



Predictive Analysis for Weather Prediction using Data Mining with ANN: A Study

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Abstract- Weather Forecasting is a scientifically and technologically challenging problem forever. Now days, Cloudburst is one of the important forecast problems. Because, it results into huge disastrous, more than 20mm of rain may fall in a few minutes. It also responsible for flash flood creation. Due to this type of sudden flood, the people are affected economically and physically very much. Therefore it is needed to forecast cloudburst in early to avoid disastrous. The main aim of the paper is to survey the various forecast techniques for cloudburst using Data Mining and Artificial Neural Network (ANN), in the literature. The most commonly used parameters for analyzing the cloudburst forecast: temperature, rainfall, evaporation and windspeed. From the study, it came to know that forecasting using big data analytics is the best solution to get accurate cloudburst prediction.

Keyword- Artificial Neural Network, Cloudburst, Data Mining, Weather forecasting, Weather Parameters

I. INTRODUCTION

Weather forecasting [1] play a vital role in our daily life because due to the polluted environment temperature, rainfall, evaporation, wind speed, humidity, pressure, moisture will change over time to time. These can affect the daily routine life of the human beings. It is one of the challenging role for meteorologist to predict the weather condition from all over the world. Number of scientist also estimates more methods to predict the weather condition but these methods have less accuracy.

The directions of the wind, the color of the clouds are used by the weather cock in the ancient times [2]. But in the present, Ground observations observation from ships and aircraft, radiosondes, doppler radar and satellites are used to forecast the weather condition [1]. Impulsive rainfall may cause major disaster. In the recent time, danger able disaster cloudburst, which affects the people's day to day life. The flash floods damage the property, communication system and human casualties which shake the country economic status.

Cloudburst is a large quantifiable amount of rainfall rate in excess of 25 millimeters per hour (1 inch per hour) and the raindrops in the range of 3.5 mm in diameters. Most cloudbursts come from convective cumulonimbus clouds that form thunderstorms and the amount of moisture required for a heavy downpour [3].

The paper is organized as follows: Section 2 explains the background study for Weather condition, Data mining technique and ANN. Section 3 discusses the related work for weather prediction and finally section 4 presents the conclusion with future research direction.

II. BACKGROUND STUDY

A. Method for Weather Prediction

In Weather prediction, there are three methods available [4].

- Synoptic Weather prediction
- Numerical Weather prediction
- Statistical Weather prediction

1) *Synoptic Weather Prediction*

In metrological center, they provide synoptic chart for every day. Within a Specific time, different weather parameters are observed. Different data collection and the study of observational data observed from thousands of weather stations.

2) *Numerical Weather Prediction*

The capability of computer to predict the weather is known as Numerical Weather Prediction. If the initial stage of the weather is not totally known, the prediction will not be completely accurate.

3) *Statistical Weather Prediction*

Pure Statistical methods are used to predict the weather, along with numerical methods are also available. It used past records of weather parameters to predict the future occurrence.

B. *Data Mining*

Data Mining [5] is the process of discovering interesting patterns and knowledge from large amount of data. The data sources can include database, data warehouse, the web and other information repositories. Data mining is also known as knowledge discovery process. It is also an iterative sequence data.

Data Mining tasks can be classified in to two types: Descriptive and Predicative.

- Descriptive Mining tasks characterize properties of the data in a target data set.
- Predictive Mining tasks perform induction on the current data in order to make prediction

The most commonly used Data mining technique are classification, clustering, Decision Trees which is shown in Table I. Figure 1 shows the flow of machine learning sequence in data mining techniques.

C. *Classification*

Classification is the process of finding a model that describes and distinguishes data classes or concepts for the purpose of being able to use the model to predict the class of objects whose class label is unknown [6].

D. *Clustering*

Clustering analyses data objects without consulting a known class label. The unsupervised learning technique of clustering is a useful method for ascertaining trends and patterns in data, when there are no pre-defined classes [6].

Table I. Data Mining Techniques and Algorithm

Data Mining Techniques	Algorithm
Classification	Back propagation, KNN and Genetic algorithm
Clustering	K-Mean and K- Medoids
Decision Trees	ID3, C4.5 and CART

E. *Decision Tree*

Tree-shaped structures that represent sets of decisions. These decisions generate rules for the classification of a dataset. Specific decision tree methods include Classification and Regression Trees (CART) and ID3 [7].

F. *Artificial Neural Network (ANN)*

An Artificial Neural Network [8] is information processing that can be inspired by the nature of human nervous system that is brain process information. The common ANN applications through a learning process are pattern recognition (or) data classification.

There are three basic elements of neuron

1. Synapses connecting links obtained weight
2. Added input signals weighted by synapses of neuron.
3. An activation function for limiting the amplitude of the output neuron.

If the hidden layer is increased gradually then the performance of the network in the form of an error is increased. Artificial Neural Network can be used for weather prediction for the best result. It is also known as non-linear predictive model as in figure 2.

Data Collection

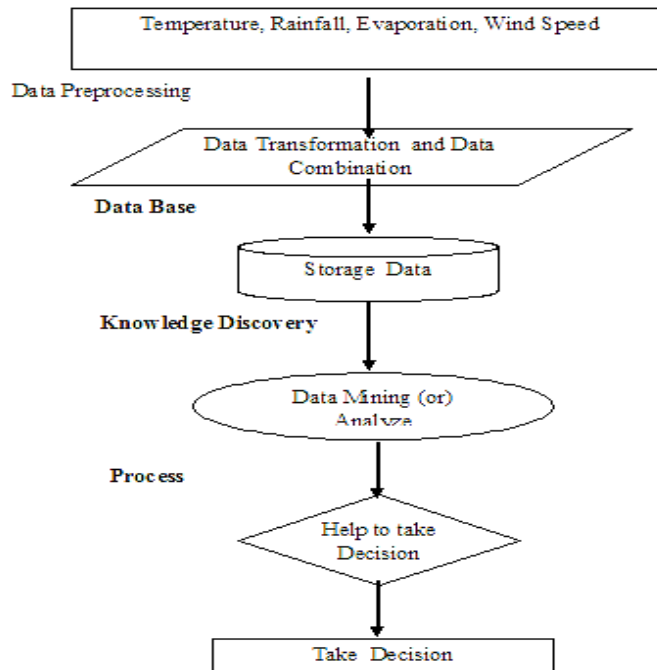


Figure 1. Technique Sequence Machine Learning

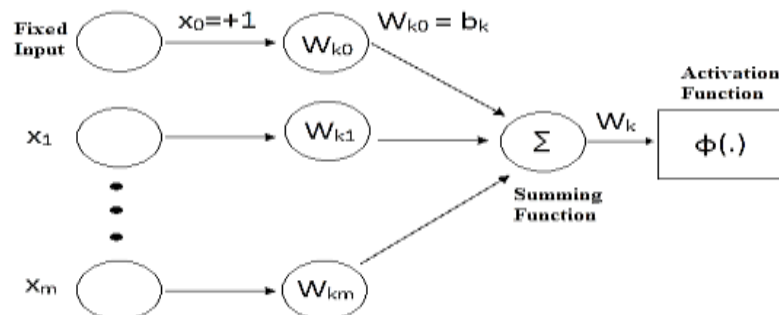


Figure 2. Non Linear Model ANN

III. RELATED WORK

Table II tabulates the various data mining techniques and ANN methods used for weather prediction with different set of weather parameters.

Table II. Related Research works

Author Name	Prediction	Technique	Parameters
Folorunshoolaiya [1]	Weather and Climate	Data Mining and Artificial Neural Network	Temperature, Rainfall, Evaporation, Wind speed.
SupriyBachal et al, [2]	Weather Prediction for solar output of PV cells	Data Mining	Temperature, Rainfall, Cloud Cover, Humidity.
AbhishekSaxona et al,[8]	Weather forecasting	Artificial Neural network	Maximum and Minimum, Temperature, Rainfall, Cloud Conditions, Wind Stream and their direction.

Author Name	Prediction	Technique	Parameters
ArpitTiwari [5]	Cloudburst	Data Mining	Year, Month, Average, Pressure, Relative Humidity, Clouds quantity, Precipitation and average temperature.
Badhiye et al [6]	Temperature and Humidity	Data Mining	Sea surface Temperature.
DivyaChauhan et al, [9]	Weather	Data Mining	Temperature, Rainfall, Pressure and cloud condition.
Zahoor Jan [10]	Seasonal to Inter Annual climate Prediction	Data Mining	Rain, Wind speed, Dew point, Temperature.
Rupa [7]	Rainfall	Data Mining, Neural Network, Fuzzy logic, ANFIS	Surface pressure, Heat, Moisture, Breeze.
P. Hemalatha [11]	Weather forecasting for ships using Global positioning system.	Data Mining	Climate (sunny ,cloudy, Rainy), Temperature, Humidity, Stormy.
M.A.K. Nafeela et al, [12]	Climate	Data Mining	Temperature, Humidity.
MR.Dhawal Hirani [13]	Rainfall	Data Mining	Humidity, Air pressure, Surface Land Temperature, Wind Velocity.
Pinky saikia Dutta [14]	Rainfall	Data Mining	Minimum & Maximum Temperature Mean sea level pressure, Wind speed, Rainfall.
Pallavi [15]	Rainfall	AI, ANN, Fuzzy logic, ANFIS	Relative Humidity, Total cloud cover, Wind Direction, Temperature.
Jyothis Joseph et al, [16]	Rainfall	Data Mining	Relative Humidity, Pressure, Temperature, Perceptible water, Wind Speed.
R.Nagalakshmi et al, [17]	Maximum Temperature	Data Mining	Thunder stomps, Tornadoes, Hail storms, Maximum daily Temperature.

IV. CONCLUSION

Weather prediction is a meteorological work that may convert to Researcher work by applying the Numerical Weather Prediction method. From the study, it has been observed that Data Mining Technique, ANN, Fuzzy logic & ANFIS result to better accuracy. In future the 100% accuracy is obtained by applying the Big Data Analytics. In addition to that, the optimization algorithms are also combined with Big Data Analytics process to get precise prediction especially for cloudburst.

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