

RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE

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Abstract: Rainfall prediction is one of the challenging tasks in weather forecasting. Accurate and timely rainfall prediction can be very helpful to take effective security measures in advance regarding: on-going construction projects, transportation activities, agricultural tasks, flight operations and flood situation, etc. Data mining techniques can effectively predict the rainfall by extracting the hidden patterns among available features of past weather data. This research contributes by providing a critical analysis and review of latest data mining techniques, used for rainfall prediction. In our proposed system we propose a new forecasting method that uses a Convolutional Neural Network monthly rainfall for a selected location. In our proposed system we are going to forecast the rainfall result based on the mean square error, mean absolute error and root mean square error, which we get in train and test of the dataset based deep learning technique.

Key words: Rainfall prediction, Data Mining, Convolutional Neural Network & Deep Learning

Introduction:

Weather forecasting ensures the sustainable development of society and economy. Therefore, the interest in forecasts has started since 650 BC, where Babylonians tried to predict weather based on observations of clouds (observed patterns). Then, multiple philosophers proposed various forecasting theories. Over time, it was noticed that these theories were not adequate. Consequently, it was perceived that there is a need to understand the weather from a broader perspective. With the invention of new instruments, measurement of the atmosphere was undertaken. Various instruments, such as the telegraph and radiosonde, allowed better monitoring of weather conditions. Nowadays, these instruments are used to record weather conditions. For modern rainfall forecasting, forecasts were produced before



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the invention of the computer, where Lewis Fry Richardson used arithmetic equations to predict weather after World War I (1922). Consequently, scientists introduced new methods that were developed along with the vast spread of technology. Nowadays, scientists use different methods to apply forecasts. Because to its relevance to human life and needs, either forecasting is applied everywhere in the world. The increasing availability of climate data during the last decades (observational records, radar and satellite maps, observations from ship and aircraft, proxy data, etc.) makes it important to find an effective and accurate tools to analyze and extract hidden knowledge from this huge data. Meteorological data mining is a form of Data mining concerned with finding hidden patterns inside largely available meteorological data, so that the information retrieved can be transformed into usable knowledge. Useful knowledge can play important role in understanding the climate variability and climate prediction. In turn, this understanding can be used to support many important sectors that are affected by climate like agriculture, vegetation, water resources and tourism.

Support Vector Regression and Multilayer perception implemented for prediction of maximum rainfall in annual and non-monsoon session. Input parameter like average temperature in month, wind velocity, humidity, and cloud cover was conceder for predicting rainfall in non-monsoon session. The performance of the results was measure with MSE (mean squared error), correlation coefficient, coefficient of efficiency and MAE (mean absolute error). The results of SVR were compared to those of MLP and simple regression technique.

This paper reports a detailed survey on rainfall predictions using different rainfall prediction methods extensively used over last 20 years. From the survey it has been found that most of the researchers used Machine Learning techniques for rainfall prediction and got significant results. The survey also gives a conclusion that the forecasting techniques that use MLP are suitable to predict rainfall than other forecasting techniques such as statistical and numerical methods. However some limitations is clearly noticed in all the methods of rainfall prediction discussed in this survey paper. The extensive references in support of the different developments of methods provided in this research should be of great help to researchers to accurately predict rainfall in the future and to select the method that would solve their problem they will be facing in their proposed prediction model.

Rainfall prediction has been one of the most scientifically and technologically challenging task in the climate dynamics and climate prediction theory around the world in the last century. This paper applies neural network for rainfall prediction. In this paper two methods such as classification and clustering are implemented. The neural network Bayesian regularization has been applied in the implementation.

Data Selection and Loading: The data selection is the process of selecting the data predicting the rainfall. In this project, the rainfall dataset is used for forecasting rainfall. The dataset which contains the information about the monthly wise data of rainfall with corresponding location.

Data Preprocessing:

Data pre-processing is the process of removing the unwanted data from the dataset. Missing data removal, Encoding Categorical data, missing data removal: In this process, the null values such as missing values are removed using imputer library. Encoding Categorical data: That categorical data is defined as variables with a finite set of label values. That most machine learning algorithms require numerical input and output variables. That an integer and one hot encoding is used to convert categorical data to integer data.

Splitting Dataset into Train and Test Data:

Data splitting is the act of partitioning available data into. Two portions, usually for cross-validates purposes. One portion of the data is used to develop a predictive model and the other to evaluate the model's performance. Separating data into training and testing sets is an important part of evaluating data mining models. Typically, when you separate a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing.

Feature Scaling:

Feature scaling is a method used to standardize the range of independent variables or features of data. In data processing, it is also known as data normalization and is generally performed during the data pre-processing step. Feature Scaling or Standardization: It is a step of Data Pre Processing which is applied to independent variables or features of data. It basically helps to normalise the data within a particular range. Sometimes, it also helps in speeding up the calculations in an algorithm.

Classification:

A convolution layer accepts a multichannel one dimensional signal, convolves it with each of its multichannel kernels, and stacks the results together into a new multichannel signal that it passes on to the next layer. A 1D convolution with a kernel sized 3 and stride 1. The default is to move filters of a set Width by 1 element at a time when performing convolutions; this is called Horizontal stride and it can be altered by the user. The bigger the stride, the smaller the output vector will be.

Result Generation:The Final Result will get generated based on the overall classification and prediction. The performance of this proposed approach is evaluated using some measures like, Mean Square Error, Mean Absolute Error, Root Mean Square Error and Visualization.

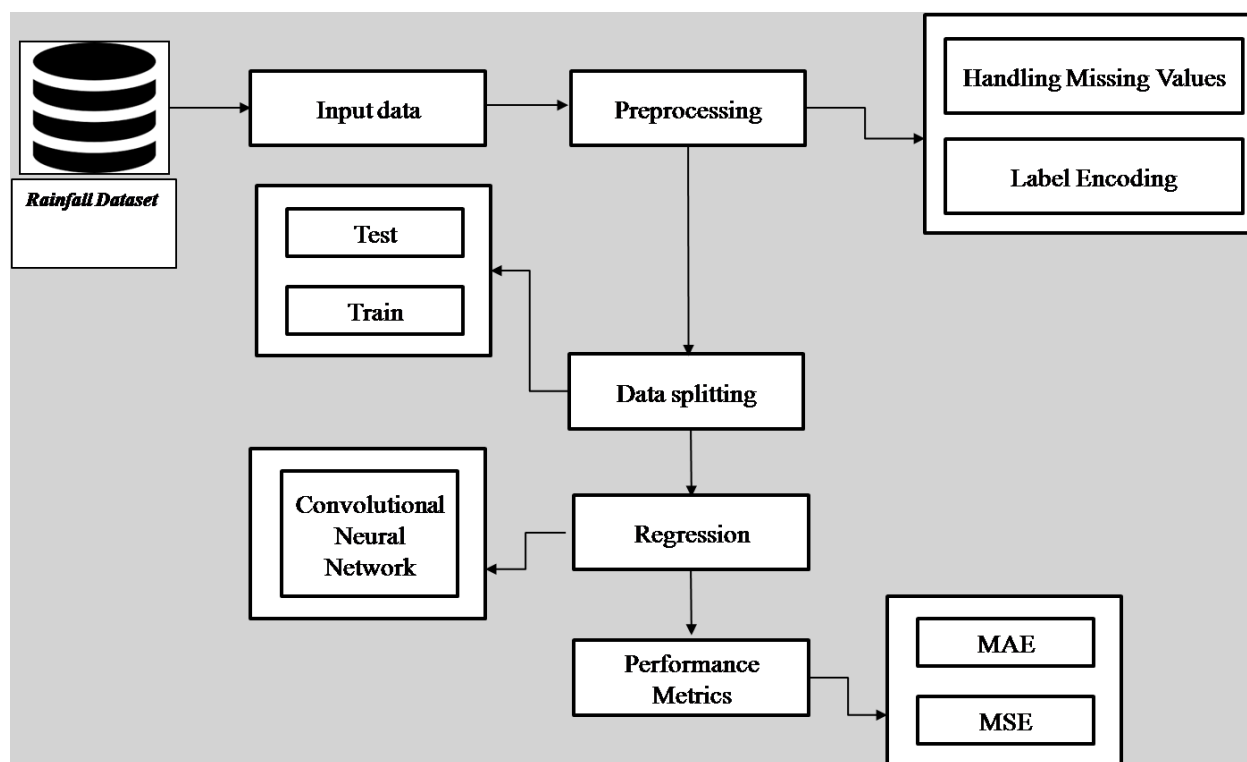


Fig.1. Rainfall Prediction Technique:

Conclusions:

In this study, Deep Learning and Data Mining is used to analyse the monthly rainfall. Data mining techniques can effectively predict the rainfall by extracting the hidden patterns among available features of past weather data. Convolutional Neural Network is used to predict the monthly rainfall for a selected location. We evaluate the performance result of algorithm based on mean absolute error, mean squared error and root mean squared error. In future, we will implement this process in different platforms. Data mining is one of the most widely used methods to extract data from different sources and organize them for better usage. In spite of having different commercial systems for data mining, a lot of challenges come up when they are actually implemented. With rapid evolution in the field of data mining, companies are expected to stay abreast with all the new developments.

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