A survey on weather forecasting to predict rainfall using big data analytics.

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ABSTRACT

Big data is defined as a large amount of data which requires new technologies to make possible to extract value from it by capturing and analysis process. Analytics often involves studying past historical data to research potential trends. Weather prediction has been one of the most interesting and fascinating domain and it plays a significant role in meteorology. Weather prediction is to estimate of future weather conditions. Weather condition is the state of atmosphere at a given time in terms of weather variables like rainfall, thunderstorm, cloud conditions, temperature, pressure, wind direction etc.Predicting the weather is essential to help preparing for the best and the worst of the climate. This paper presents the review of big data analytics for Weather Prediction and studies the benefit of using it.

INDEX TERMS: Classification, Rainfall Prediction, Support vector machine, Weather Conditions, Weather Forecasting.

1. INTRODUCTION

Big data analytics [10] is the process of examine the large data sets containing a variety of data types. The goal of analytics is to improve the business by gaining information. Data mining is a process that is used to find the useful patterns from large amount of data. Data mining can also be defined as the process of extract the previously unknown and useful information from large quantities of incomplete data for practical application [6]. Weather prediction is the application of technology to predict the action of the atmosphere for a given location. It is becoming increasingly vital for business, agriculturists, farmers, disaster management and related organizations to understand the

natural phenomena [4].The art of weather prediction began with using the reoccurring astronomical and meteorological events to help them to monitor the seasonal changes in the weather. Throughout these centuries, this attempt is made to produce forecasts based on weather changes and personal observations. Weather prediction has been one of the most interestingness domains. The scientists are been trying to forecast the meteorological data using a big set of methods, some of them more accurate than others.

2. BACKGROUND STUDY

Weather forecasting is an essential application in meteorology and has been one of the most scientific challenging problems around the world. Weather condition is state of atmosphere at given time and the weather parameters are temperature, humidity and wind speed, The accuracy of the prediction is depends on knowledge of prevailing weather condition over large areas. Weather is the non-linear and dynamic process it varies day-to-day even minute-to-minute. Weather forecasting remains the big challenge of its data intensive and the frenzied nature. Generally two approaches

are used to forecast weather that are empirical and dynamical approach. The first approach is based on the occurrence of analogues and it is often referred to as an analogue forecasting. This approach is useful in predicting the local weather if recorded cases are plentiful. The dynamical approach is useful to predict large scale weather phenomena and it is not predict the short term weather efficiently [1].One major technology growing and assisting in the field of predictive data is big data analytics. Big data is a recent upcoming technology which can bring huge benefits to the business organizations. Big data analytics is the process to examine a large data set that containing a variety of data types. Analytics often involves studying past historical data [10].

Rain forecast is basically done by gathering quantitative data about the existing status of the atmosphere on a given place using the scientific understanding of atmospheric process [7].Rainfall information is important for flood production, water resource management of all activity plans in the nature. It helps in planning to make necessary arrangements for procurement,

transport and distribution of food grains if there is below normal rainfall. Rainfall information is necessary for food production plan, water management in the nature. The resulted rainfall amounts are intended to help farmers in making decision regarding their crop [6].

3. LITERATURE REVIEW

In this section, we present the review of past researches in weather prediction. The work done by distinct researchers and their comparison is down in Table I.

Authors	Year	Algorithms	Attributes	Time Period
Ankita Joshi, Bhagyashri et al	2015	Decision tree algorithm	Max temperature, rainfall, evaporation and wind speed	13 years
Ms.Ashwini Mandale, et al	2015	Artificial neural network and decision tree techniques.	Max temperature, min temperature, sunshine, Rainfall,	Months and years.
TV Rajini Kanth, et al	2014	Data mining technique k-means cluster algorithm.	High temperature, cold climate, Rainfall	112 years
M.Viswambari, Dr.R.Anbu Selvi	2014	Back propagation technique	Rainfall, wind pressure, humidity	Monthly Forecast.
Nikhil, Sethi, Dr.Kanwal Garg	2014	Multiple linear regression technique	Rainfall,vapor pressure, average temperature cloud cover	30 years
pinky saikia dutta, hitesh tahbilder	2014	Data mining techniques	Temperature, pressure, wind direction,rainfall,humidity	6 years period
Sanjay D.Sawaitul, et al	2012	Back Propagation algorithm	Rainfall, temperature, humidity, prediction	24 hours
Manisha Kharola, Dinesh Kumar	2013	Back propagation algorithm	Temperature, Humidity, Pressure	-

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Explanation on each study

Prediction of rainfall the future values is analyzing by Temperature, Rainfall and humidity data is one of the vital parts which can be helpful to the society as well as to the economy. Some of the work in this area as:

Ms. Ashwini Mandale, Mrs. Jadhawar B.A et al[1] developed on efficient Data mining techniques it used the algorithms are Artificial Neural Network and Decision tree Algorithms for meteorological to forecast weather. The performance of this algorithm would be compared with the standard performance metrics. It used two approaches that are empirical approach, dynamic approach.The comparison of results carried out by using CART to predict future values of parameters given the Month and Year.

Ankita Joshi, Bhagyashri Kamble et al [2] proposed a data mining techniques of decision tree algorithm. The challenging problem is to predict the complicated weather phenomena with limited observations.To predict the weather by numerical means the meteorologists have developed atmospheric models that is approximate by using mathematical equations. They found 82% accuracy in variation of rainfall prediction.

M.Viswambari and Dr.R.Anbu Selvi [3] implemented the data mining techniques is to forecasting rainfall, wind pressure, humidity to forecast the weather data about past historical and future value. Classification is the problem to identify the set of categories a new observation regards, on the basis of a training data containing the observations whose category membership is known The goal of any supervised learning algorithm is to find a correct output to minimize errors.

T V Rajini Kanth, V V SSS Balaram et al [5] implemented the k-clustering technique to grouping the similar data sets to forecast the temperature, rainfall so it would be need higher scientific techniques like machine learning algorithms for effective study and predictions of weather conditions using linear regression. It is found through k-means cluster analysis.

Pinky saikia dutta and Hitesh tahbilder [6] implemented is done by using multiple linear regressions that presented in the data mining technique in forecasting monthly rainfall of Assam. It was carried out by

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traditional statistical technique and Multiple Linear Regression. The data include Six years period collected locally from Regional Meteorological Center. They found 63% accuracy in variation of rainfall for our proposed model.

Nikhil Sethi, Dr.Kanwal Garg [7] Rainfall prediction model is implemented with empirical statistical technique. It is used the multiple linear regression (MLR) technique for the early prediction of rainfall. There are two approaches used for predicting rainfall. One is Empirical another one is Dynamical approach. The results prove that there is a close relations between the predicted and actual rainfall amount.

Manisha Kharola and Dinesh Kumar[8] described the back propagation algorithm.ANNs are capable of producing accurate predictions of weather variables for small scale of imperfect datasets. The actual network output is subtracted from the desired outputs in an error signal is produced to predict the future weather with the help of back propagation training algorithm.

Sanjay D. Sawaitul [17] developed a back propagation algorithm for weather

forecasting and processing information. They provided the information of coming weather after some period amount of time by changing some parameters of what will be the effect on other parameters are recorded shown on wireless display, to prevent the adverse effect of climate change.

4. Limitations

There are several limitations in better implementation of weather forecasting in data mining techniques. It cannot predict the weather short term efficiently. They used only small limited areas for weather forecasting.Accurate weather prediction is a difficult task due to dynamic change of atmosphere. It is susceptible for predict weather in large areas at a time.

5. Conclusions

The proposed methodology aims at providing an efficient weather forecasting framework for predicting and monitoring the weather attribute datasets to predict rainfall. In past the parameters of weather were recorded only for the present time only. The future work will explore a working model of selection that can be classifying the framework for continuous monitoring the climatic attributes and also to increase the

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range of wireless devices using the algorithms to transmitting the data. It can be continuously monitoring to predict rainfall and generate the report of weather forecasting.

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