

# Machine Learning Based Rainfall Analysis

Pratap Ganachari, Vijetha, Ruchi Kumari

Department of Computer Science, Srinivas Institute of Technology, Valachil, Mangaluru, Karnataka, India

## ABSTRACT

### Article Info

Volume 7, Issue 4

Page Number: 208-212

### Publication Issue :

July-August-2021

### Article History

Accepted : 10 July 2021

Published : 17 July 2021

Rainfall is one of the most vital components of agriculture and also predicting it is the most challenging task. In general, weather and rainfall are highly non-linear and complex phenomena, which require progressive computer modeling and simulation for their precise prediction. Numerous and diverse machine learning models are used to predict the rainfall which are Multiple Linear Regression, Neural networks, K-means, Naive Bayes and more. This paper proposes a rainfall prediction model using Conventional Neural Network (CNN) 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.

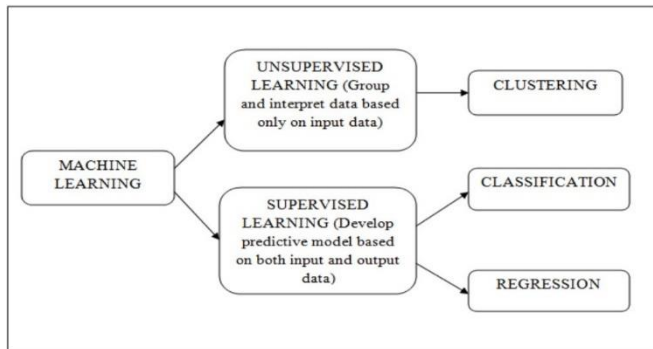
Keywords: Conventional Neural Network, Multiple Linear Regression, Neural networks, K-means, Naive Bayes

## I. INTRODUCTION

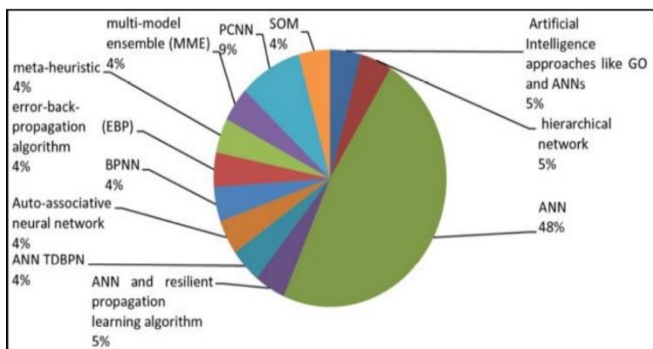
Rainfall prediction is vital in Indian civilization and it plays major role in human life to an excellent extent. It is demanding responsibility of meteorological department to predict the frequency of rainfall with uncertainty. It is complicated to predict the rainfall accurately with changing climate. It is challenging to forecast the rainfall for both summer and rainy seasons. Researchers in all over the world have developed various models to predict the rain fall mostly using random numbers and they are similar to the climate data.

The proposed model is developed using CNN. 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. All the clustering algorithms come under supervised machine learning. Figure 1 represents the various classification of machine learning algorithms. Figure 2 describes the rainfall prediction research based on neural network for Indian scenario. Even though many models have developed, but it's necessary for doing research using machine learning algorithms to urge accurate prediction. The error free prediction provides better planning in the agriculture and other industries.



**Figure 1.** Categorization of algorithm in machine learning.



**Figure 2.** Neural Network based Rainfall Prediction Methodologies

## II. RELATED WORK

There are many works within the literature for the prediction of rain fall. This section discusses a number of the work associated with our proposed methodology. 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 in comparison to BPNN. The MSE is high in BPNN. Minghui Qiu et al. have introduced rainfall prediction using short term method due to its challenges within the prediction. To solve this convolutional neural network model

was wont 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. 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 wont to model and predict the worldwide monthly average rainfall for 10368 Geographic Locations round 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 are often still reduced Xianggen Gan et al. have discussed back propagation neural network for rainfall prediction. The Proposed model 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. Proposed model is implemented using Matlab neural network platform and the accuracy of BPN Network prediction is 100% whereas regression prediction is 67%. Sam Cramer et al. proposed a strategy to predict rainfall with 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. GP overcomes the weakness of MCRP by predicting the various climates better than MCRP. Mohini P et al. have discussed a survey of different NNs to predict the rainfall. FFNN, RNN, TDNN were wont to predict better compared to forecasting techniques. The disadvantage of NNs is that it predicts accurate just for annual rainfall in comparison with monthly rainfall prediction. To overcome the problem meteorological parameters can be used. Sandeep Kumar 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 processing technique rectilinear regression. To validate and to urge computational result pandas and scikit Learn were used. To predict rainfall for different seasons K fold was used. Prediction for 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 info within 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. Apache Hadoop are often utilized in next version to extend the accuracy rate. Table 1 describes the comparison of different rainfall prediction methods in the literature.

### III. SYSTEM IMPLEMENTATION

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 3 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 CNN:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip} + \epsilon$$

the number of observation is indicated by n. The dependent variable is  $y_i$  and the descriptive variable is  $x_i$ .  $\beta_0$  and  $\beta_p$  are the constant y intercept and slop of descriptive variable respectively. 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,  $y_i$  is calculated randomly and the mean and variance are 0 and 1. Figure 4 explains the flow of CNN prediction.

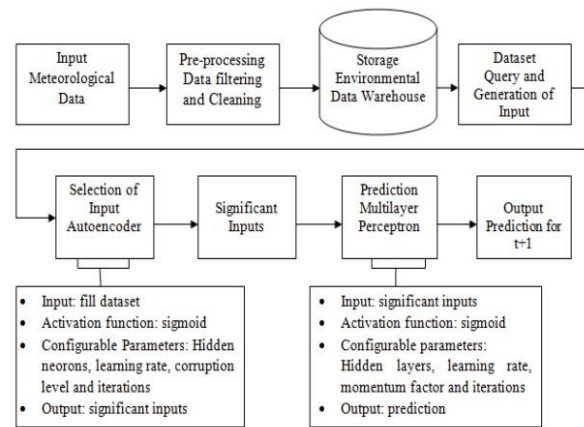


Figure 3. Block Diagram of Proposed Methodology

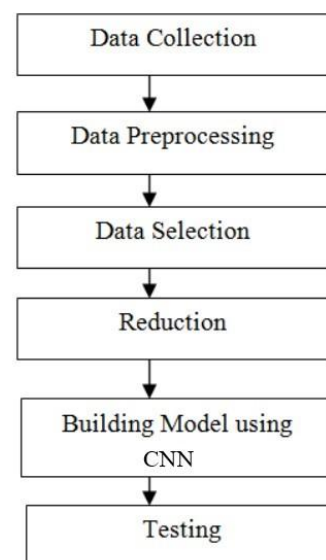


Figure 4. Block Diagram of Proposed Methodology

#### IV. EXPERIMENTAL RESULT

The system is being designed and following outputs have been obtained as results.

In figure 5 shows the user options to login or create a account in order to access the proposed system portal

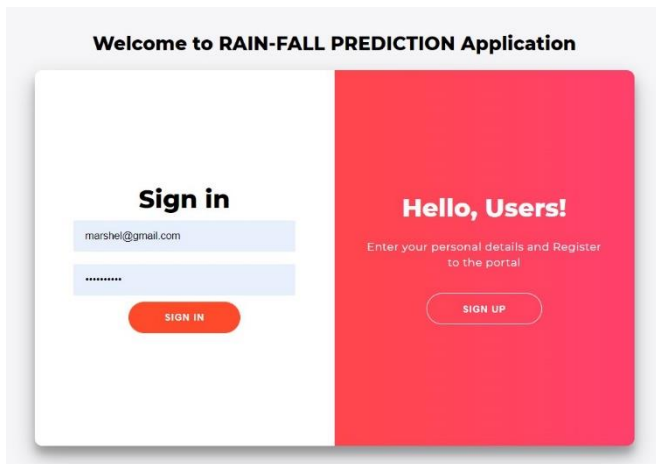


Figure 5. Login/Signup Page

In figure 6 shows the type of analysis needs to be processed by user i.e analysis state wise or district wise or get detailed analysis .

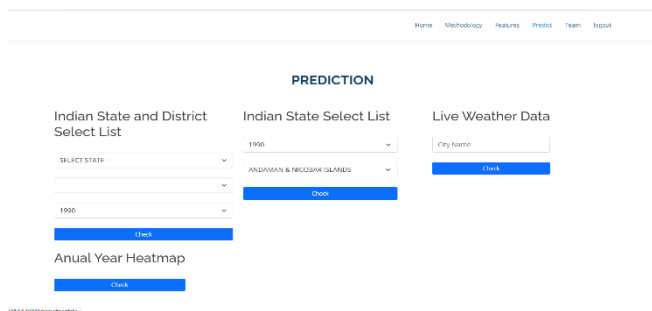


Figure 6. User option page

In figure 7 shows the result of prediction done by proposed system for district wise rainfall analysis in contrast with ground truth in a graphical format.

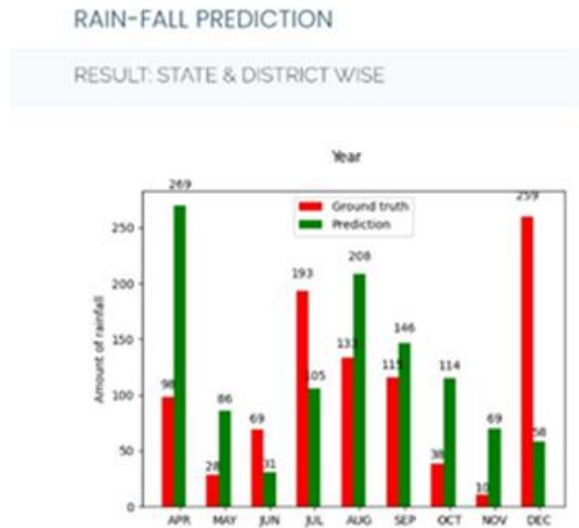


Figure 7. Prediction page district wise.

In figure 8 shows the result of prediction done by proposed system for state wise and particular year in contrast with ground truth in a graphical format.

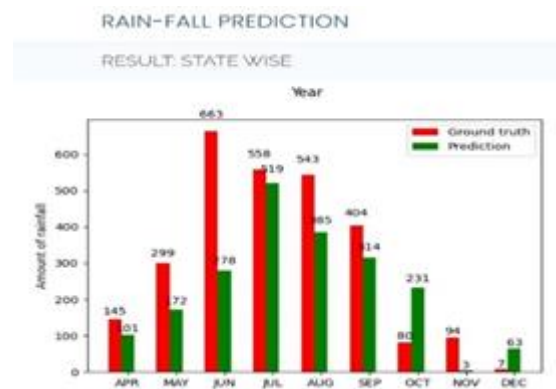


Figure 8. Prediction page state wise for particular year

In figure 9 shows the live weather data of any city of india in contrast with weather components.

VI. REFERENCES



Figure 9. Live Weather data.

In figure 10 shows the result of heatmap designed by proposed system for annual rainfall stats.

HEATMAP PAGE



Figure 10. Heatmap graph page

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 CNN and provides improved results in terms of accuracy.

- [1]. 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
- [2]. 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.
- [3]. Mr. Sunil Navadia, Mr. Pintukumar Yadav, Mr. Jobin Thomas, Ms. Shakila Shaikh, "Weather Prediction: A novel 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

Cite this article as :

Pratap Ganachari, Vijetha, Ruchi Kumari, "Machine Learning Based Rainfall Analysis", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 7, Issue 4, pp.208-212, July-August-2021. Available at doi : <https://doi.org/10.32628/CSEIT217462>  
 Journal URL : <https://ijsrcseit.com/CSEIT217462>