**LITERATURE SURVEY**

## 1) Elucidating The Role Of Topological Pattern Discovery And Support Vector Machine In Generating Predictive Models For Indian Summer Monsoon Rainfall

**AUTHORS: Manojit Chattopadhyay, Surajit Chattopadhyay**

The present paper reports a study, where growing hierarchical self-organising map (GHSOM) has been applied to achieve a visual cluster analysis to the Indian rainfall dataset consisting of 142 years of Indian rainfall data so that the yearly rainfall can be segregated into small groups to visualise the pattern of clustering behaviour of yearly rainfall due to changes in monthly rainfall for each year. Also, through support vector machine (SVM), it has been observed that generation of clusters impacts positively on the prediction of the Indian summer monsoon rainfall. Results have been presented through statistical and graphical analyses. Behaviour of systems with many interdependent components that lead to organized as well as irregular features is referred to as complexity. In such systems the knowledge of the parts does not necessarily lead to the predictable behaviour of the entire system. Complexities associated with meteorological and geophysics processes have been reviewed in Sharma et al (2012). Modelling complexity of atmospheric phenomena and generating prediction schemes accordingly has long been an area of major concentration for the meteorologists over the globe (Kondratyev and Varotsos, 1995; Varotsos 2005, 2013, Blackwell, 2014). In view of importance of the estimation of the future projected precipitation and rainfall on short- and long-term basis detrended fluctuation analysis has been implemented by Efstathiou and Varotsos (2012) in rainfall time series to explore the intrinsic properties of their temporal variability. In another recent study, Chattopadhyay and Chattopadhyay (2013) explored the association between solar activity and Indian summer monsoon rainfall through spectral analysis after carrying out Box-Cox transformation. Association between SST and ENSO over the tropics has been discussed in a recent study by Varotsos et al. (2014), where they suggested that the warming in the sea surface temperature (SST) since 1900, did not occur smoothly and slowly, but with two rapid shifts in 1925/1926 and 1987/1988, which are more obvious over the tropics and the northern midlatitudes.

# 2) A Rainfall Prediction Model using Artificial Neural Network

**AUTHORS:**  **Kumar Abhishek, Abhay Kumar, Rajeev Ranjan, Sarthak Kumar**

The multilayered artificial neural network with learning by back-propagation algorithm configuration is the most common in use, due to of its ease in training. It is estimated that over 80% of all the neural network projects in development use back-propagation. In back-propagation algorithm, there are two phases in its learning cycle, one to propagate the input patterns through the network and other to adapt the output by changing the weights in the network. The back-propagation-feed forward neural network can be used in many applications such as character recognition, weather and financial prediction, face detection etc. The paper implements one of these applications by building training and testing data sets and finding the number of hidden neurons in these layers for the best performance. In the present research, possibility of predicting average rainfall over Udupi district of Karnataka has been analyzed through artificial neural network models. In formulating artificial neural network based predictive models three layered network has been constructed. The models under study are different in the number of hidden neurons.

# 3) A Short-Term Rainfall Prediction Model using Multi-Task Convolutional Neural Networks

**AUTHORS** **: Minghui Qiu, Peilin Zhao, Ke Zhang, Jun Huang, Xing Shi,**

**Xiaoguang Wang, Wei Chu**

# Precipitation prediction, such as short-term rainfall prediction, is a very important problem in the field of meteorological service. In practice, most of recent studies focus on leveraging radar data or satellite images to make predictions. However, there is another scenario where a set of weather features are collected by various sensors at multiple observation sites. The observations of a site are sometimes incomplete but provide important clues for weather prediction at nearby sites, which are not fully exploited in existing work yet. To solve this problem, we propose a multi-task convolutional neural network model to automatically extract features from the time series measured at observation sites and leverage the correlation between the multiple sites for weather prediction via multi-tasking. To the best of our knowledge, this is the first attempt to use multi-task learning and deep learning techniques to predict short-term rainfall amount based on multi-site features. Specifically, we formulate the learning task as an end-to-end multi-site neural network model which allows to leverage the learned knowledge from one site to other correlated sites, and model the correlations between different sites. Extensive experiments show that the learned site correlations are insightful and the proposed model significantly outperforms a broad set of baseline models including the European Centre for Medium-range Weather Forecasts system (ECMWF).

# 4) Deep Learning Models for the Prediction of Rainfall

**AUTHORS** : **Aswin S, Geetha P and Vinayakumar R**

Rainfall is one of the major source of freshwater for all the organism around the world. Rainfall prediction model provides the information regarding various climatological variables on the amount of rainfall. In recent days, Deep Learning enabled the self-learning data labels which allows to create a data-driven model for a time series dataset. It allows to make the anomaly/change detection from the time series data and also predicts the future event's data with respect to the events occurred in the past. This paper deals with obtaining models of the rainfall precipitation by using Deep Learning Architectures (LSTM and ConvNet) and determining the better architecture with RMSE of LSTM as 2.55 and RMSE of ConvNet as 2.44 claiming that for any time series dataset, Deep Learning models will be effective and efficient for the modellers.

**5)** **The Research Of Rainfall Prediction Models Based On Matlab Neural Network**

**AUTHORS**: Xianggen Gan, Lihong Chen, Dongbao Yang, Guang Liu

The continuously cloudy or rainy forecast is an important basis that is used to make choice of wheat harvest time but multiple regression weather forecast models hardly content the rate of required accuracy. Matlab neural network toolbox is composed of a series of typical neural network activation functions that make computing network output into calling activation functions. BP artificial neural network that is based on Matlab platform and utilizes error back propagation algorithm to revise network weight has dynamic frame characteristics and is convenient for constructing network and programming. After it has been trained by input forecast samples, network forecast model that has three neural cells possesses very good generalization capability. After we contrast fitting rate and accuracy rate of network model with ones of regression model, network model has a distinct advantage over regression model.