International Journal for Research in Engineering Application & Management (IJREAM)
ISSN : 2454-9150 Vol-07, Special Issue, MAY 2021

Prediction of Rainfall Using Machine Learning Techniques

[1]Prof. Gayatri Naik, [2]Mr.Tushar Patil, [3]Miss.Akanksha Yadav, [4]Miss.Jyoti Yadav

[1]Asst.Professor, [2,3,4]UG Student,[1,2,3,4]Computer Engg. Dept. Shivajirao S. Jondhle College of Engineering & Technology, Asangaon, Maharashtra, India. [1]krishngita123@gmail.com, [2]tusharpatil9715 @gmail.com,[3] akku123yadav@gmail.com, [4] jyoti.yaadav98@gmail.com

Abstract- Rainfall prediction is one of all the necessary techniques to predict the climate in any country. This paper proposes a downfall prediction model victimization Multiple Linear Regressions (MLR) for the Indian dataset. The info taken from 1901 to 2015 is monthly-wise. The input data has multiple metrological parameters and to predict the downfall additionally, it's thoroughly. The Mean sq. Mark Error (MSE), accuracy, correlation are the parameters wished to validate the projected model. From the results, the projected machine learning model provides higher results than the other algorithms inside the literature. It's the rigorous responsibility of the metrological department to predict the frequency of downfall with uncertainty. It's difficult to predict the downfall accurately with ever-changing atmospheric condition. It's difficult to forecast the downfall for each summer and rainy seasons.

Keywords-Machine Learning, Rainfall prediction, Multiple Linear Regression.

I. INTRODUCTION

Predicting downfall may be a major element and is important for applications that surround water resource designing and management. Over the years various tries are created at capturing the downfall. One space where it's important to predict the downfall quantity accurately is inside downfall derivatives. Downfall derivatives constitute the umbrella idea of weather derivatives that are kind of like regular derivatives, defined as contracts between 2 or a lot of parties whose price relies upon the underlying quality. Downfall derivatives are a way for reducing the danger posed by adverse or unsure circumstances. Moreover, they've improved various insurance. As a result, it will be arduous to prove that the downfall has had a bearing unless it's damaging, like a drought. Similar Contracts exist for different weather variables, like temperature and wind. Inside the literature, the downfall derivatives split into 2 main elements. To predict the amount of downfall for downfall derivatives, the applied math approach of Markov-chain extended with downfall prediction (MCRP) is employed. However, this approach specifically is the most ordinarily used, and can so be acting as a benchmark for our projected method-ology. The employment of those models permits for the simulation of downfall on a daily duration, so giving a lot of within the downside domain. The explanation why have a tendency to have an interest in daily amounts instead of monthly or annual quantity models is as a result of The models are a lot changed. Although the Although the MCRP approach is kind of fashionable, it faces many drawbacks. 1st of all, the model is incredibly simple and is heavily dependent on past data being reflective of the longer term.

II.AIMS AND OBJECTIVE

a) Aim

The aim of the study is the prediction of the rainfall using historical monthly data based on artificial intelligence methodologies such as Neuro-Fuzzy and artificial neural network. The extraction procedures/algorithms will produce the output by classification of the data according to the categories using Neuro-Fuzzy. The similar data will be grouped for the accurate and precise information that will predict rainfall more correctly and with perfect figures. The accurate and exact predictions will help in developing more appropriate strategies for agriculture and water reserves and will also be informed about the flood to implement precautionary measures.

b) Objective

This style is critical to avoid errors within the knowledge input methods and show the proper direction to the management for obtaining correct data from the processed system. It's achieved by making easy screens by information entry to handle an enormous volume of knowledge. The goal of arising with input is to form information entry easier and to be freed from morpheme errors. The knowledge entry screen is supposed to be in such a way that everyone among the subsequent manipulates is performed. It additionally provides a record that shows accurate viewing facilities.

III. LITERATURE SURVEY

The literature survey deals with the topics and so the researches which will facilitate to understand the prevailing systems of measurement like this project. The target of this literature survey is to analysis the connected work to the current project and mechanisms utilized in previous studies.

Paper 1: Elucidating the role of topological pattern discovery and support vector machine in generating prognostic models for fundamental quantity monsoon precipitation

He gift paper reports a study, where growing stratified self-organizing map (GHSOM) has been applied to realize a transparent cluster analysis to the Indian precipitation information set consisting of 142 years of Indian precipitation knowledge so as that the yearly precipitation is isolated into small groups to as certain, the pattern of clump behavior of yearly precipitation due to changes in monthly precipitation for every year. Also, through support vector machine (SVM), it's been observed that the generation of clusters impacts fully on the prediction of the elemental measure of monsoon precipitation. Results are bestowed through math and graphical analyses. Behavior of systems with many dependent parts that end in organized additionally as irregular choice is cited as complexity. In such systems the knowledge of the weather won't basically cause the bound behavior of the entire system. Complexities associated with meteorological and geophysics processes Modelling complexity of atmospheric phenomena and generating prediction schemes accordingly has long been a neighborhood of major concentration for the meteorologists over the world**.**

Paper 2: A precipitation Prediction Model practice Artificial Neural Network

The multi-layered artificial neural network with the learning by back-propagation formula configuration is the most typical in a use, owing to its ease of employment. It's numerable that over eightieth of all the neural network comes from a development using back-propagation. In the back-propagation formula, there is a unit of the measurement pair of phases in The learning cycle, one to propagate the input patterns through the network and a completely different one to adapt the output by propulsive the weights inside the network. The back-propagation-feed a forward neural network is employed in many applications like character recognition, weather, and financial prediction, face detection etc. The paper implements one altogether these applications by building employment and testing information sets and findings the number of hidden neurons in these layers for the foremost effective performance.

Paper 3: A short precipitation Prediction Model practice Multi-Task Convolutional Neural

The precipitation prediction, sort of a short precipitation prediction, is additionally an important disadvantage within the sphere of the science service. In An observation, the foremost recent studies focus on An investment instrument data or satellite footage to form predictions. However, there's another situation where a gaggle of weather decisions may be a unit of a measure collected by varied sensors at the multiple observation sites. The observations of on-line web sites are usually incomplete, however, providing important clues for weather prediction on the brink of sites that don't seem to be absolutely exploited in existing work nonetheless. To resolve this disadvantage, have gotten to propose a multitask and convolutional neural network model to mechanically extract decisions from the information measured at observation sites, and leverage the correlation between the multiples sites for weather prediction via multi-tasking. To the most effective of our data, this is often the first attempt to use multitask learning and deep learning techniques to predict short precipitation quantity supported by multisite options. Specifically, formulate the coaching task as Associate in Nursing end-to-end multisite neural network model that permits to leverage the learned data from one website to different correlate sites, and model the correlations between completely different sites.

IV. EXISTING SYSTEM

In the existing system, the rear propagation neural network is employed for precipitation prediction. This model was used by Xianggen Gan, and he was tested using the dataset from 1970 to 2000 which has 16 meteorological parameters. During network training, the target error is set as 0.01 and learning rate is set as 0.01. This model was implemented on the mat lab neural network. Genetic Programming (GP) and MCRP were compared on 21 different datasets of cities across Europe. Daily rainfall data for 10 years were taken as training data and one-year rainfall data were taken as testing data. The disadvantage of MCRP is that it predicts accurate only for annual rainfall when compared with monthly rainfall prediction.

V. COMPARTIVE STUDY

SR. NO.	PAPER TITLE	AUTHOR NAME	METHOD	ADVANTAGE	DISADVANTAGE
1.	Elucidating the role of topological pattern discovery and support vector machine and generating prognostic models For fundamental measure monsoon precipitation	Manojit Chattopadhyay, Surajit Chattopadhyay	support vector machine (SVM)	It major the rain fall according to previous years data and give Results have been presented through statistical and graphical analyses Memory Efficient	Not suitable for large data sets.[4]

2.	A precipitation Prediction Model practice Artificial Neural Network	Kumar Abhishek, Abhay Kumar, Rajeev Ranjan, Sarthak Kumar	Artificial Neural Network	The rainfall data Are stored in network not in database so, the loss of data dose not effects on data working	Time consuming and data processing duration is unknown.[5]
3.	A short precipitation Prediction Model practice Multi-Task Convolutional Neural	Minghui Liu, Peilin Zhao, Ke Zhang, Jun Huang, Xing Shi, Xiaoguang Wang, Wei Chu	Convolutional Neural Network	automatically detects the important features of rain fall data without any human supervision.	It encodes all the position and object orientation.[6]

VI. PROBLEM STATEMENT

The design of this input focuses on controlling the quantity of input data required, controlling the errors, avoiding delay, avoiding extra steps and keeping the method simple. The input is meant in such a way that it provides security and simple use with retaining the privacy. A top quality output is one which meets the wants of the top user and presents the knowledge clearly. If any system results of processing are communicated to the users and to other systems through outputs. In output design it's determined how the knowledge is to be displaced for immediate need and also the text output. It's the most important and direct source of information to the user.

VII. PROPOSED SYSTEM

The proposed method is based on the multiple linear regressions. The data for the prediction is collected from the publically available sources and the 70 percentages of the data are for training and the 30 percentages of the data is for testing. Multiple regressions are used to predict the values with the help of descriptive variables and is a statistical method. It is having a linear relationship between the descriptive variable and the output values. The number of observations is indicated by n. The depend on variable is Yi and the descriptive variable is xi. β0 and β p are the constant-y intercept and slop of the descriptive variable respectively.

VIII. ALGORITHM

Input: Rainfall data set

Output: Accuracy/error of the prediction

Step 1: start

Step 2: Importing the Data Set.

Step 3: Import the rainfall data set csv file.

Data= pd.read_csv (final.csv")

Step 4: The data is divided into a training set (70%) and a testing set (30%).

The multiple linear regressions equations are driven from the training dataset and Dataset that was taken out from the dataset using correlation.

Step 5: Fitting Multiple Linear Regressions testing dataset to the Training dataset that is after the that's after the gathering of knowledge. Y=A+BX

Yi=β0+β1xi1+β2xi2+...+β pxip + ϵ

Where: Y denotes the variable (rainfall)

And xi Where I=1,2,..,n, represent the evaluative or Independent variables called the intercept.

Step 6: calculating rainfall

Rainfall=(AvgTemp*1)(CloudCover*23

Where 1,2,3 represents the various coefficients

Step 7: calculate the Rainfall consistent with the quality of rain.

If there Not Rain: precipitation is close to = < 0.01(rainfall)

If Drizzle rain: 0.1<=precipitation=<00.1

If Moderate Rains: 0.1<precipitation<=1.2

If Heavy Rains: precipitation>=1.2

Step 8: Rainfall has been predicted

Step 9: End

IX. MATHEMATICAL MODEL

The number of observations is indicated by n. The dependent variable is Yi and the descriptive variable is xi. β0 and βp are the constant-y intercept and slop of descriptive variables respectively. Model error is indicated by €. In the proposed model multiple meteorological parameters are necessary to predict the rain fall, it's better to use multiple linear regressions rather than simple linear regression. The assumptions which are made by the multiple linear regressions are a linear relationship between both the descriptive and independent variables, the highly correlated variables are independent variables, Yi is calculated randomly and therefore the mean and variance are 0 and σ. By using this formula

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_p x_{ip} + \varepsilon$$

The formula can be calculated with the Mean Square Error, root mean square errors. Those results are displayed in the browsers.

X. SYSTEM ARCHITECTURE

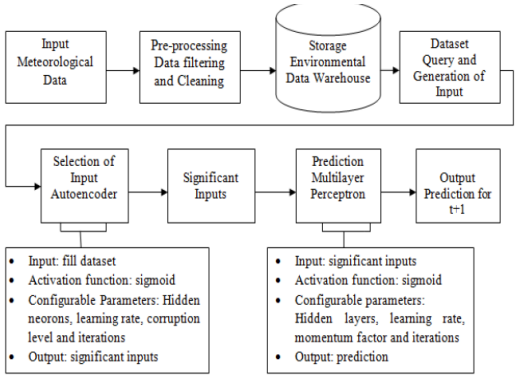

Fig.1: System Architecture

Description:

There are four modules: User, Admin, Data preprocess, Multiple Linear Regressions (MLR)The user can register the first one. While registering a user, I required a valid user email ID and mobile for further communications. The user registers once, then the admin can activate the customer. Once the admin activated the user then the user can login into the system. After login he can search the weather report based on the city. Admin can login with his credentials. The activated user only login in our applications. The admin can set the data set by the Indian metrological weather report. In this report the data has consider as monthly wise and yearly quarterly wise. The admin can add new data to the data set

XI. ADVANATGES

1. The error-free prediction provides better planning in the agriculture and other industries.
2. The linear relationship between both the descriptive independent variables, the highly correlated variable independent variables, Yi, is calculated randomly and the mean and variance are 0 and σ.
3. The power to work out the relative influence of 1 or more predictor variables to the criterion value
4. Ability to spot outliers or anomalies.

XII. DESIGN DETAILS

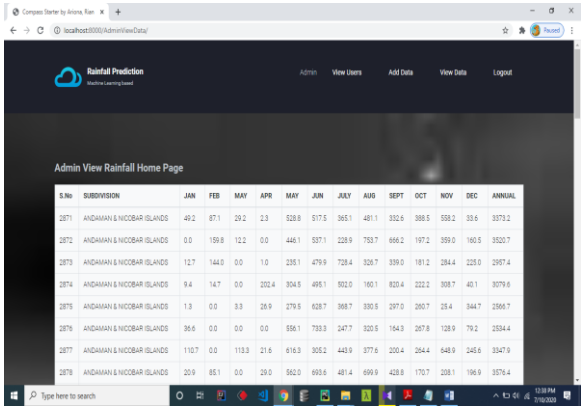

Fig.3: Admin View Data

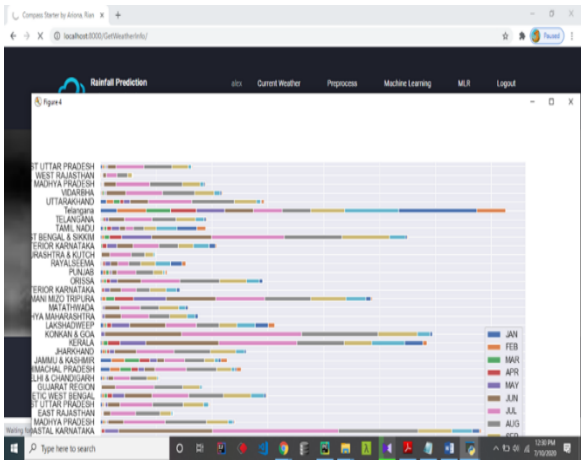

Fig.4: Graph on Rainfall Data

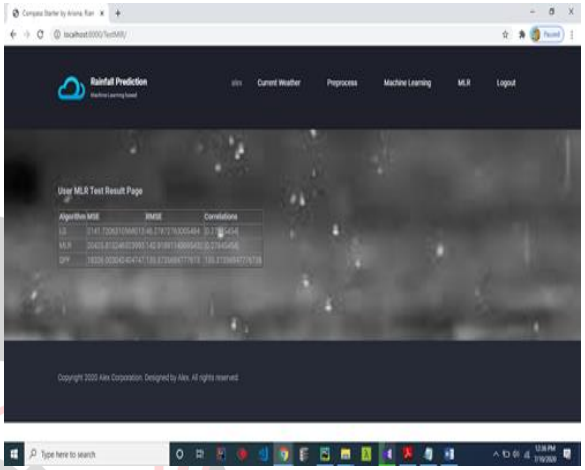

Fig.5: Final Predicted Result

XIII. CONCLUSION

Thus, we have tried to implement the paper "Moulana Mohammed, Roshitha Kolapalli, Niharika Golla, Siva Sai Maturi Fellow", "*Prediction Of Rainfall Using Machine Learning Techniques*", IEEE 2020 and according to the implementation the conclusion is as follows: Rain fall prediction plays a major role in agriculture production. The growth of the agricultural products is based on the rainfall amount. So it is necessary to predict the rainfall of a season to assist farmers in agriculture. The proposed method predicts the rainfall for the Indian dataset using multiple linear regressions and provides improved results in terms of accuracy, MSE and correlation.

REFERENCE

1] Manojit Chattopadhyay, Surajit Chattopadhyay, "Elucidating the role of topological pattern discovery and support vector machine in generating predictive models for Indian summer monsoon rainfall", Theoretical and Applied Climatology, pp. 1-12, July 2015, DOI: 10.1007/s00704-015-1544-5

[2] Kumar Abhishek, Abhay Kumar, Rajeev Ranjan, Sarthak Kumar," A Rainfall Prediction Model using Artificial Neural Network", 2012 IEEE Control and System Graduate Research Colloquium (ICSGRC 2012), pp. 82-87, 2012.

[3] Minghui Liu, Peilin Zhao, Ke Zhang, Jun Huang, Xing Shi, Xiaoguang Wang, Wei Chu, "A Short-Term Rainfall Prediction Model using Multi-Task Convolutional Neural Networks", IEEE International Conference on Data Mining, pp. 395-400, 2017, DOI 10.1109/ICDM.2017.49.

[4] Aswin S, Geetha P and Vinayakumar R, "Deep Learning Models for the Prediction of Rainfall", International Conference on Communication and Signal Processing, April 3-5, 2018, India, pp. 0657-0661.

[5] Xianggen Gan, Lihong Chen, Dongbao Yang, Guang Liu, "The Research Of Rainfall Prediction Models Based On Matlab Neural Network", Proceedings of IEEE CCIS2011, pp. 45- 48.

[6] Sam Cramer, Michael Kampouridis, Alex A. Freitas and Antonis Alexandridis, "Predicting Rainfall in the Context of Rainfall Derivatives Using Genetic Programming", 2015 IEEE Symposium Series on Computational Intelligence, pp. 711 – 718.

[7] Mohini P. Darji, Vipul K. Dabhi, Harshadkumar B.Prajapati, "Rainfall Forecasting Using Neural Network: A Survey", 2015 International Conference on Advances in Computer Engineering and Applications (ICACEA) IMS Engineering College, Ghaziabad, India, pp.706 – 713

[8] Sandeep Kumar Mohapatra, Anamika Upadhyay, Channabasava Gola, "Rainfall Prediction based on 100 years of Meterological Data",2017 International Conference on Computing and Communication Technologies for smart Nation, pp.162 – 166.

[9] Sankhadeep Chatterjee, Bimal Datta, Soumya Sen, Nilanjan Dey, "Rainfall Prediction using Hybrid Neural Network Approach", 2018 2nd International Conference on Recent Advances in Signal Processing, Telecommunications & Computing (SigTelCom), pp. 67 – 72.

[10] Mr. Sunil Navadia, Mr. Pintukumar Yadav, Mr. Jobin Thomas, Ms. Shakila Shaikh, "Weather Prediction: A unique approach for measuring and analyzing weather data", International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC 2017), pp. 414 - 417

