

# Rainfall Analysis Using CNN

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**Abstract-** Back propagation is most generally utilized in neural network projects because it's easy to coach and for its accuracy. Back propagation learning algorithm consists of two facets, the primary one generate the input pattern of the network and therefore the another one to regulate the output through altering the weights of the network. The back propagation algorithm are often for predicting rainfall. This paper materialize training, testing of knowledge set and detecting the hidden neuron within the network. In this research, rainfall prediction in the various region of India has been analyzed using neural network back propagation algorithm. Three layer model has been used for training and studying different attributes of the hidden neurons within the network.

**Keywords-** Back propagation, Conventional Neural Network, Machine learning.

## I. INTRODUCTION

India is the country in which agriculture is the backbone of the country. Agriculture is that the integral part of the economy which plays an important role within the growth of economy. Rainfall prediction is that the most vital tool for growth of agriculture within the country. Rainfall prediction is most intricate and difficult procedure to perform accurately. Prediction needs great deal of archival and actual data from past records. Rainfall plays vital role in human life and agriculture, it's very essential for irrigation. Rainfall prediction is additionally useful for sewer management, water management and flood forecasting. Many factors influence rainfall prediction like temperature, humidity, wind speed, pressure, temperature etc. Artificial neural network are often used for predicting due to having the potential of examining and determining the historical data used for prediction. CNN has better accuracy than statistical and mathematical models. CNN works on the principle of biological neurons which is a type of data driven technique. The conjunction between meteorological parameters and rainfall can be analyzed using CNN. Back propagation is the common method for training CNN. It is the supervised learning method which needs a dataset of the specified output from many inputs, making up the training set. It is most useful for feed-forward network (networks that haven't any feedback or just , that haven't any

connection therein loop). The paper aims to develop CNN using back propagation for predicting the rainfall in Delhi region of India. The Indian economy highly depends on monsoon and seasonal rainfall so it's necessary and challenging or meteorological researchers to predict rainfall in several regions of the country.

## II. RELATED WORK

An extensive research is being done on classification, which is one of the functionalities of data mining. A variety of classification techniques such as Decision Tree Induction, Bayesian Classification, Naïve Bayes Classifiers, Multi-Layer Perceptron, Genetic algorithms, Fuzzy logic and Support Vector Machines have been developed. Many researchers have made comparative analysis of different classification techniques with respect to different applications. The most common problem in the selection of attributes is using fast and accurate algorithm which doesn't require long time to run and give accurate and correct results.

In previous work [1] paper reports a detailed survey on rainfall predictions using different rainfall prediction methods extensively used over last 20 years. From the survey it has been found that most of the researchers used Machine Learning techniques for rainfall prediction and got significant results. The survey also gives a conclusion that the forecasting techniques that use MLP are suitable to predict rainfall than other forecasting techniques such as statistical and numerical methods. However some limitations is clearly noticed altogether the methods of rainfall prediction discussed during this survey paper. The extensive references in support of the various developments of methods provided during this research should be of great help to researchers to accurately predict rainfall within the future and to select the method that would solve their problem they will be facing in their proposed prediction model.

Another research paper [2] considers, use of data mining technique in forecasting monthly Rainfall of Assam. This was administered using traditional statistical technique - Multiple rectilinear regression . The data include Six years period collected locally from Regional Meteorological Center, Guwahati, Assam, and India. The performance of this model is

measured in adjusted R-squared. Our experiments results shows that the prediction model supported Multiple rectilinear regression indicates acceptable accuracy. In these cases the output took the form of classification rules, which are basic knowledge representation styles that many machine learning methods used. The weather problem is a tiny dataset that we will use repeatedly to illustrate machine learning methods.

A survey paper proposes a new idea in comparing two common predictors i.e. the statistic method and AI (AI) for rainfall prediction using empirical data series. The statistic method uses Auto-Regressive Integrated Moving (ARIMA) and Adaptive Splines Threshold Autoregressive (ASTAR), most favourable statistic tools, while in the AI, combination of Genetic Algorithm-Neural Network (GA-NN) is chosen. The results show that ASTAR gives best prediction compare to others, in term of root mean square (RMSE) and following trend between prediction and actual.

### III. SYSTEM IMPLEMENTATION

System implementation includes initial step of knowledge mining. Dataset is collected from government meteorological website, input and target data are decided for the prediction, and dataset is made accordingly. For input and target previous data has been taken for prediction. The input and target data need to be normalized due to having different units. For normalization the mean of all the info i.e. humidity, wind speed and rainfall is calculated. Let mean be  $M$ ,  $M = \text{Sum of entries}/\text{number of entries}$  variance (SD) of every entry is calculated. After calculating the mean and variance the worth of every parameter is normalized. Normalized value =  $(x-M)/SD$  Normalization will preserve the connection among the particular data values.

CNN may be a physical cellular network that's ready to acquire, store and utilize experimental knowledge which has been associated with the network capability and performance. There are differing types of neural networks and therefore the one implemented during this paper is feed forward network.

#### A. Feed Forward Network

In the generic feed forward network characterized by the shortage of feedback. the knowledge moves in just one direction that's forward, this sort of network are often connected in cascade to make multilayer network. The layer consists of neurons and makes independent computation on data that it receives and passes to a different layer. Weights are the connection between the 2 layers, neurons makes computation based upon weighted sum of inputs. the

primary layer of feed forward network is that the input layer and therefore the last layer is that the output, other layer between the 2 layers are called hidden layers. A function called the edge is employed for calculating the output of the neuron within the output layer.

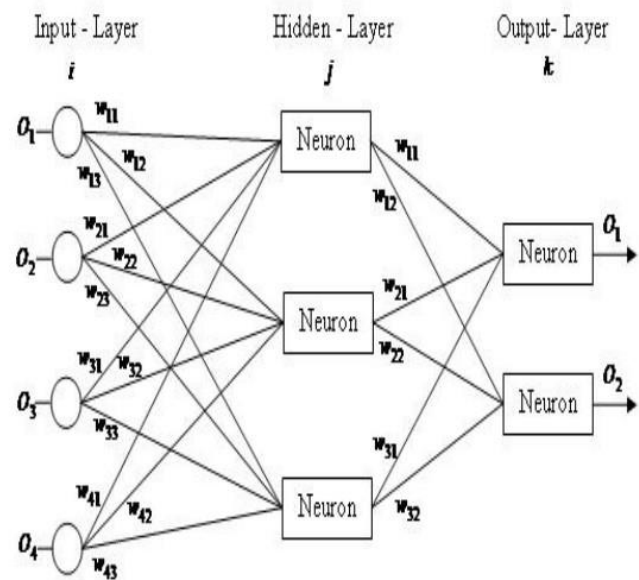


Figure1. A feed forward network design

In this paper the input and target data is calculated for India. The database is collected from government meteorological websites. Rainfall are often of two types seasonal and non- seasonal, seasonal rainfall occur during monsoon period that's from the month of May to the month of September and rest of the months causes non seasonal rainfall. It is very difficult to predict daily base data because it's tough to take care of accuracy in data and therefore the parameters used for rainfall prediction, these parameters must be accurate for generating minimum mean square error. It is not easy to maintain accuracy of the parameters used for calculating daily basis data which can lead to high error in data training, testing and validation.

After creating the info base and normalizing the data, next step is training of the input file using back propagation algorithm. Training of the input file within the machine learning is completed using python and keras for CNN. Back propagation algorithm takes 70 percent of knowledge for training, 15 percent for testing and 15 percent for validation. The input file contains 365 samples out of which 255 samples are for training, 55 samples for testing and rest samples for validation for every particular state in India for every year.

IV. EXPERIMENTAL RESULT

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

In figure 2 shows the user options to login or create a account in order to access the proposed system portal

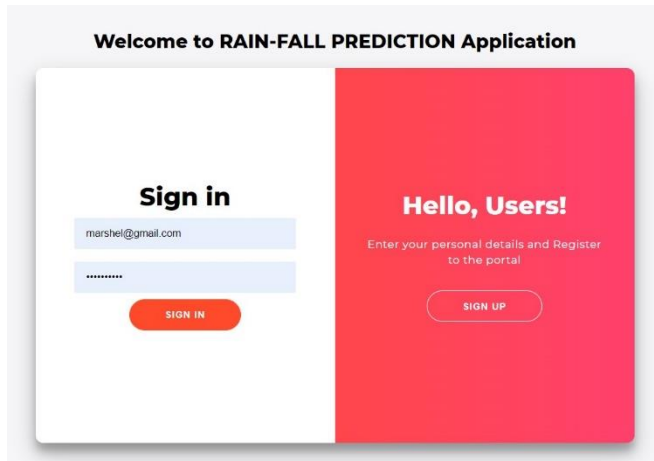


Figure 2.Login/Signup Page

In figure 3 shows the type of analysis needs to be processed by user i.e analysis state wise or district wise or get detailed analysis .

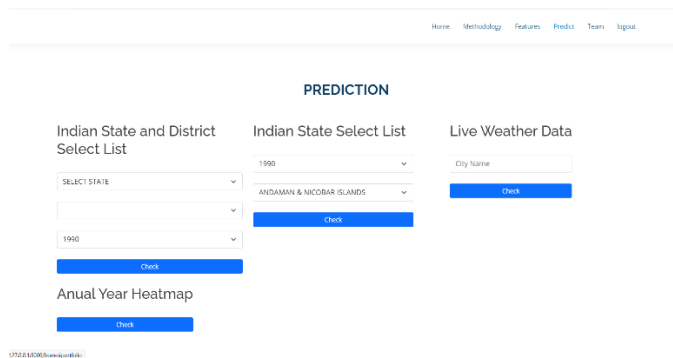


Figure 3.User option page

In figure 4 shows the result of prediction done by proposed system for district wise rainfall analysis in contrast with ground truth in a graphical format.

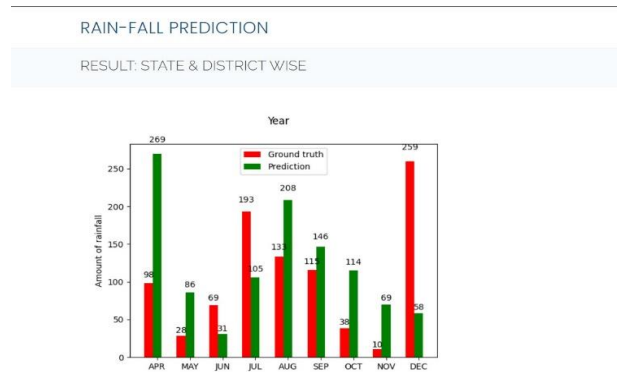


Figure 4.Prediction page district wise.

In figure 5 shows the result of prediction done by proposed system for state wise and particular year in contrast with ground truth in a graphical format.

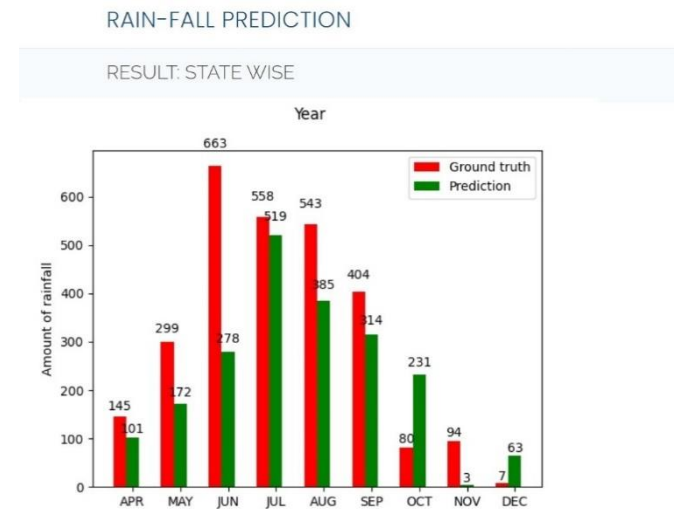


Figure 5.Prediction page state wise for particular year

In figure 6 shows the live weather data of any city of india in contrast with weather components.



Figure 6.Live weather data

In figure 7 shows the result of heatmap designed by proposed system for annual rainfall stats.

HEATMAP PAGE



Figure7.Heatmap graph page

V. CONCLUSION

Proposed system provides a platform for young budding farmers or youth who are interested in researching through rainfall pattern of India in order to provide a new solution for unseasonal rainfall issue in India, which are resulting in crops being wasted and farmers losses in crop production.

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