

Literature Review on Rainfall Prediction

Rushil Patel*

Department of Instrumentation and Control Engineering, Nirma University, Ahmedabad, India

Mini Review Article

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***For correspondence:**

Rushil Patel, Department of
Instrumentation and Control
Engineering, Nirma University,
Ahmedabad, India

E-mail: 18bic042@nirmauni.ac.in

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ABSTRACT

Heavy rainfall prediction is a major problem for Meteorological department as it is closely associated with the Economy and life of human. It is a cause for natural disasters like Flood and drought which are encountered by people across the Globe every year. Accuracy of rainfall forecasting has great Importance for countries like India whose economy is largely dependent on agriculture. Due to dynamic nature of atmosphere, Statistical techniques fail to provide good accuracy for rainfall Forecasting. Nonlinearity of rainfall data makes Artificial Neural Network a better technique. Comparison of Different approaches and algorithms used by researchers for Rainfall prediction is shown in a tabular form.

INTRODUCTION

Rainfall prediction is helpful to avoid flood which save lives and properties of humans. Moreover, it helps in managing resources of water. Information of rainfall in prior helps farmers to manage their crops better which result in growth of country's economy. Fluctuation in rainfall timing and its quantity makes rainfall prediction a challenging task for meteorological scientists. In all the services provided by meteorological department, Weather forecasting stands out on top for all the countries across the globe. The task is very complex as it requires numbers of specialized and also all calls are made without any certainty.

Table 1: Comparison of Different approaches used by researchers for Rainfall prediction.

Authors	Region	Dataset time period	Techniques	Rainfall predicting attribute	Accuracy measure
M.Kannan et al.(2010)[1]	Global	5 year	Regression	Rainfall, humidity, wind direction, min-max temp.	MSE
S. Chattopadhyay (2007) [2]	Global	Monthly	ANN	Rainfall	MSE
P. Dutta, H. Tahbilder (2014) [3]	Global	6 month	Regression	Rainfall	RMSE
P. Goswami, Srividya (1996) [4]	Global	Yearly	ANN	Mean rainfall	Relative percentage error
S. Kannan, S. Ghosh (2010) [5]	Local (River)	Daily	Decision tree, CART, K-mean	Temperature, pressure, wind speed, rainfall	MSE

LITERATURE REVIEW

M. Kannan predicted short term rainfall. Empirical method technique is used for prediction task. Data of three specific months for five years is analyzed for particular region. Clustering is used for grouping the elements [1]. Pinky Saikia Dutta and Hitesh Tahbilder predicted monthly Rainfall of Assam by traditional statistical technique - Multiple Linear Regression. Parameters selected for the model are min-max temperature, mean sea level pressure, wind speed and rainfall. Acceptable accuracy is given by prediction model based on multiple linear regressions [3]. S. Chattopadhyay has used two parameters minimum temperature and maximum temperature for rainfall forecasting. S.Chattopadhyay used past four months rainfall data as inputs to neural network model [2]. P. Goswami and Srividya have combined RNN and TDNN features and conclusion of their work was that composite models gives better accuracy than the single model. They used linear regression method for rainfall prediction [4]. S. Kannan and S. Ghosh contributed towards developing K- mean clustering technique combined with decision tree

algorithm, CART, is used for rainfall states generation from large scale atmospheric variables in a river basin. Rainfall state on daily basis is derived from the historical daily multi-site rainfall data using K-mean clustering [5].

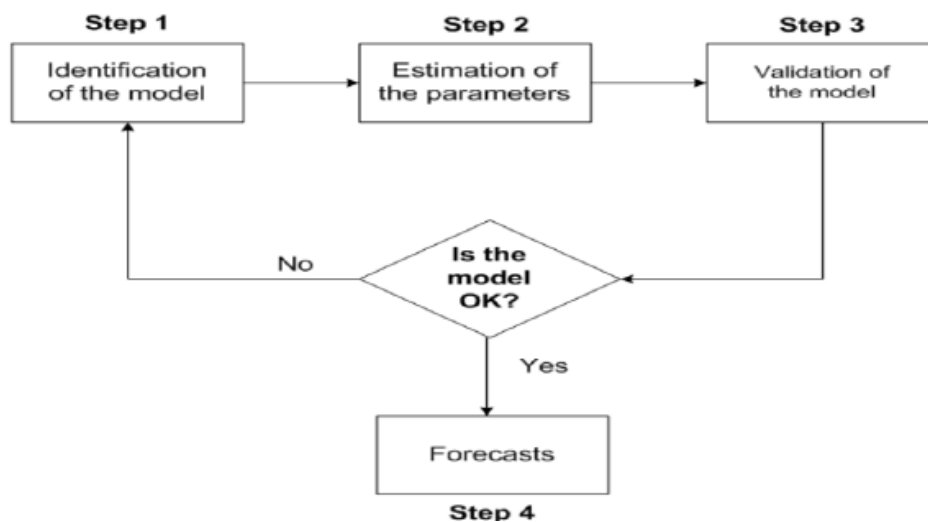
Basic understanding of used techniques for rainfall prediction

Two widely used methods for rainfall forecasting are:

1. Statistical methods
2. Numerical weather prediction (NWP)

Nature of rainfall data is non-linear. Frequency, intensity and amount are main characteristics for time series rainfall. These values can be varied from one position on earth to other position of earth and from one time to other time. Every statistical model has some drawbacks. Combination of AR and MA together forms a general and useful class of the time series model known as ARMA model. ARMA model is only useful for stationary time-series data and forecasting of short term rainfall. The statistical approaches do not have the ability to identify nonlinear patterns and irregular trend in the time series.

Figure 1: Outline of Box-Jenkins methodology.



Artificial neural network: ANN is a computational model that is inspired by the human brain. ANN contains a big number of interconnected neurons, which mostly operate in parallel, and are well structured. Categories of neural networks are either single layer or multi-layer. Layer between input layer and output layer is called as hidden layer. A Single-Layer Feed Forward (SLFF) neural network consists one input layer whose nodes have weights assigned and one output layer. A Multilayer Feed-Forward (MLFF) neural network architecture can be developed by adding hidden layers in SLFF neural network.

Linear regression: Linear regression is a simple method to know rainfall prediction. It can be used on simple data sets, with linear relationships between two variables. One variables is treated as the independent variable because the model assumes that changes in the other variable don't impact it. In this method authors got less accuracy.

CONCLUSION

The estimation of rainfall is of great importance in terms of water resources management, human life and their environment. It can be met with the incorrect or incomplete estimation problems because rainfall estimation is affected from the geographical and regional changes and properties. This paper presented review of two-three methods used for rainfall prediction and problems one might encounter while applying different approaches for rainfall forecasting. Due to nonlinear relationships in rainfall data and ability of learning from the past makes Artificial Neural Network a preferable approach from all available approaches.

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