PREDICTION OF RAINFALL USING MACHINE LEARNING

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ABSTRACT:

In India ,0Agriculture is the0key point0for survival. For0agriculture, rainfall is most important. These days rainfall prediction0has become0a major problem. Prediction of rainfall gives7awareness to people7and know in advance7about rainfall to7take certain7precautions to protect7their crop from7rainfall. Many techniques7came into existence7to predict7rainfall. Machine7Learning algorithms are7mostly useful in predicting7rainfall. Some of the major7Machine Learning7algorithms are ARIMA7Model (Auto-Regressive7Integrated Moving7Average), Artificial Neural7Network, Logistic7Regression, Support7Vector Machine and7Self Organizing7Map. Two commonly7used models predict7seasonal rainfall such7as Linear and NonLinear7models. The first models7are ARIMA Model. While using7Artificial Neural7Network (ANN) predicting7rainfall can be7done using7Back Propagation7NN, Cascade7NN or Layer7Recurrent Network.7Artificial NN is7same as Biological7Neural7Networks

INTRODUCTION:

In today's8situation, rainfall8is considered8to be one8of the responsible8factors for8most of the8significant things across8the world. In8India, agriculture8is considered8to be one8of the important8factors for8deciding the economy8of the country8and agriculture8is solely dependent8on rainfall. Apart8From that8in the coastal areas8across the world,8getting to know8the amount8of rainfall is8very much8necessary. In some8of the areas which8have water scarcity, to8establish rain water harvester, prior8prediction of the8rainfall should be8done. This project8deals with the prediction8of rainfall8using machine learning8& neural networks.8The project performs8the comparative8study of machine8learning approaches and8neural network8approaches then accordingly8portrays the8efficient approach8for rainfall prediction.8First of all,8pre-process is8performed. Pre-process is the8process of representing8the data set in8the form of several8graphs such as bar8graph, histogram etc. The prediction8has been done8using the data8set which contains8rainfall data8from year 1901 to 2015 for different8regions across the8country. It contains8month wise data8as well as annual8rainfall data8for the8same.

MOTIVATION:

Rainfall information0in the8past helps farmers8better manage8their crops, leading8to economic8growth in the country.8Prediction of8precipitation is8beneficial to prevent8flooding that saves8people's lives8and property.

SYSTEM ANALYSIS

EXISTING SYSTEM

Machine learning approach deals with predicting rainfall using machine learning approach. It finds the accuracy of the machine learning approach using two types of errors i.e., RE and RMSE. In these four major trends of machine learning are being used. The first one is called hybridization,which means multiple machine learning approaches are being used together and accordingly prediction is being done. The second one9deals with improving9the quality of9dataset which9is being used. Data

mining9approach helps to find the hidden pattern, which will help to predict9the rainfall correctly.This approach takes all the parameters, which affect9the rainfall such as climate, wind speed etc. and predict the future rainfall. Customized,integrated and modified data mining technique is used9to predict rainfall.Many climate variables are being taken topredict rainfall.

PROPOSED SYSTEM:

We have proposed ANN(ARTIFICAL NEEURAL NETWORK)based rainfall prediction and forecasting system to efficiently predict the rainfall and to do forecasting for upcoming years. It provides the better accuracy comparing to the existing approach. It consumes less time for huge amount of data.

SYSTEM DESIGN:

SYSTEM ARCHITECTURE:

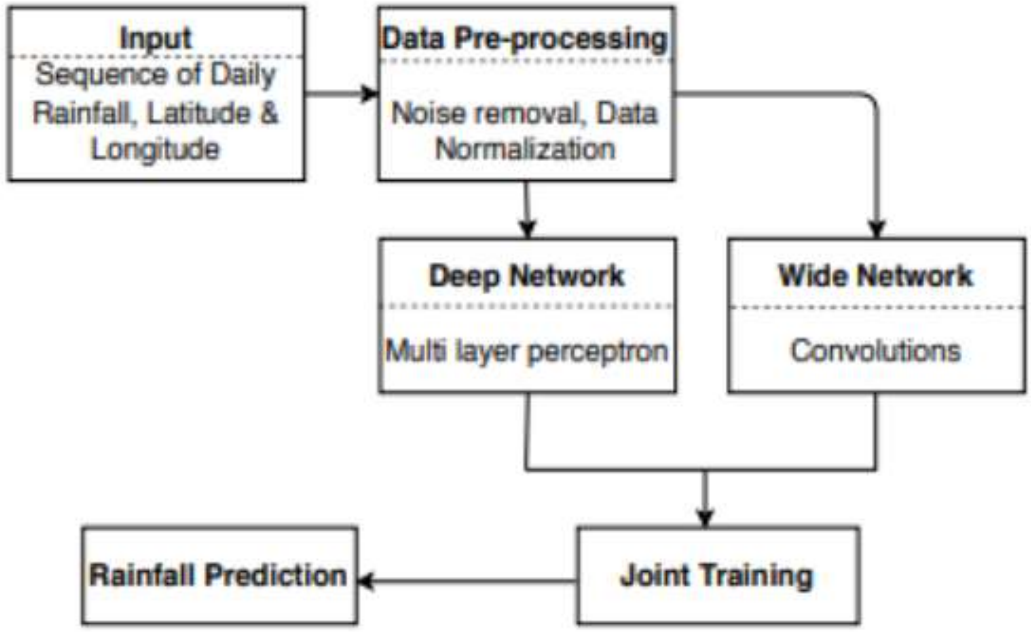

Fig 3.1 Architecture outline of the classification of rain fall prediction

The model takes sequence of dail rainfall intensities and geographical parameters, namely latitude and longitude as input. After initial pre-processing, input goes to a deep network, which is a ANN (ARTIFICAL NEURAL NETWORK) and a wide network consists of convolutions. The model is2trained using joint training approach, considering outputs from deep and wide networks simultaneously.

FLOWCHART:

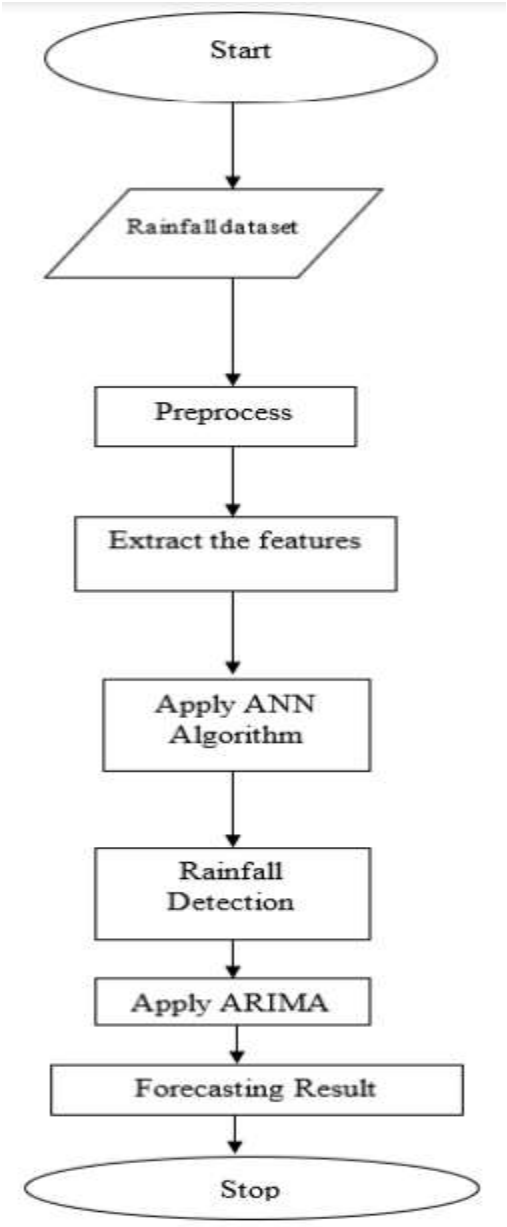

Fig 3.2 Flow Chart

ALGORITHM APPLIED

ARTIFICAL NEURAL NETWORK

Artificial neural network1model ANN is an1adaptive system1that changes its structure1based on external or internal1information that1flows through the1network during its1learning phase. The1neural network1is neurons connected1together with the1output from one neuron1becoming input1to others until the1final output is reached. The network1learns when an1example of a set of input1data with known1results/output are1presented to it, the weighting1factors are adjusted1(either through human1intervention or by a programmed1algorithm) and these connection1weights store the1knowledge necessary to bring1the final output closer1to the known1result (Haykin 1999). In this present1study, ANN models with three1training algorithms1were developed1to forecast the daily1rainfall. Using the1available data of the1study area, trial and1error approach1has been employed in finalizing1the present ANN1structure. The Neuro solution version 5 (http://www.nd.com) has1been used in the model1development. The first1ANN model (A)

was1trained using1MLP backpropagation1algorithm network with1simple structure, four nodes1in the input layer, single hidden1layer with seven nodes1and one node1in the output layer.1Input to the model1is the present-day1rainfall data (t) and the 3-day lagged rainfall [(t 1) (t 2) (t 3)], while the1output is rainfall of the1next day (t þ 1). The transfer1function used is the sigmoid1function with1400 numbers of1epochs. In the second1ANN model (B), the radial1basis function (RBF) was used for training1the network. The input and the output1of training data set1were kept same as1MLP network. However,1the transfer1function, TanhAxon, was used1. The third1ANN model (C) was trained1using time-lagged recurrent1networks (TLRNs). Data1used to train the model was the same as the previous1two models (A and B). In the TLRN1algorithm, the increased1number of nodes in the hidden1layer reduced the performance and hence the number of nodes in the1hidden layers was reduced to two. For all the1networks, the number of hidden1layers and number1of neurons in each layer1were found by trial1and error. Out of 471years of rainfall1data, 35 years1of data are used1for training and1remaining 12 years1are used for testing;1this length is achieved through a trial-anderror1modelling1approach.

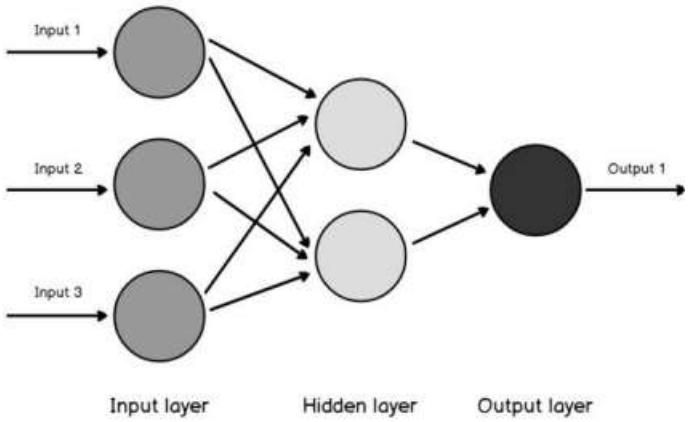

Fig 4.1 Artificial Neural Network

ARIMA forecast model: ARIMA is an acronym that stands for Auto Regressive Integrated Moving Average. It is a class of model that captures a suite of different3standard temporal structures in time series data.

Components of ARIMA: ARIMA has three components – AR (autoregressive3term), I (differencing3term) and MA (moving3average term). Let us understand each of these3components AR term refers to the past values used for forecasting the next value. The AR term is defined by the parameter ‘p’ in arima. MA term is used to defines number of past forecast errors used to predict the future values. The parameter ‘q’ in arima3represents the MA term. ACF plot is used to identify the correct ‘q’ value. Order of differencing specifies the number of times the differencing operation3is performed on series to make it stationary. Test like ADF and KPSS can be used to determine3whether the series is stationary and help in identifying the d value. Steps of ARIMA Load the data: This step will be the same. Load the data into your notebook Preprocessing3data: The input should be univariate, hence drop the other columns Fit Auto ARIMA: Fit the model on the3univariate series Predict values on validation set: Make predictions on the validation3set Calculate RMSE: Check the performance3of the model3using the predicted values3against the actual values.

Building Model

We apply3a convolutional layer to3capture such combinations. In3addition to this, to3make our model more3generalized with3respect to different3atmospheric conditions, we3are using geographical3parameters namely, longitude3and latitude3while designing3and developing3our model.

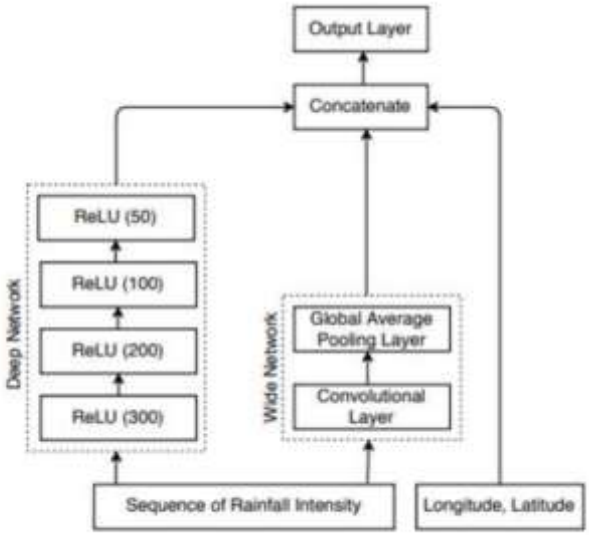

Fig:5.2 ANN model

CONCLUSIONS

This project represented the5Deep Learning Approach for predicting the rainfall by using the ANN (ARTIFICAL NEURAL5NEIWORK). Comparing the present architecture with other state approaches. This project provided a study ofdifferent types5of methodologies used to forecast and predict rainfall and issues that could be found when applying different approaches to forecasting rainfall. Because of nonlinear relationships in rainfall datasets and the ability to learn from the5past, Artificial Neural Network makes a superior solution to all approaches available.

FUTUREWORK:

The future work of the project would be the improvement of architecture for light and other weather scenarios.Also, can develop a model for small changes in climate in future. An algorithm for testing daily basis dataset instead of accumulated dataset could be of paramount Importance for further research.

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