

## International Journal of Computer Science and Mobile Computing



A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X

IMPACT FACTOR: 6.199

*IJCSMC, Vol. 8, Issue. 12, December 2019, pg.101 – 108*

# AN EFFICIENT MODEL FOR SEASONAL PREDICTABILITY ON NORTH EAST MONSOON USING MULTILAYER PERCEPTRON

**R.Aarathi<sup>1</sup>; Dr. R.Shanmugavadivu<sup>2</sup>**

Research Scholar, Department of Computer Science, PSG College of Arts and Science, Coimbatore, India<sup>1</sup>

Assistant Professor, Department of Computer Science, PSG College of Arts and Science, Coimbatore, India<sup>2</sup>

<sup>1</sup>[aarathi2170@gmail.com](mailto:aarathi2170@gmail.com); <sup>2</sup>[shanmugavadivu@psgcas.ac.in](mailto:shanmugavadivu@psgcas.ac.in)

*Abstract: The metrological data mining is a method of data mining technique which is used to finding the hidden patterns inside the widely available weather data. Climate change can affect many sectors, like agriculture, water resources, and tourism. So, the early prediction of rainfall plays a crucial role in India. The objective of this research work, to forecast the North East Monsoon Rainfall for the next three years in particular regions of Tamil Nadu. This paper collects a real-time rainfall dataset under five regions Coimbatore, Erode, Tirupur, Dindigul, and Theni between 2009 and 2018 in Tamil Nadu. Rainfall data are collected from the metrological department and Tamil Nadu government websites. Artificial Neural Networks is a very admired and one of the most widely used techniques for rainfall forecasting. Multilayer Perceptron algorithm is used to predict the North East Monsoon Rainfall.*

*Keywords: Rainfall Forecasting, Artificial Neural Network, Multilayer Feed Forward Neural Network.*

## Introduction

Indian is an agriculture-based country, where more than half of the population in india relies upon the agriculture-related activities. Many peoples in the country are directly or indirectly depending on the agriculture-related activities. Some peoples are directly involved with farming, and some people are doing business with these agriculture products. However the agriculture industry has been playing a significant role in the Indian economy, still the contribution of agriculture sector in the Indian economy cannot be denied. India is entirely dependent on monsoon rainfall, for recharging its water resources, monsoon failures show the way to water scarcity and severe drought. The Southwest monsoon is in full swing in July to October and it brings 75% of the rain to the country. But Tamilnadu mostly depends on North-East monsoon comparing to South West Monsoon. The average annual rainfall of the state Tamil Nadu got 52%

during the North-East monsoon, and 38% during the southwest monsoon. The Northeast monsoon lies between October to December and this could be Kharif season in Agriculture. This is the rainy season of Tamilnadu.

In this research work, predicts the North east Monsoon rainfall for the next three years 2019 to 2021, based on the last ten years data. The research is done in the particular region (Coimbatore, Erode, Tirupur, Dindigul, Theni) in Tamilnadu.

### **Literature Survey**

G Shrivastava [2] used Feed Forward Neural Network with Error Backpropagation Algorithm to predict the yearly rainfall for 5 years. One input layer with 11 neurons, one hidden layer with 3 neurons and one output layer were used in the model. Humidity, Dew point, and Pressure are taken as Predicting Variables, and sigmoid is used as an Activation Function.

C Wu and K Chau [3] used Artificial Neural Network for predicting the daily and monthly rainfall with the help of Moving Average (MA) and Singular Spectrum (SSA). One input layer, one hidden layer with 22 neurons was used for prediction. Take the predicting variables as Maximum Temperature and Minimal Temperature.

S.Nanda et al [4] used Functional Link Artificial Neural Network (FLANN) and Multilayer Perceptron (MLP) to predict the South West Monsoon in India. ARIMA model is used for prediction of monthly rainfall. Take the accuracy measure as Mean Squared Error (MSE) and sum of square errors. Sigmoid function used for the activation function.

V. Dabhi and S. Chaudhary [5] used Wavlet Artificial Neural Network to predict the daily rainfall data for next two years. Evaporation, maximum temperature, minimum temperature, humidity and rainfall per day were used as a Predicting Variables. Log sigmoid and pure linear functions are the Activation Function.

Priya [7] used Multilayer Feed Forward Neural Network (MFFNN) with Error Back Propagation (EBP) Algorithm to forecast the monthly rainfall. The model using the variables as maximum temperature and minimum temperature. Take the input layer and output layer with one neuron and hidden layer with two neurons. Root Mean Squared Error is used for the accuracy measure based on that the error rate calculated.

### **Data Collection**

Datasets are present in the real-time rainfall dataset under five region's Coimbatore, Erode, Tiruppur, Dindigul, and Theni districts in Tamil Nadu. For these five regions the average measurements of rainfall, temperature and Humidity datasets are taken for present research work.

The present work analyses the rainfall information, temperature, and humidity data during the period of the northeast monsoon. Rainfall is measured by millimeter (mm), the temperature is measured by Celsius and humidity is measured by percentage. Northeast monsoon

lies between the periods October November and December. The data sets are collected from Metrological department websites, and Agriculture university websites.

Monthly weather data collected from the Tamilnadu metrological department and Agriculture University in Tamilnadu.

District	Year	Rainfall(mm)	Temperature (Celsius)	Humidity(percentage)
Coimbatore	2009	228.43	26	66
Coimbatore	2010	78.13	28	70
Coimbatore	2011	109.52	26	60
Coimbatore	2012	110.04	29	55
Coimbatore	2013	158.2	27	70
Coimbatore	2014	144.5	30	72
Coimbatore	2015	201.34	31	56
Coimbatore	2016	101.24	25	62
Coimbatore	2017	170.74	28	68
Coimbatore	2018	627.1	29	66

## OBJECTIVE OF STUDY

The objective of the research to predict the northeast monsoon rainfall in the next three years (2019, 2020, and 2021) based on the ten years data (2009-2018) in Tamilnadu. Northeast monsoon includes the three months (October, November, and December) because it could be the rainy season in Tamilnadu. The prediction is done only in the five districts in Tamilnadu. The five districts Coimbatore, Erode, Dindigul, Tiruppur, and Theni are known as “Western Zone” in Agro-climatic zones in Tamilnadu. These five districts contribute 25% of the major crops produced in Tamilnadu. The data of particular districts are taken the prediction is done based on the data.

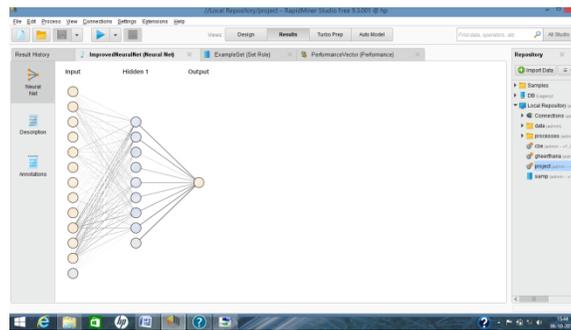
## PROPOSED RESEARCH WORK

The proposed work uses the data mining techniques of prediction methods which is used to analyses the northeast monsoon and occurring rainfall during the season. To predict the rainfall for the next three years based on the last ten years rainfall, humidity, and temperature. In this prediction uses the Multilayer Perceptron algorithm in Artificial Neural Network. North east monsoon is the important monsoon in tamilnadu, which gives more than 52% rainfall in tamilnadu. So, the prediction of north east monsoon plays a crucial role in many fields in tamilnadu. Based on the relative humidity, air temperature, and rainfall the north east monsoon rainfall is predicted for upcoming three years (2019, 2020, and 2021). In this study, the average rainfall of the northeast monsoon will be predicted for next three years.

A Multilayer Perceptron is a technique of feed forward and backpropagation artificial neural network. The artificial neural network consists of a single neuron is called Perceptron, which is the simplest form of neural network. The Perceptron has one input and one output node, which are directly connected. The input and output node has connections that are associated with the weight and activation function to calculate the solution.

## RESULTS AND DISCUSSION

The Multilayer Perceptron algorithm is well suited for predicting the North East Monsoon rainfall in Tamilnadu. The algorithm develops the improved neural network that has input layer, hidden layer and output layer.

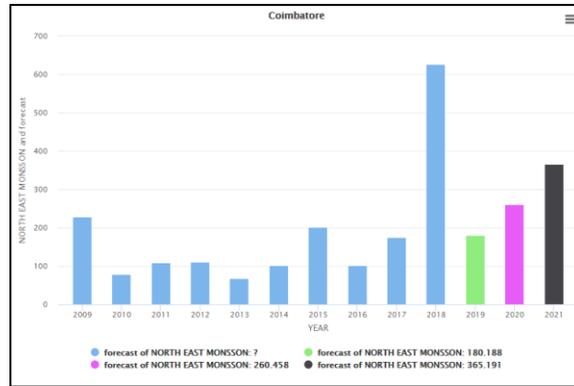


**Fig 1. Improved neural network**

This chart shows the average Northeast Monsoon rainfall in Coimbatore from the year of 2009 to 2021. The years 2009 to 2018 are data taken for prediction, the years 2019, 2020, and 2021 rainfall data are predicted. The result shows the prediction of the northeast monsoon rainfall in Coimbatore District in table as well as chart.

Row No.	YEAR	NORTH EAS...	forecast of ...	NORTH EAS...
1	2009	228.430	?	228.430
2	2010	78.130	?	78.130
3	2011	109.520	?	109.520
4	2012	110.040	?	110.040
5	2013	68.140	?	68.140
6	2014	102.420	?	102.420
7	2015	202.340	?	202.340
8	2016	101.240	?	101.240
9	2017	174.740	?	174.740
10	2018	627.100	?	627.100
11	2019	?	180.188	180.188
12	2020	?	260.458	260.458
13	2021	?	365.191	365.191

**Tab 1. Forecasting results for Coimbatore**

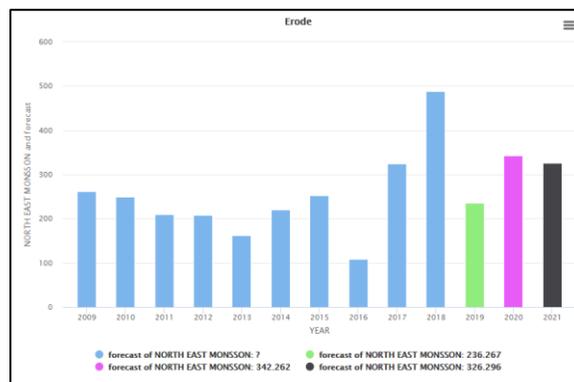


**Fig 2. Forecasting result for Coimbatore in chart**

The result shows the prediction of the northeast monsoon rainfall in Erode District in table as well as chart.

Row No.	YEAR	NORTH EAS...	forecast of ...	NORTH EAS...
1	2009	261.210	?	261.210
2	2010	249.220	?	249.220
3	2011	209.190	?	209.190
4	2012	208.230	?	208.230
5	2013	162.080	?	162.080
6	2014	220.440	?	220.440
7	2015	252.650	?	252.650
8	2016	108	?	108
9	2017	324.790	?	324.790
10	2018	488.300	?	488.300
11	2019	?	236.267	236.267
12	2020	?	342.262	342.262
13	2021	?	326.296	326.296

**Tab 2. Forecasting result for Erode**

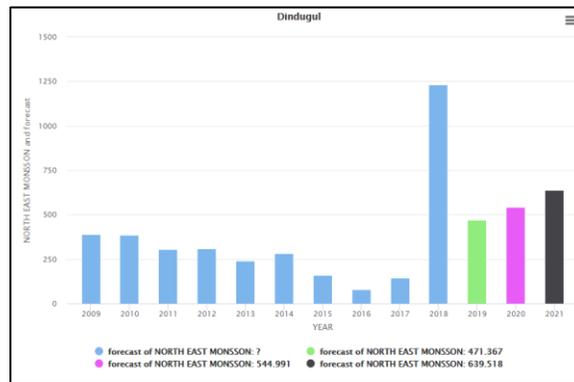


**Fig 3. Forecasting result for Erode in chart**

The result shows the prediction of the northeast monsoon rainfall in Dindigul District in table as well as chart.

Row No.	YEAR	NORTH EAS...	forecast of ...	NORTH EAS...
1	2009	391.880	?	391.880
2	2010	385.420	?	385.420
3	2011	304.410	?	304.410
4	2012	311.420	?	311.420
5	2013	242.590	?	242.590
6	2014	284.800	?	284.800
7	2015	161.650	?	161.650
8	2016	80.910	?	80.910
9	2017	143.820	?	143.820
10	2018	1233.600	?	1233.600
11	2019	?	471.367	471.367
12	2020	?	544.991	544.991
13	2021	?	639.518	639.518

**Tab3. Forecasting result for Dindigul**

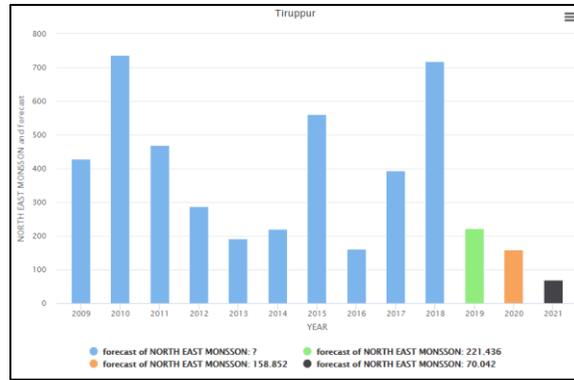


**Fig 4. Forecasting result for Dindigul in chart**

The result shows the prediction of the northeast monsoon rainfall in Tiruppur District in table as well as chart.

Row No.	YEAR	NORTH EAS...	forecast of ...	NORTH EAS...
1	2009	429.020	?	429.020
2	2010	737.160	?	737.160
3	2011	469.270	?	469.270
4	2012	287.410	?	287.410
5	2013	192.330	?	192.330
6	2014	219.710	?	219.710
7	2015	560.680	?	560.680
8	2016	160.870	?	160.870
9	2017	394.280	?	394.280
10	2018	718.080	?	718.080
11	2019	?	221.436	221.436
12	2020	?	158.852	158.852
13	2021	?	70.042	70.042

**Tab 3. Forecasting result for Tiruppur**

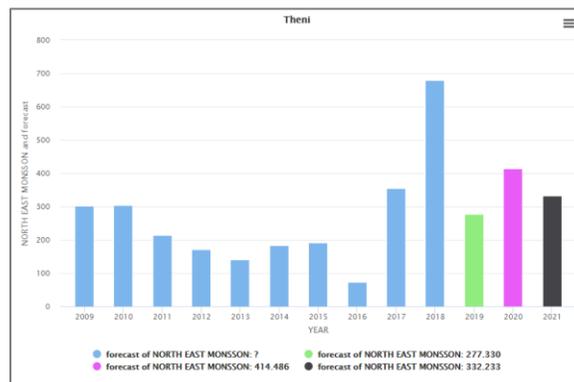


**Fig 4. Forecasting result for Tiruppur in chart**

The result shows the prediction of the northeast monsoon rainfall in Theni District in table as well as chart.

Row No.	YEAR	NORTH EAS...	forecast of ...	NORTH EAS...
1	2009	301.570	?	301.570
2	2010	303.990	?	303.990
3	2011	213.880	?	213.880
4	2012	172.090	?	172.090
5	2013	141.790	?	141.790
6	2014	184.530	?	184.530
7	2015	191.090	?	191.090
8	2016	72.570	?	72.570
9	2017	354.960	?	354.960
10	2018	680.300	?	680.300
11	2019	?	277.330	277.330
12	2020	?	414.486	414.486
13	2021	?	332.233	332.233

**Tab 5. Forecasting result for Theni**



**Fig 6. Forecasting result for Theni in chart**

## CONCLUSION

In this research work the attempt to forecast the northeast monsoon rainfall based on an artificial neural network with Multilayer Perceptron for Coimbatore, erode, Tiruppur, Dindigul, theni regions. Monthly weather data collected from the Tamilnadu metrological department and Agriculture University in Tamilnadu. The empirical method based on observed and predicted values of rainfall in the training period and testing period of the execution; it develops the model and shows a satisfactory result.

## BIBLIOGRAPHY

- [1]. R.Aarathi, Dr.R.Shanmugavadivu, "A Survey on Artificial Neural Network Algorithms for Forecasting", International Journal of Scientific Development and Research, Volume 4, Issue 9, Page no: 294-296.
- [2]. G. Shrivastava, S. Karmakar, and M. K. Kowar, "BPN model for long range forecast of monsoon rainfall over a very small geographical region and its verification for 2012," Geofizika, vol. 30, no. 2, pp. 155-172, 2013.
- [3]. V. K. Dabhi and S. Chaudhary, "Hybrid Wavelet-Postfix-GP model for rainfall prediction of Anand region of India," Advances in Artificial Intell., pp. 1-11, 2014.
- [4]. A. R. Naik and S. K. Pathan, "Indian monsoon rainfall Classification And Prediction using Robust Back Propagation Artificial Neural Network," Int. J. of Emerging Technology and Advanced Eng., vol. 3, no. 11, pp. 99-101, 2013.
- [5]. R. R. Deshpande, "On the rainfall time series prediction using Multilayer Perceptron Artificial Neural Network," Int. J. of Emerging Technology and Advanced Eng., vol. 2, no. 1, pp. 148-153, 2012.
- [6]. M. A. Sharma and J. B. Singh, "Comparative Study of rainfall forecasting models," New York Sci. J., pp. 115-120, 2011.
- [7]. A. Kumar, A. Kumar, R. Ranjan, and S. Kumar, "A rainfall prediction model using artificial neural network," Control and Syst. Graduate Research Colloq. (ICSGRC), pp. 82-87, 2012.
- [8]. J. Abbot and J. Marohasy, "Application of Artificial Neural Networks to rainfall forecasting in Queensland, Australia," Advances in Atmospheric Sci., vol. 29, no. 4, pp. 717-730, 2012.
- [9]. Kannan, M., S. Prabhakaran, and P. Ramachandran. "Rainfall forecasting using data mining technique." International Journal of Engineering and Technology, Vol.2 no. 6 , pp. 397-401, 2010.
- [10]. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques" in proceeding of second edition Morgan Kaufmann Publisher An imprint of Elsevier 2006.