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## Review on Rainfall Forecasting Using Different Techniques and Algorithms

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**ABSTRACT**-Rainfall Forecasting is one of the most challenging topics across the globe. Unlike traditional methods, modern Weather forecasting involves a combination of knowledge of trends and patterns and computer models. Using these methods, accurate forecasting could be done. Forecasting System is based on any architecture or technology such as Artificial Neural Network Forecasting, Sensor-Based, Numerical weather prediction model, Fuzzy sub-system or a used friendly web based system. The weather predictions in advance of 2-8 days is also possible. Forecasting could be carried out globally or region based. This paper focuses on giving different ways to forecast the weather in different regions. The paper presents the review of Rainfall Forecasting using different techniques and studies the benefit of using them. It provides a survey of available literatures of some techniques given by different researchers. The technical success, that have been achieved by various researchers in the field of rainfall forecasting ,has been reviewed and presented in this survey paper.

**KEYWORDS:**Artificial Intelligence;Artificial Neural Network;Fuzzy Logic;ANFIS;Rainfall Forecasting

### I. INTRODUCTION

Artificial Intelligence particularly means the ability of machines to perform function similar to those that relate to human thoughts. It needs human intelligence such as learning and the ability to interpolate from current knowledge. AI consists of many branches such as Artificial Neural Network, Genetic Algorithm, Fuzzy Logic and hybrid of these methodologies. It has also been applied in different areas such as modeling, identification, optimization and prediction. Rainfall prediction, time series data, river flow prediction etc. are achieved by the use of artificial intelligence techniques. Rainfall forecasting is mainly done to avoid future mishappenings by knowing in advance to tackle with it. The application of neuro-fuzzy technique is fast growing approach in the field of forecasting. Accurate rainfall forecasting is one of the challenging problem for the scientists over globe.

### II. LITERATURE REVIEW

On a worldwide scale, large numbers of attempts have been made by different researchers to forecast Weather accurately using various techniques.

Indrabayu, Nadjamuddin Harun etc[1], in their paper proposed a new approach for rainfall prediction method, which combines the Support Vector Machine (SVM) and Fuzzy Logic methods. The performance of the proposed method is compared to the Neural Network (NN)-Fuzzy. Ten years meteorological data (2001-2010) was collected from BMKG Indonesia for Makassar City. The climatological data is obtained from PT LAPAN Bandung and the Meteorology, Climatology and Geophysics Region IV Makassar Indonesia for 10 years (2001-2010) and is analysed by MATLAB 7.6.

Somia A. Asklany, Khaled Elhelow etc[2], in their paper predicted rainfall by applying fuzzy rule base and fuzzy logic. Five parameters: relative humidity, total cloud cover, wind direction, temperature and surface pressure were the input variables used. The output percentage approximately around eighty percent is considered as success forecast. It is clear that this means that there still has a degree of uncertainty associated with the models output for the rainfall events and more verification skills would be introduced in the following section that all give high agreement with the recorded



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rainfall. For future work, they suggested that the use of hybrid intelligent approach by merging the fuzzy inference system with neural network may give the ability to learn and reduce the need for the experts.

Jyothis Joseph and Ratheesh T K[3], used data mining techniques such as clustering and classification techniques for rainfall prediction. This paper describes empirical method technique belonging to clustering and classification approach. ANNs are used to implement these techniques. The artificial neural networks not only analyze the data but also learn from it for future predictions making them suitable for weather forecasting. Neural networks provide a methodology for solving many types of non-linear problems that are difficult to be solved through traditional methods. The rainfall values are clustered using subtractive clustering and the rainfall states identified as low, medium, heavy and which are given as outputs for training. Separating data into training and testing sets is an important part of evaluating data mining models. Applying subtractive clustering, the optimum numbers of clusters obtained was 3. The rainfall values were categorized as low, medium & heavy. Rainfall Prediction gave the accuracy of 87%.

Jignesh Patel and Dr. Falguni Parekh[4], developed an efficient model to forecast monthly monsoon rainfall for Gandhinagar station using Adaptive Neuro Fuzzy Inference System (ANFIS). Eight models were developed using various membership functions and climatic parameters as inputs. In this paper, the generalized bell-shaped built-in membership function (gbell) has been used as a membership function in both Hybrid and Back propagation method for ANFIS. The study reveals that hybrid Model with seven membership functions and using three inputs-temperature, relative humidity and wind speed gives best result to forecast rainfall for area under study. Root mean square error for training period is 0.95 and for validation it is 76.27

Akash D Dubey[5], in his paper used different artificial neural networks that have been created for the rainfall prediction of Pondicherry, a coastal region in India. These ANN models were created using three different training algorithms namely, feed-forward back propagation algorithm, layer recurrent algorithm and feed-forward distributed time delay algorithm. The number of neurons for all the models was kept at 20. The mean squared error was measured for each model and the best accuracy was obtained by feed-forward distributed time delay algorithm with MSE value as low as .0083. There were total 12 ANN models which were trained using the 800 data samples of the region which were collected over 100 years. After the training, the validation and testing of the neural networks was done using 200 data samples each. The performance measure of the neural networks was the Mean Square Error (MSE). For a network to be more accurate, the MSE has to be as low as possible.

### III. CONCLUSION

This paper presents a survey that uses several approach for weather forecasting. But in my opinion ANFIS approach is the best and can be considered as an alternative to traditional meteorological approaches. ANFIS combines ANN and FUZZY LOGIC and in this advantage of individual is counted. ANN is a mathematical approach and Fuzzy is human reasoning and uses expert knowledge. As ANN is self-trained, so when it is combined with Fuzzy, it updates the Fuzzy Rules which fuzzy alone cannot do. The study describes that major advantage of neural networks is their flexible non-linear modeling capacity and concluded that due to the nonlinear nature of weather, prediction accuracy obtained by above techniques is still below the satisfactory level. Therefore, use of hybrid combination of ANN and Fuzzy Logic could improve the result considerably.

### REFERENCES

- [1] Indrabayu, Nadjamuddin Harun, M. Saleh Pallu and Andani Achmad, "A New Approach of Expert System for Rainfall Prediction Based on Data Series", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622, Vol. 3, Issue 2, March -April 2013, pp.1805-1809
- [2] Somia A. Asklany, Khaled Elhelou, I.K. Youssef and M. Abd El-wahab, "Rainfall events prediction using rule-based fuzzy inference system", Elsevier, Atmospheric Research 101 (2011) 228-236
- [3] Jyothis Joseph and Ratheesh T K, "Rainfall Prediction using Data Mining Techniques", International Journal of Computer Applications (0975 - 8887) Volume 83 - No 8, December 2013
- [4] Jignesh Patel and Dr. Falguni Parekh, "Forecasting Rainfall Using Adaptive Neuro-Fuzzy Inference System (ANFIS)", International Journal of Application or Innovation in Engineering & Management (IJAIEM), Volume 3, Issue 6, June 2014, ISSN 2319 - 4847
- [5] Akash D Dubey, "Artificial Neural Network Models for Rainfall Prediction in Pondicherry", International Journal of Computer Applications (0975 - 8887) Volume 120 - No.3, June 2015