (ICBEIA), 2011 International Conference on. IEEE, 2011.
- [9] Noone, David, and Harvey Stern. "Verification of rainfall forecasts from the Australian Bureau of Meteorology's Global Assimilation and Prognosis(GASP) system." Australian Meteorological Magazine 44.4 (1995): 275-286.
- [10] Hornik, Kurt, Maxwell Stinchcombe, and Halbert White. "Multilayer feedforward networks are universal approximators." Neural networks 2.5 (1989): 359-366.
- [11] Haykin, Simon. Neural networks: a comprehensive foundation. Prentice Hall PTR, 1994.
- [12] Rajeevan, M., Pulak Guhathakurta, and V. Thapliyal. "New models for long range forecasts of summer monsoon rainfall over North West and Peninsular India." Meteorology and Atmospheric Physics 73.3-4 (2000): 211-225.

3713

by 1q Qqq

Submission date: 15-Apr-2021 06:01AM (UTC-0700)

Submission ID: 1559922598

File name: 37130089,37130088_final_project_report.pdf (1.07M)

Word count: 2166

Character count: 57388

SOIL ANALYSIS USING DEEP LEARNING

Submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering

By

CHUNDURI BHARGAV (37130089)

CHINTAPALI ROHIT SHARMA (37130088)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
G
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

SATHYABAMA

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

**Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI -**

600 119 APRIL – 2021



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Bonafide Certificate

This is to certify that this Project Report is the bonafide work of **CHUNDURI BHARGAV (37130089)** and **CHINTAPALI ROHIT SHARMA (37130088)** who have done the Project work as a team who carried out the project entitled "**SOIL ANALYSIS USING DEEP LEARNING**" under my supervision from September 2019 to April 2020.

Internal Guide

Dr. I. Rexiline Sheeba, M.E, Ph.D

Head of the Department

Dr. T. RAVI M.E, Ph.D

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

We, **CHUNDURI BHARGAV (37130089)** and **CHINTAPALI ROHIT SHARMA (37130088)** hereby declare that the **Project Report** entitled **“SOIL ANALYSIS USING DEEP LEARNING”** done by us under the guidance of **Dr. I. REXALINE SHEEB** at **Sathyabama Institute of Science and Technology** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Electronics and Communication Engineering**.

DATE :

PLACE:

1.CHUNDURI BHARGAV

2.CHINTAPALI ROHIT SHARMA

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr. N. M. Nandhitha, M.E, Ph.D**, Dean, School of Electrical and Electronics and **Dr. T Ravi, M.E. Ph.D**, Head of the Department, Dept. of Electronics and Communication Engineering for providing us necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Project Guide **Dr. I. Rexiline Sheeba, M.E. Ph.D**, for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of **Electronics and Communication Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

India is an agricultural country and its economy is largely based upon crop productivity and rainfall. For analyzing the crop productivity, soil prediction is required and necessary to all farmers. Soil Analysis is the application of science and technology to predict the state of the soil. It is important to exactly determine the rainfall for effective use of water resources, crop productivity and pre planning of water structures. Using different data mining techniques it can predict rainfall. Data mining techniques are used to estimate the rainfall numerically. This paper focuses some of the popular data mining algorithms for rainfall prediction. Naive Bayes, K-

Nearest Neighbour algorithm, Decision Tree, Neural Network and fuzzy logic are some of the algorithms compared in this paper. From that comparison, it can analyze which method gives better accuracy for this prediction.

Table of Contents

<u>S.no</u> <u>no</u>	<u>Name of Title</u>	<u>Page</u>
1	Abstract	v
2	Introduction	1
3	Investigations	2
4	System Architeure	4
5	System Requirements	5
6	Software Environment	6
7	Literature Analysis	22
8	Modules	25
9	Data flow diagram	27
10	UML diagrams	29
11	Use case diagrams	31
12	Sequence diagram	32
13	Activity diagram	33
14	MY SQL	34

<u>S.no</u> <u>no</u>	<u>Name of Title</u>	<u>Page</u>
15	Table	39
16	Feasiblity Study	40
17	Economical Feasiblity	41
18	System Design and Testing plan	42
19	Basics of testing	43
20	Requirement Analysis	46
21	Conclusion	50
22	References	51

INTRODUCTION

Soil Analysis is one of the most challenging tasks. Though already many algorithms have been proposed but still accurate prediction of rainfall is very difficult. In an agricultural country like India, the success or failure of the crops and water scarcity in any year is always viewed with greatest concern. A small fluctuation in the seasonal rainfall can have devastating impacts on agriculture sector. Accurate prediction has a potential benefit of preventing casualties and damages caused by natural disasters. Under certain circumstances such as flood and drought, highly accurate rainfall prediction is useful for agriculture management and disaster prevention. In this paper, various algorithms have been analyzed. Data mining techniques are efficiently used in soil prediction.

INVESTIGATIONS

EXISTING SYSTEM:

Agriculture is the strength of our Indian economy. Farmer only depends upon monsoon to be their cultivation. The good crop productivity needs good soil, fertilizer and also good climate. Weather forecasting is the very important requirement of the each farmer. Due to the sudden changes in climate/weather, The people are suffered economically and physically. Weather prediction is one of the challenging problems in current state. The main motivation of this paper to predict the weather using various data mining techniques. Such as classification, clustering, decision tree and also neural networks. Weather related information is also called the meteorological data. In this paper the most commonly used weather parameters are rainfall, wind speed, temperature and cold.

DISADVANTAGES EXISTING SYSTEM

- Classification
- Clustering
- Decision tree

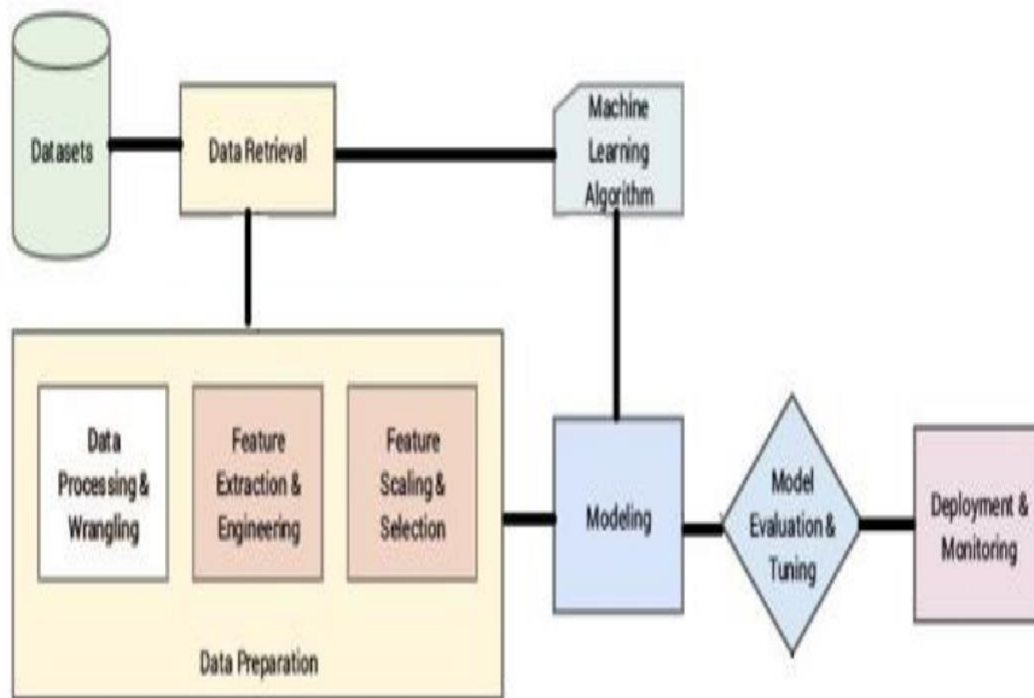
PROPOSED SYSTEM

- Rainfall is important for food production plan, water resource management and all activity plans in the nature.
- The occurrence of prolonged dry period or heavy rain at the critical stages of the crop growth and development may lead to significant reduce crop yield.
- India is an agricultural country and its economy is largely based upon crop productivity.
- Thus rainfall prediction becomes a significant factor in agricultural countries like India.
- Rainfall forecasting has been one of the most scientifically and technologically challenging problems around the world in the last century.

ADVANTAGES OF PROPOSED SYSTEM

- Numerical Weather Prediction
- Statistical Weather Prediction
- Synoptic Weather Prediction

SYSTEM ARCHITECTURE



SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS:

- System - Windows 7/10
- Speed - 2.4GHZ
- Hard Disk - 40GB
- Monitor - 15VGA color
- RAM - 4GB

SOFTWARE REQUIREMENTS:

- Operating System - Windows XP
- Coding language - PYTHON
- IDE - PYCHARM

SOFTWARE ENVIRONMENT

Python:

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

- **Python is Interpreted** – Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive** – You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented** – Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language** – Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

History of Python

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++,

Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python is now maintained by a core development team at the institute, although

Guido van Rossum still holds a vital role in directing its progress.

Python Features

Python's features include –

- **Easy-to-learn** – Python has few keywords, simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- **Easy-to-read** – Python code is more clearly defined and visible to the eyes.
- **Easy-to-maintain** – Python's source code is fairly easy-to-maintain.
- **A broad standard library** – Python's bulk of the library is very portable and cross-platform compatible on UNIX, Windows, and Macintosh.
- **Interactive Mode** – Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.
- **Portable** – Python can run on a wide variety of hardware platforms and has the same interface on all platforms.

- **Extendable** – You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.

7

- **Databases** – Python provides interfaces to all major commercial databases.
- **GUI Programming** – Python supports GUI applications that can be created and ported to many system calls, libraries and window systems, such as Windows MFC, Macintosh, and the X Window system of Unix.
- **Scalable** – Python provides a better structure and support for large programs than shell scripting.

Apart from the above-mentioned features, Python has a big list of good features,

few are listed below –

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports dynamic type checking.

- It supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

Python is available on a wide variety of platforms including Linux and Mac OS X. Let's understand how to set up our Python environment.

8

Getting Python

The most up-to-date and current source code, binaries, documentation, news, etc., is available on the official website of Python <https://www.python.org>.

Windows Installation

Here are the steps to install Python on Windows machine.

- Open a Web browser and go to <https://www.python.org/downloads/>.
- Follow the link for the Windows installer python-XYZ.msifile where XYZ is the version you need to install.
- To use this installer python-XYZ.msi, the Windows system must support Microsoft Installer 2.0. Save the installer file to your local machine and then run it to find out if your machine supports MSI.

- Run the downloaded file. This brings up the Python install wizard, which is really easy to use. Just accept the default settings, wait until the install is finished, and you are done.

The Python language has many similarities to Perl, C, and Java. However, there are some definite differences between the languages.

First Python Program

Let us execute programs in different modes of programming.

9

Interactive Mode Programming

Invoking the interpreter without passing a script file as a parameter brings up the following prompt –

```
$ python  
  
Python2.4.3(#1,Nov112010,13:34:43)  
  
[GCC 4.1.220080704(RedHat4.1.2-48)] on linux2  
  
Type "help", "copyright", "credits" or "license" for more information.  
  
>>>
```

Type the following text at the Python prompt and press the Enter –

```
>>>print "Hello, Python!"
```

If you are running new version of Python, then you would need to use print stat

ement with parenthesis as in **print ("Hello, Python!");**. However in Python version 2.4.3, this produces the following result –

```
Hello, Python!
```

Script Mode Programming

Invoking the interpreter with a script parameter begins execution of the script and continues until the script is finished. When the script is finished, the interpreter is no longer active.

9

Let us write a simple Python program in a script. Python files have extension **.py**. Type the following source code in a test.py file –

```
print"Hello, Python!"
```

We assume that you have Python interpreter set in PATH variable. Now, try to run this program as follows –

```
$ python test.py
```

This produces the following result –

```
Hello, Python!
```

Flask Framework:

Flask is a web application framework written in Python. Armin Ronacher, who leads an international group of Python enthusiasts named Pocco, develops it.

Flask is based on Werkzeug WSGI toolkit and Jinja2 template engine. Both are Pocco projects.

Http protocol is the foundation of data communication in world wide web. Different methods of data retrieval from specified URL are defined in this protocol.

10

The following table summarizes different http methods –

Sr. No	Methods & Description
1	GET Sends data in unencrypted form to the server. Most common method.
2	HEAD Same as GET, but without response body
3	POST Used to send HTML form data to server. Data received by POST method is not cached by server.

xx

4	PUT Replaces all current representations of the target resource with the uploaded content.
5	DELETE Removes all current representations of the target resource given by a URL

By default, the Flask route responds to the **GET** requests. However, this

11

preference can be altered by providing methods argument to **route()** decorator.

In order to demonstrate the use of **POST** method in URL routing, first let us create an **HTML** form and use the **POST** method to send form data to a URL.

Save the following script as login.html

```
<html>

<body>

<form action="http://localhost:5000/login" method="post">
1
<p>Enter Name:</p>

<p><input type="text" name="nm"/></p>

<p><input type="submit" value="submit"/></p>
```

```
</form>
```

```
</body>
```

```
</html>
```

12

Now enter the following script in Python shell.

```
from flask import Flask, redirect, url_for, request
app=Flask(__name__)
@app.route('/success/<name>')
def success(name):
    return 'welcome %s'% name
@app.route('/login', methods=['POST', 'GET'])
def login():
    if request.method == 'POST':
        user=request.form['nm']
        return redirect(url_for('success', name= user))
```

```

else:

user=request.args.get('nm')

return redirect(url_for('success',name= user))

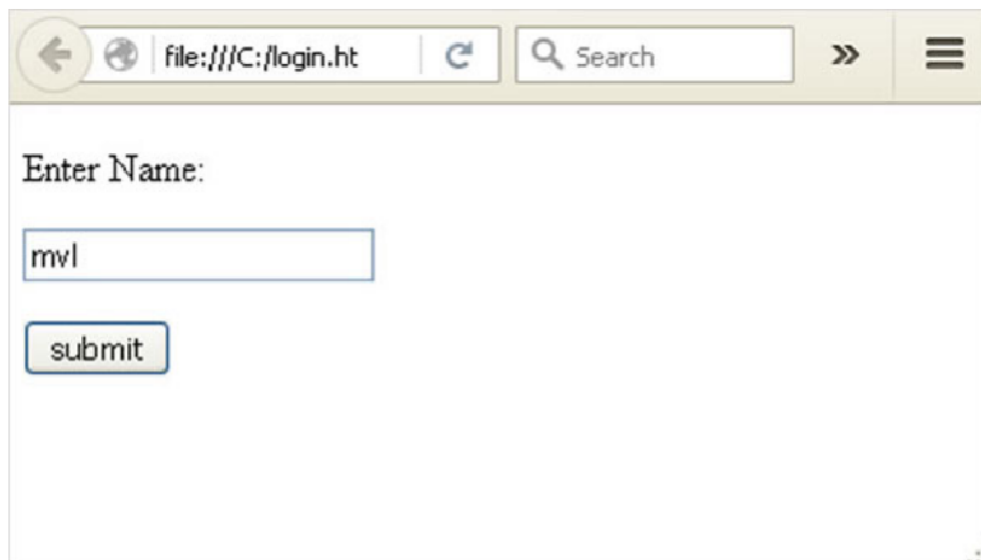
if __name__ == '__main__':

app.run(debug =True)

```

13

After the development server starts running, open **login.html** in the browser, enter name in the text field and click **Submit**.



The screenshot shows a web browser window with the address bar displaying 'file:///C:/login.ht'. The main content area contains a form with the label 'Enter Name:'. Below the label is a text input field with the value 'mvl'. Underneath the input field is a button labeled 'submit'.

Form data is POSTed to the URL in action clause of form tag.

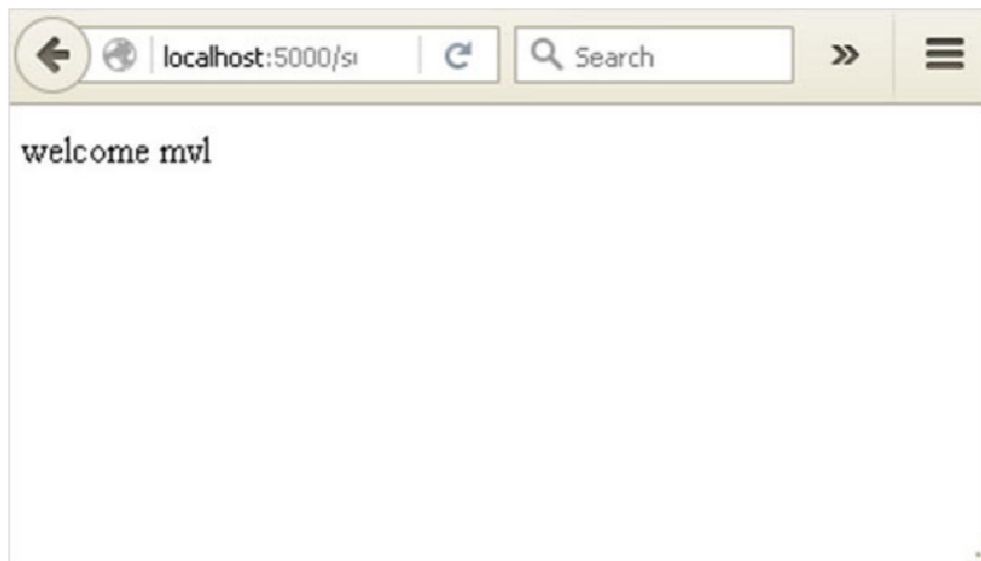
http://localhost/login is mapped to the **login()** function. Since the server has received data by **POST** method, value of 'nm' parameter obtained from the form d

ata is obtained by –

```
user = request.form['nm']
```

14

It is passed to ‘**success**’ URL as variable part. The browser displays a **welcome** message in the window.



Change the method parameter to ‘**GET**’ in **login.html** and open it again in the browser. The data received on server is by the **GET** method. The value of ‘nm’ parameter is now obtained by –

```
User = request.args.get('nm')
```

Here, **args** is dictionary object containing a list of pairs of form parameter and its corresponding value. The value corresponding to 'nm' parameter is passed on to '/success' URL as before.

What is Python?

Python is a popular programming language. It was created in 1991 by Guido van Rossum.

It is used for:

- web development (server-side),
- software development,
- mathematics,
- system scripting.

What can Python do?

- Python can be used on a server to create web applications.
- Python can be used alongside software to create workflows.
- Python can connect to database systems. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.
- Python can be used for rapid prototyping, or for production-ready software development.

Why Python?

- Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc).
- Python has a simple syntax similar to the English language.
- Python has syntax that allows developers to write programs with fewer lines than some other programming languages.
- Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.

16

- Python can be treated in a procedural way, an object-orientated way or a functional way.

Good to know

- The most recent major version of Python is Python 3, which we shall be using in this tutorial. However, Python 2, although not being updated with anything other than security updates, is still quite popular.
- In this tutorial Python will be written in a text editor. It is possible to write Python in an Integrated Development Environment, such as Thonny, Pycharm, Netbeans or Eclipse which are particularly useful when managing larger collections of Python files.

Python Syntax compared to other programming languages

- Python was designed to for readability, and has some similarities to the English language with influence from mathematics.

- Python uses new lines to complete a command, as opposed to other programming languages which often use semicolons or parentheses.
- Python relies on indentation, using whitespace, to define scope; such as the scope of loops, functions and classes. Other programming languages often use curly-brackets for this purpose.

Python Install

Many PCs and Macs will have python already installed.

17

To check if you have python installed on a Windows PC, search in the start bar for Python or run the following on the Command Line (cmd.exe):

```
C:\Users\Your Name>python --version
```

To check if you have python installed on a Linux or Mac, then on linux open the command line or on Mac open the Terminal and type:

```
python --version
```

If you find that you do not have python installed on your computer, then you can download it for free from the following website: <https://www.python.org/>

Python Quickstart

Python is an interpreted programming language, this means that as a developer you write Python (.py) files in a text editor and then put those files into the python interpreter to be executed.

The way to run a python file is like this on the command line:

```
C:\Users\Your Name>python helloworld.py
```

Where "helloworld.py" is the name of your python file.

Let's write our first Python file, called helloworld.py, which can be done in any text editor.

```
helloworld.py
```

```
print("Hello, World!")
```

Simple as that. Save your file. Open your command line, navigate to the directory where you saved your file, and run:

```
C:\Users\Your Name>python helloworld.py
```

18

The output should read:

```
Hello, World!
```

Congratulations, you have written and executed your first Python program.

The Python Command Line

To test a short amount of code in python sometimes it is quickest and easiest not to write the code in a file. This is made possible because Python can be run as a command line itself.

Type the following on the Windows, Mac or Linux command line:

```
C:\Users\Your Name>python
```

From there you can write any python, including our hello world example from earlier in the tutorial:

```
C:\Users\Your Name>python
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> print("Hello, World!")
```

Which will write "Hello, World!" in the command line:

```
C:\Users\Your Name>python
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> print("Hello, World!")
Hello, World!
```

19

Whenever you are done in the python command line, you can simply type the following to quit the python command line interface:

```
exit()
Execute Python Syntax
```

As we learned in the previous page, Python syntax can be executed by writing directly in the Command Line:

```
>>> print("Hello, World!")
```

Hello, World!

Or by creating a python file on the server, using the .py file extension, and running it in the Command Line:

```
C:\Users\Your Name>python myfile.py
```

Python Indentations

Where in other programming languages the indentation in code is for readability only, in Python the indentation is very important.

Python uses indentation to indicate a block of code.

Example

```
if 5 > 2:
```

```
    print("Five is greater than two!")
```

Python will give you an error if you skip the indentation:

Example

```
if 5 > 2:
```

```
print("Five is greater than two!")
```

20

Comments

Python has commenting capability for the purpose of in-code documentation.

Comments start with a #, and Python will render the rest of the line as a comment:

Example

Comments in Python:

```
#This is a comment.
```

```
print("Hello, World!")
```

Docstrings

Python also has extended documentation capability, called docstrings.

Docstrings can be one line, or multiline.

Python uses triple quotes at the beginning and end of the docstring:

```
xxx
```

Example

Docstrings are also comments:

```
"""This is a multilinedocstring."""  
print("Hello, World!")
```

LITERATURE ANALYSIS

A. Indian Summer Monsoon Rainfall (ISMR) Forecasting using Time Series Data: A Fuzzy-Entropy-Neuro based Expert System In [30],

authors presented a model to forecast Indian Summer Monsoon Rainfall on the basis of monthly and seasonal timescales. To forecast, time series dataset was used, spanning from 1871 till 2014. The dataset was classified in two parts (1) 1871-1960 used as training data, and (2) 1961-2014 used as test data. Statistical analysis reported the dynamic nature of rainfall in monsoon, which could not be predicted effectively with mathematical and statistical models. So, the authors in this research recommended to use three techniques for this type of prediction: Fuzzy Set, Entropy a

and Artificial Neural Network. By using these three techniques, a forecasting model is developed to deal with the dynamic nature of the ISMR. In proposed model, fuzzy set theory is used to handle uncertainties which are inherited in dataset. The entropy computational concept was modified in this model and used to provide the input as a degree of membership in the entropy function. That entropy function was referred as Fuzzy Information-Gain (FIG). Then, each fuzzified rule was defuzzified using the ANN. The value of FIG of each fuzzy-set was then used as input into ANN. The proposed model was named as “Fuzzy-Entropy-Neuro Based Expert System for ISMR Forecasting” because it is the integration of fuzzy set, entropy and ANN. To evaluate the performance of proposed model following accuracy measures were used: Standard Deviations (SDs), Correlation Coefficient (CC), Root Mean Square Error (RMSE) and

22

Performance Parameter (PP). According to results the proposed model is effective and efficient in comparison with other existing models.

B. An Extensive Evaluation of Seven Machine Learning Methods for Rainfall Prediction in Weather Derivatives

The researchers in compared the predictive performance of latest and state of the art method named “Markov chain extended with rainfall prediction” with the other widely used machine learning techniques: Support Vector Regression, Genetic Programming, M5 Rules, M5 Model trees, Radial Basis N

xxx

neural Networks, and k-

Nearest Neighbours. Daily rainfall datasets were collected from 42 cities of two continents, with very diverse climatic features. 20 cities were selected from around the Europe and 22 from around the USA. There were two reasons of choosing two continents for data extraction, first is to perform the experiment on different climates having diverse weather and second was the geographical locations as the selected cities were very far apart from each other. The ultimate goal was to not bias the experiment to particular climate type or for particular geographic location. According to results the accumulating rainfall amounts can bring good results as compared to prediction using daily rainy data. While using the accumulated data, Support Vector Regression, Radial Basis Functions, and Genetic Programming overall performed well however Radial Basis Functions performed better than modern technique of “Markov chain”. For all selected datasets, each technique used the same

parameters so it was not guaranteed that the best possible set of parameters was used for all the techniques. During the experiment, the researchers have noted a relationship between predictive accuracy and climatic attributes such as: volatile nature of rainfall, amount of maximum rainfall and the interquartile range of rainfall. Moreover no significant difference was noted in algorithms’ prediction error among the cities of both the continents (USA and Europe). Issue regarding the discontinuity in rainfall

data was solved with the help of accumulated rainfall amounts.

C.A Hybrid Model for Statistical Downscaling of Daily Rainfall

Authors in proposed a hybrid technique to downscale the daily rainfall by integrating two methods: 1) Random Forest, and 2) Support Vector Machine. RF was selected due to its robustness in classification and it was used to predict whether it will be rain or not whereas SVM were selected due to its feature to fit in non-linear data and it was used to predict the amount of rainfall, if it will occur. The proposed model was evaluated by downscaling daily rainfall at three stations, Dungun, Besut, and Kemaman on the east cost of peninsular, Malaysia. Daily rainfall time series data from 1961 till 2000 was collected from Department of Irrigation and Drainage Malaysia. Total of 26 climatic features were collected from National Centre for Environmental Prediction re analysis dataset, which were used as predictors for downscaling the models. To assess homogeneity in rainfall time series, various quality control activities were performed. Histograms

24

for the dataset were created to reflect the problems moreover Student's t test was also used to identify any variance in the means between two segments of dataset which finally found homogeneous at all three locations. According to results the hybrid technique is capable to downscale the rainfall with Nash-Sutcliffe efficiency within range of 0.90-0.93, which is much higher than RF and SVM models.

MODULES

xxx

- Data Collection
- Data Cleaning
- Data Selection
- Data Transformation
- Data Mining Stage

Data Collection

The data used for this work was collected from meteorologist's centre. The case data covered the period of 2012 to 2015. The following procedures were adopted at this stage of the research: Data Cleaning, Data Selection, Data Transformation and Data Mining.

Data Cleaning

In this stage, a consistent format for the data model was developed which is search missing data, finding duplicated data, and weeding out of bad data. Finally system cleaned data were transformed into a format suitable for data mining.

25

Data Selection

At this stage, data relevant to the analysis like decision tree was decided on and retrieved from the dataset. The Meteorological dataset had ten attributes in that were using two attributes for future prediction. Due to the nature of the Cloud Form data where all the values are the same and the high percentage of missing values in the sunshine data both were not used in the analysis.

xxx

Data Transformation

“This is also known as data consolidation”. It is the stage in which the selected

data is transformed into forms appropriate for data mining. The data file was saved in Comma Separated Value (CSV) file format and the datasets were normalized to reduce the effect of scaling on the data.

Data Mining Stage

The data mining stage was divided into three phases. At each phase all the algorithms were used to analyse the meteorological datasets. The testing method adopted for this research was percentage split that train on a percentage of the dataset, cross validate on it and test on the remaining percentage. Thereafter interesting patterns representing knowledge were identified.

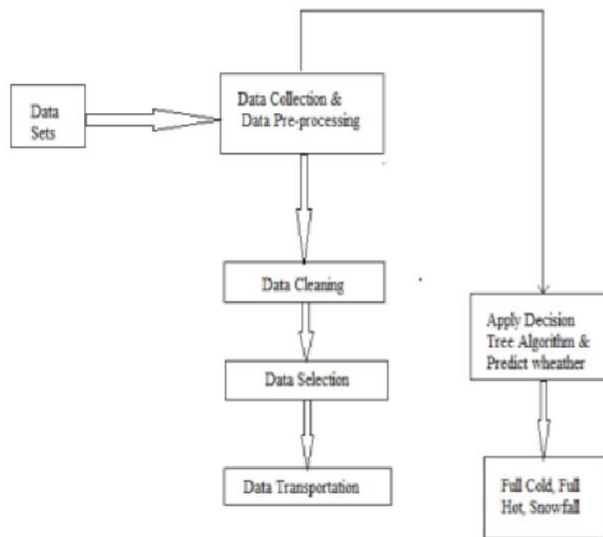
DATA FLOW DIAGRAM

1. The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
2. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the syst

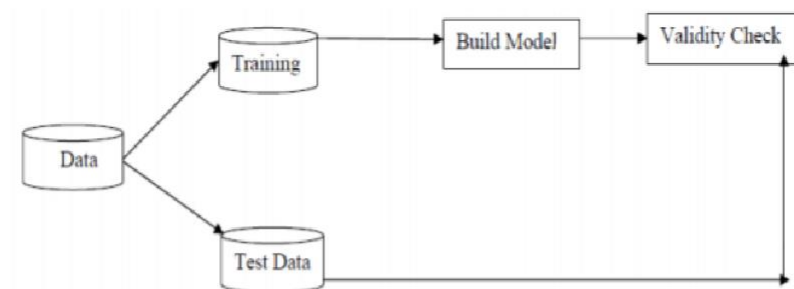
em process, the data used by the process, an external entity that interacts with the system and the information flows in the system.

3. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.

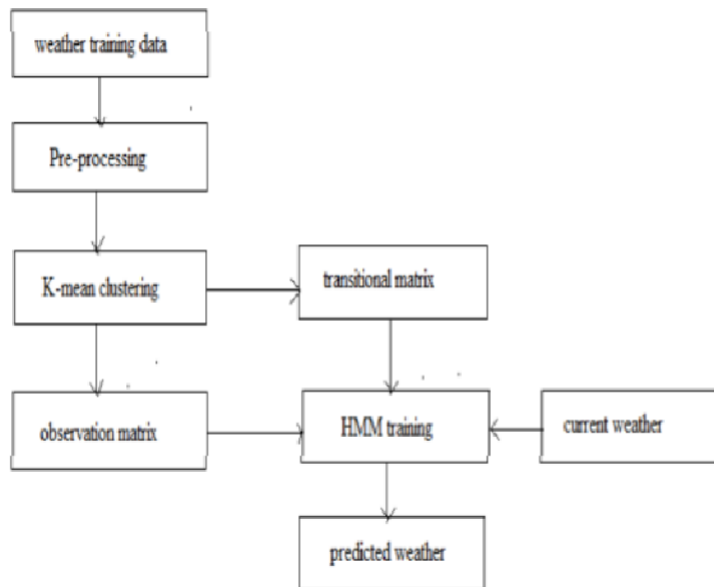
4. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.



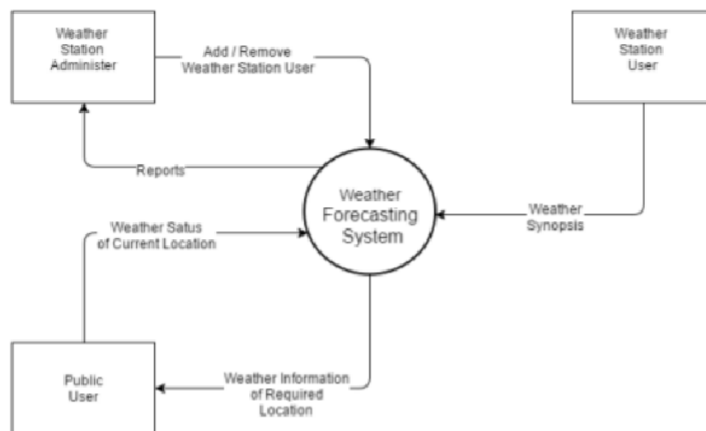
LEVEL - 1



LEVEL - 2



LEVEL – 3



UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

GOALS:

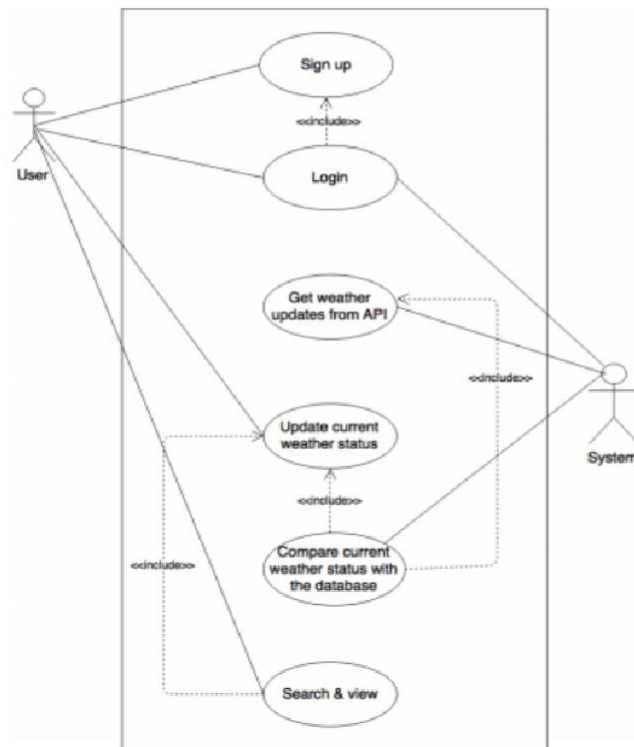
The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts.

3. Be independent of particular programming languages and development process.
4. Encourage the growth of OO tools market.
5. Support higher level development concepts such as collaborations, frameworks, patterns and components.
6. Integrate best practices.

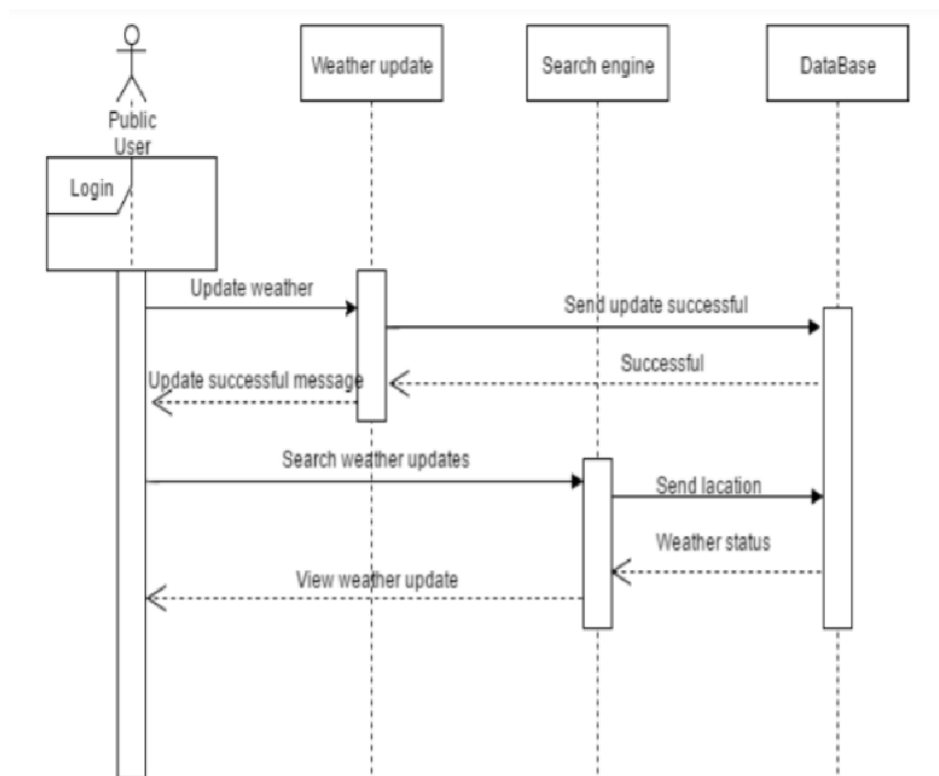
USE CASE DIAGRAM:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.



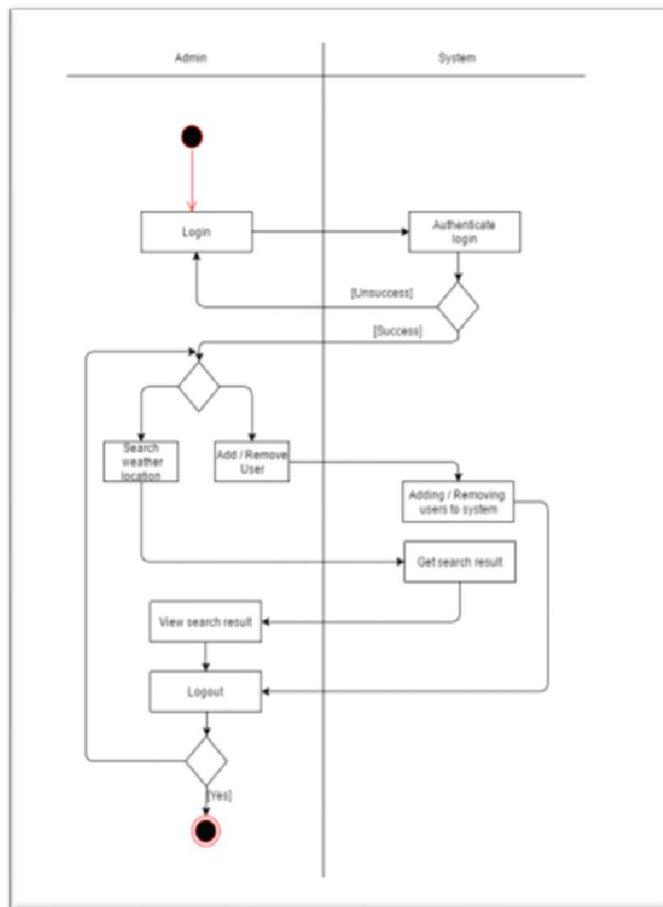
SEQUENCE DIAGRAM:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.



MYSQL :

MySQL, officially, but also called "My Sequel" is the world's most widely used open-source relational database management system (RDBMS) that runs as a server providing multi-user access to a number of databases, though SQLite probably has more total embedded deployments. The SQL phrase stands for

Structured Query Language.

The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other 'AMP' stacks).

LAMP is an acronym for "Linux, Apache, MySQL, Perl/PHP/Python." Free software-open source projects that require a full-featured database management system often use MySQL.

For commercial use, several paid editions are available, and offer additional functionality. Applications which use MySQL databases include: TYPO3, MODx, Joomla, WordPress, phpBB, MyBB, Drupal and other software. MySQL is also used in many high-profile, large-scale websites, including Wikipedia, Google (though not for searches), Facebook, Twitter, Flickr and YouTube. Microsoft is the vendor of SQL Server. We have different editions of SQL Server, where SQL Server Express is free to download and use. SQL Server uses T-SQL (Transact-SQL). T-SQL is Microsoft's proprietary extension to SQL. TSQL is very similar to standard SQL, but in addition it supports some extra functionality, built-in functions, etc.

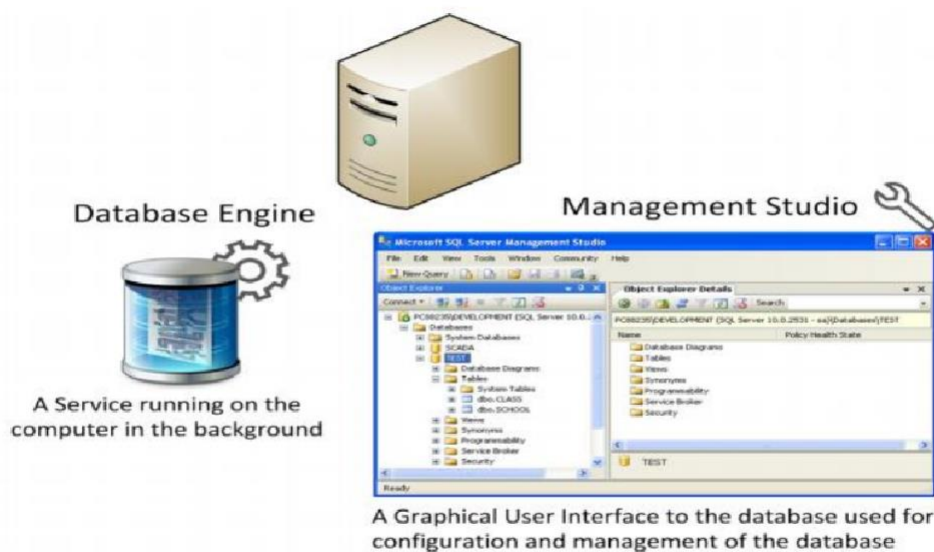
T-SQL expands on the SQL standard to include procedural programming,

local variables, and various support functions for string processing, date processing, mathematics, etc. SQL Server consists of a Database Engine and a Management Studio (and lots of other stuff which we will not mention here). The Database engine has no graphical interface -

it is just a service running in the background of your computer (preferable on the server). The Management Studio is graphical tool for configuring and viewing the information in the database. It can be installed on the server or on the client (or both).

SQL Server Management Studio can also be used to create a new database, alter any existing database schema by adding or modifying tables and indexes, or analyze performance. It includes the query windows which provide a GUI based

interface to write and execute queries.



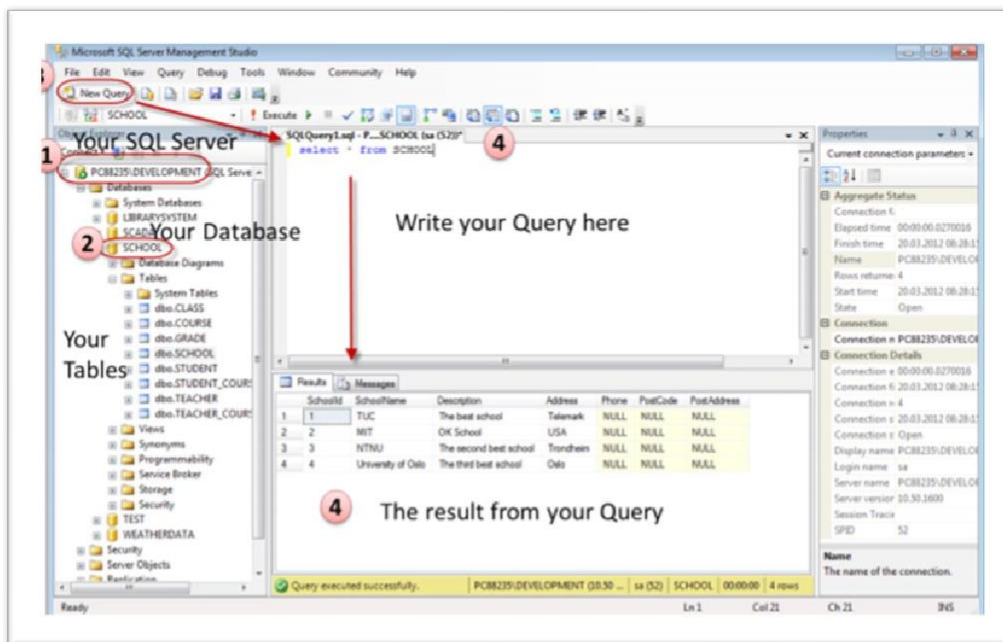
2.3.1 SQL SERVER MANAGEMENT STUDIO

SQL Server Management Studio is a GUI tool included with SQL Server for configuring, managing, and administering all components within Microsoft SQL Server. The tool includes both script editors and graphical tools that work with objects and features of the server. As mentioned earlier, version of SQL Server Management Studio is also available for SQL Server Express Edition, for which it is known as SQL Server Management Studio Express.

A central feature of SQL Server Management Studio is the Object Explorer, which allows the user to browse, select, and act upon any of the objects within the server. It can be used to visually observe and analyze query plans and optimize the database performance, among others. SQL Server Management Studio can also be used to create a new database, alter any existing database schema by adding or modifying tables and indexes, or analyze performance. It includes the query windows which provide a GUI based interface to write and execute queries.

When creating SQL commands and queries, the “Query Editor” (select “New Query” from the Toolbar) is used (shown in the figure above). With SQL and the “Query Editor” we can do almost everything with code, but sometimes it is also a good idea to use the different Designer tools in SQL to help us do the work without coding (so much).

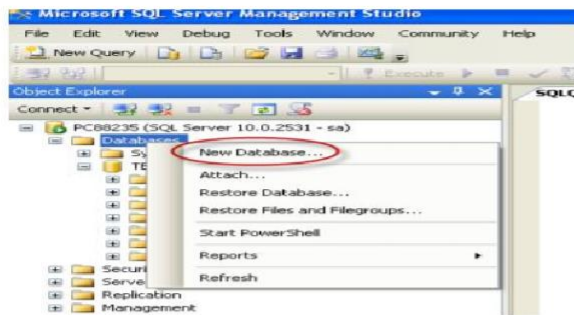
37



2.3.2 Create a new Database

It is quite simple to create a new database in Microsoft SQL Server. Just ri

ght-click on the “Databases” node and select “New Database...”



The OLAP Services feature available in SQL Server version 7.0 is now called SQL Server 2000 Analysis Services. The term OLAP Services has

38

been replaced with the term Analysis Services. Analysis Services also includes a new data mining component. The Repository component available in SQL Server version 7.0 is now called Microsoft SQL Server 2000 Meta Data Services. References to the component now use the term Meta Data Services. The term repository is used only in reference to the repository engine within Meta Data Services

SQL-SERVER database consists of six type of objects,

They are,

1. TABLE
2. QUERY
3. FORM
4. REPORT
5. MACRO

Table

A database is a collection of data about a specific topic.

Views of Table

We can work with a table in two types,

1. Design View
2. Datasheet View

Design View:

To build or modify the structure of a table we work in the table design view. We can specify what kind of data will be hold.

39

Datasheet View:

To add, edit or analyses the data itself we work in tables datasheet view mode.

Query:

A query is a question that has to be asked the data. Access gathers data that answers the question from one or more table. The data that make up the answer is either dynaset (if you edit it) or a snapshot (it cannot be edited). Each time we run query, we get latest information in the dynaset. Access either displays the dynaset or snapshot for us to view or perform an action on it, such as deleting or updating.

FEASIBILITY STUDY:

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

The feasibility study investigates the problem and the information needs of the stakeholders. It seeks to determine the resources required to provide an information systems solution, the cost and benefits of such a solution, and the feasibility of such a solution.

40

The goal of the feasibility study is to consider alternative information systems solutions, evaluate their feasibility, and propose the alternative most suitable to the organization. The feasibility of a proposed solution is evaluated in terms of its components.

ECONOMICAL FEASIBILITY:

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour in to the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY:

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY:

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

SYSTEM DESIGN AND TESTING PLAN

INPUT DESIGN:

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, co

controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occurs.

42

OUTPUT DESIGN:

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displayed for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the future.
- Signal important events, opportunities, problems, or warnings.

- Trigger an action.
- Confirm an action.

Test plan:

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Also to assess the feature of a software item. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process.

43

Verification:

Verification is the process to make sure the product satisfies the conditions imposed at the start of the development phase. In other words, to make sure the product behaves the way we want it to.

Validation:

Validation is the process to make sure the product satisfies the specified requirements at the end of the development phase. In other words, to make sure the product is built as per customer requirements.

Basics of software testing:

There are two basics of software testing: black box testing and white box testing.

Black box Testing:

Black box testing is a testing technique that ignores the internal mechanism of the system and focuses on the output generated against any input and execution of the system. It is also called functional testing.

White box Testing: White box testing is a testing technique that takes into account the internal mechanism of a system. It is also called structural testing and glass box testing. Black box testing is often used for validation and white box testing is often used for verification.

44

Types of testing

There are many types of testing like

- Unit Testing
- Integration Testing
- Functional Testing
- System Testing
- Stress Testing
- Performance Testing
- Usability Testing
- Acceptance Testing
- Regression Testing
- Beta Testing

Unit Testing:

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

Integration Testing:

Integration testing is testing in which a group of components are combined

45

to produce output. Also, the interaction between software and hardware is tested in integration testing if software and hardware components have any relation. It may fall under both white box testing and black box testing.

Functional Testing:

Functional testing is the testing to ensure that the specified functionality required in the system requirements works. It falls under the class of black box testing.

System Testing:

System testing is the testing to ensure that by putting the software in different en

vironments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

Stress Testing:

Stress testing is the testing to evaluate how system behaves under unfavorable conditions. Testing is conducted at beyond limits of the specifications. It falls under the class of black box testing.

Performance Testing:

Performance testing is the testing to assess the speed and effectiveness of the system and to make sure it is generating results within a specified time as in performance requirements. It falls under the class of black box testing.

Usability Testing:

Usability testing is performed to the perspective of the client, to evaluate how the GUI is user-friendly? How easily can the client learn? After learning how to use, how proficiently can the client perform? How pleasing is it to use its design? This falls under the class of black box testing.

Acceptance Testing:

Acceptance testing is often done by the customer to ensure that the delivered product meets the requirements and works as the customer expected. It falls under the class of black box testing.

Regression Testing:

Regression testing is the testing after modification of a system, component, or a group of related units to ensure that the modification is working correctly and is not damaging or imposing other modules to produce unexpected results. It falls under the class of black box testing.

REQUIREMENT ANALYSIS:

Requirement analysis, also called requirement engineering, is the process of determining user expectations for a new modified product. It encompasses the tasks that determine the need for analysing, documenting, validating and managing software or system requirements. The requirements should be documentable, actionable, measurable, testable and traceable related to identified business needs or opportunities and define to a level of detail, sufficient for system design.

FUNCTIONAL REQUIREMENTS:

It is a technical specification requirement for the software products. It is th

e first step in the requirement analysis process which lists the requirements of particular software systems including functional, performance and security requirements. The function of the system depends mainly on the quality hardware used to run the software with given functionality.

Usability:

It specifies how easy the system must be use. It is easy to ask queries in any format which is short or long, porter stemming algorithm stimulates the desired response for user.

48

Robustness:

It refers to a program that performs well not only under ordinary conditions but also under unusual conditions. It is the ability of the user to cope with errors for irrelevant queries during execution.

Security:

The state of providing protected access to resource is security. The system provides good security and unauthorized users cannot access the system there by providing high security.

Reliability:

It is the probability of how often the software fails. The measurement is often expressed in MTBF (Mean Time Between Failures). The requirement is needed in order to ensure that the processes work correctly and completely without be

ing aborted. It can handle any load and survive and even capable of working around any failure.

Compatibility:

It is supported by version above all web browsers. Using any web servers like localhost makes the system real-time experience.

Flexibility:

The flexibility of the project is provided in such a way that is has the ability

to run on different environments being executed by different users.

Safety:

Safety is a measure taken to prevent trouble. Every query is processed in a secured manner without letting others to know one's personal information.

NON- FUNCTIONAL REQUIREMENTS

Portability:

It is the usability of the same software in different environments. The project can be run in any operating system.

Performance:

These requirements determine the resources required, time interval, through

put and everything that deals with the performance of the system.

Accuracy:

The result of the requesting query is very accurate and high speed of retrieving information. The degree of security provided by the system is high and effective.

Maintainability:

Project is simple as further updates can be easily done without affecting its stability. Maintainability basically defines that how easy it is to maintain the

system. It means that how easy it is to maintain the system, analyse, change and test the application. Maintainability of this project is simple as further updates can be easily done without affecting its stability.

CONCLUSION

Soil analysis is a segmental work that easy to modify researcher work by applying the numerical prediction method. Soil can be analysed by using various data mining techniques especially classification clustering and neural network, decision tree. The aim for improving the classification and prediction performance for the traditional. Soil prediction model is designed and developed in this work. But some limitation of the model is also observed, thus in near future need to be review before use of the proposed technique. and also soil there are some issues and challenges in which better implement of data mining technique should be implement

ted in field of Soil science.

.

REFERENCES:

- [1] Xiong, Lihua, and Kieran M. OConnor. "An empirical method to improve the prediction limits of the GLUE methodology in rainfallrunoff modeling." *Journal of Hydrology* 349.1-2 (2008): 115-124.
- [2] Schmitz, G. H., and J. Cullmann. "PAI-OFF: A new proposal for online flood forecasting in flash flood prone catchment s." *Journal of hydrology* 360.1-4 (2008): 1-14.
- [3] Riordan, Denis, and Bjarne K. Hansen. "A fuzzy casebased system for weather prediction." *Engineering Intelligent Systems for Electrical Engineering and Communications* 10.3 (2002): 139-146.
- [4] Guhathakurta, P. "Long-

range monsoon rainfall prediction of 2005 for the districts and sub-division Kerala with artificial neural network." *Current Science* 90.6 (2006): 773-779.

[5] Pilgrim, D. H., T. G. Chapman, and D. G. Doran. "Problems of rainfall-runoff modelling in arid and semiarid regions." *Hydrological Sciences Journal* 33.4 (1988): 379-400.

[6] Lee, Sunyoung, Sungzoon Cho, and Patrick M. Wong. "Rainfall prediction using artificial neural networks." *Journal of Geographic Information and Decision Analysis* 2.2 (1998): 233-242..

[7] French, Mark N., Witold F. Krajewski, and Robert R. Cuykendall. "Rainfall forecasting in space and time using a neural network." *Journal of hydrology* 137.1-4 (1992): 1-31.

52

[8] Charaniya, Nizar Ali, and Sanjay V. Dudul. "Committee of artificial neural networks for monthly rainfall prediction using wavelet transform." *Business, Engineering and Industrial Applications (ICBEIA)*, 2011 International Conference

on. IEEE, 2011.

[9] Noone, David, and Harvey Stern. "Verification of rainfall forecasts from the Australian Bureau of Meteorology's Global Assimilation and Prognosis(GASP) system." *Australian Meteorological Magazine* 44.4 (1995): 275-286.

[10] Hornik, Kurt, Maxwell Stinchcombe, and Halbert White. "Multilayer feedforward networks are universal approximators." *Neural networks* 2.5 (1989): 359-

366.

[11] Haykin, Simon. Neural networks: a comprehensive foundation. Prentice Hall PTR, 1994.

[12] Rajeevan, M., Pulak Guhathakurta, and V. Thapliyal. "New models for long range forecasts of summer monsoon rainfall over North West and Peninsular India." *Meteorology and Atmospheric Physics* 73.3-4 (2000): 211-225.

ORIGINALITY REPORT

4%

SIMILARITY INDEX

3%

INTERNET SOURCES

0%

PUBLICATIONS

2%

STUDENT PAPERS

PRIMARY SOURCES

1

ddaaadd.tistory.com

Internet Source

3%

2

Submitted to The Scientific & Technological
Research Council of Turkey (TUBITAK)

Student Paper

1%

Exclude quotes On

Exclude bibliography On

Exclude matches Off