Rainfall Prediction Using Machine Learning

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Abstract- *In the period of big data, finding an answer from the colossal information is a major test. The trendy expression analytics which causes us in taking care of such issues, Data investigation is made out of different measurable and explanatory strategies used to grow new methods to anticipate future prospects. In the current situation anticipating the rainfall is estimated to be a significant and interesting errand, as it's firmly connected with the agriculture, economy and human life. Exactness of a precipitation determining has significance for nations like India whose economy is significantly relies upon agribusiness.This paper proposes a rainfall prediction model using Multiple Linear Regression (MLR) for Indian dataset. The input data is having multiple meteorological parameters and to predict the rainfall in more precise. The Mean Square Error (MSE), accuracy, correlation are the parameters used to validate the proposed model. From the results, the proposed machine learning model provides better results than the other algorithms in the literature.*

Keywords- Multiple Linear Regression, rainfall, prediction, machine learning, accuracy.

I. INTRODUCTION

India's foremost occupation is agriculture and its economy depends upon the agriculture of the country. But rainfall has a dramatic effect on agriculture. Rainfall prediction is significant in Indian progress and it assumes significant job in human life generally. It is requesting obligation of meteorological office to foresee the recurrence of rainfall with vulnerability. It is confounded to anticipate the rainfall precisely with changing climatic conditions. It is trying to figure the rainfall for both summer and blustery seasons. Scientists in everywhere throughout the world have created different models to anticipate the downpour fall for the most part utilizing arbitrary numbers and they are like the climate data.

Early prediction of rainfall is important for the better growth of the economy. Early prediction of rainfall has been one of the most challenging tasks in the world from past years. Various kinds of techniques used for prediction are Artificial Neural Network (ANN), Support Vector Machine (SVM) and clustering etc.

The proposed model is developed using multiple linear regression. The proposed method uses Indian meteorological date to predict the rain fall. Usually machine learning algorithms are classified into two major categories: (i) unsupervised learning (ii) supervised learning. In unsupervised learning the data is grouped and interpreted based only on input data. But in supervised learning a predictive model is developed based on both input and output data. All the clustering algorithms come under supervised machine learning. The algorithm that is used here also comes under supervised learning.

II. LITERATURE REVIEW

This section discusses some of the work related to our proposed methodology. There are many works in the literature for the prediction of rain fall.

Aswin et al. in [4] proposed a model to predict the rainfall precipitation by using Deep Learning Architectures (LSTM and ConvNet). LSTM and ConvNet Architectures are used to model and predict the Global monthly average rainfall for 10368 Geographic Locations around the globe for 468 Months. RMSE of the proposed system, LSTM is 2.55 whereas the RMSE of ConvNet is 2.44.By increasing the hidden layers errors can be still reduced.

Mohapatra et al. have proposed rainfall prediction for the data ranging from 1901 to 2002 of Bangalore, India. The Collected data were investigated using data mining technique Linear Regression. To validate and to get computational result pandas and scikit Learn were used. To predict rainfall for different seasons K fold was used. Prediction for rainy season was more accurate compared to summer season.

Sankhadeep Chatterjee et al. have proposed predicting rainfall using Neural Network. The Meteorological Station from Dumdum, West Bengal has given the data in the years between the years 1989 – 1995. The data was clustered using K means clustering. In [9] Hybrid Neural Network (HNN) was compared with MLP-FFN classifier. HNN was better by producing 89.54 % of accuracy (with selection features) and 84.26% of accuracy (without selection features) compared to MLP-FFN.

Sunil Navadia et al. have proposed a model to predict rainfall using predictive analysis in Hadoop. Data were analyzed and prediction of rain was done using Apache PIG. Appache Hadoop can be used in next version to increase the accuracy rate. Table 1 describes the comparison of different rainfall prediction methods in the literature.

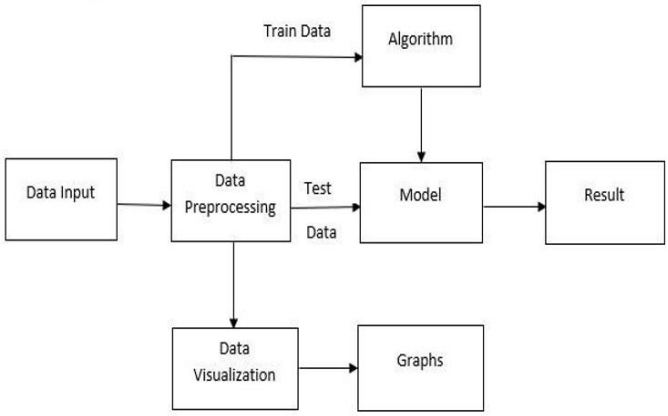
Kumar Abhishek et al. have proposed a rainfall prediction technique using neural network in [2]. The proposed model in [2] predicts the rainfall of Udupi district from Karnataka state of India. BPNN with feed forward, layer recurrent and BPNN with cascade feed forward neural networks are experimented. The proposed model takes 70% of the data for training and 30% for testing. The recurrent network shows better accuracy when compared to BPNN. The MSE is high in BPNN. Minghui Qiu et al. have introduced rainfall prediction using short term method because of its challenges in the prediction. To solve this convolutional neural network model was used to predict the short term rainfall by collecting set of weather features from multiple surrounding observations. It was compared with public weather forecast model and proved significantly better.

III. PROPOSED SYSTEM

The proposed method is based on the multiple linear regression. The data for the prediction is collected from the publically available sources and the 70 percentage of the data is for training and the 30 percentage of the data is for testing. Figure 2 describes the block diagram of the proposed methodology. Multiple regression is 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 following is the equation for multiple linear regression:

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

The number of observation 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 variable respectively. Model error is indicated byε. In the proposed model multiple meteorological parameters are necessary to predict the rain fall, it is better to use the multiple linear regression instead of simple linear regression. The assumptions which are made by the multiple linear regression are: linear relationship between the both the descriptive and independent variables, the highly correlated variables are independent variables, yi is calculated randomly and the mean and variance are 0 and σ. Figure 3 explains the flow of MLR prediction.



Block Diagram of Proposed Methodology

IV. RESULTS

This section deals with the results in the proposed MLR based rain fall prediction method. The total number of data in the selected data set is 4189. Figure 4 describes the MLR prediction result. The accuracy of the MLR prediction is 0.99.

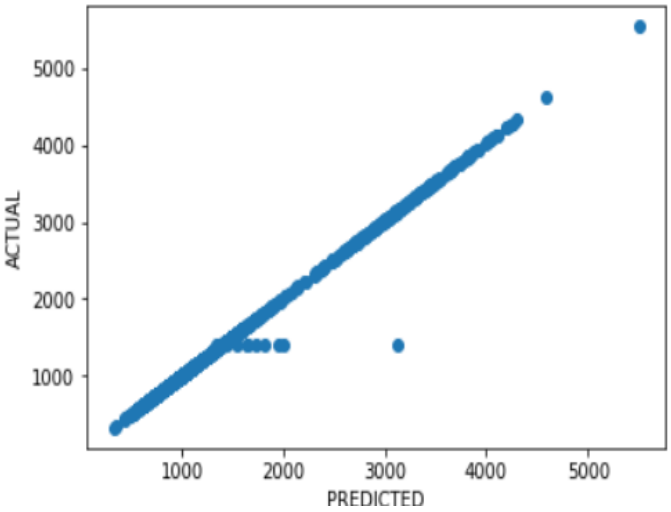


Fig. MLR Prediction Result

The multiple linear regression accuracy after prediction is as follows:

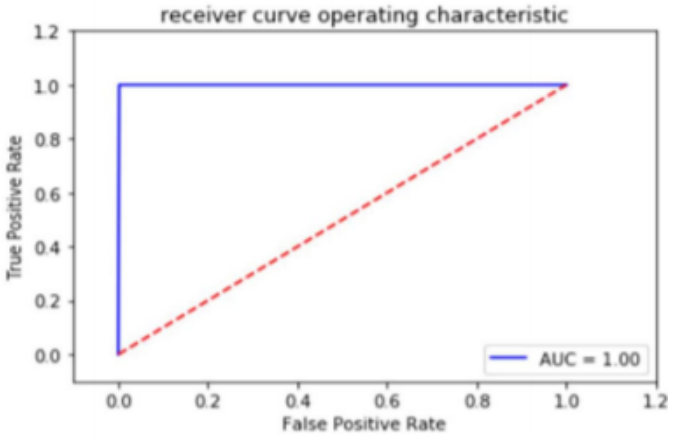


Figure 5. MLR Accuracy after Prediction

V. CONCLUSION

Rain fall prediction plays the 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 regression and provides improved results in terms of accuracy, MSE and correlation.

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