



REVIEW ON DATA MINING TECHNIQUES FOR WEATHER PREDICTION

¹R. Jayakumar, ²Dr. R. Annamalai Saravanan,

¹Research Scholar, ²Associate Professor and Head,

¹Department of Computer Science, ²Department of Information Technology,

^{1,2}Sankara College of Science and Commerce,

^{1,2}Coimbatore, Tamilnadu, India.

Abstract - Weather forecasting is a strategy to foresee what the air will resemble in a specific spot by utilizing logical knowledge to mention weather observable facts. As such, it's an approach to foreseeing things like overcast cover, downpour, snow, wind speed and temperature before they occur. Amazing weather predictions are required for everyday exercises and it was one of the really difficult issues confronting the world since it comprises of multidimensional and nonlinear data. According to the overview the different techniques and calculations utilized for weather prediction in the field of data mining are regulated and solo AI calculations, fake brain organizations, Support Vector Machine, FP Growth Algorithm, Hadoop with map diminishes, K-implies calculation, Naive Bayes calculation and decision tree classification calculation.

Keywords: [Weather prediction, Data mining, Support Vector Machine, Decision tree.]

1. INTRODUCTION

The advancement of perception gear and communication technology works with the recording of observational data utilizing refined sensors and the integration of data from different spots progressively. Analysis of a progression of sensor data is valuable to see the successive examples. Weather Forecasting is an area of current technology that predicts the atmospheric circumstances for a specific area by gathering dynamic data connected with weather. The knowledge of the ongoing atmospheric state is refreshed by different weather determining tools like satellites, Balloons and airplane, Buoys and land stations and Radar Systems. The data gathered from states are twisted into Numerical portrayal is known as osmosis. Weather Predictions are fundamental for different applications, for example, climate checking, dry spell location, agriculture and creation, energy industry, flying industry, communication, contamination dispersal and so on. Classification is a data mining technique intended for ordering obscure examples. Precipitation can be effortlessly anticipated utilizing classification techniques. Clustering is a technique that gathering objects in view of information.

2. LITERATURE SURVEY

1. V. Suryanarayana (2019) et.al proposed Novel Weather Data Analysis Using Hadoop and MapReduce. These days analyzing data of exceptionally enormous sums has turned into a big challenge. Data could be clinical, logical, climatically, meteorological, promoting or monetary. Strategies of Data digging are utilized for the extraction of unpledged material from enormous data sets. Weather forecasting can be linked to help numerous significant areas which are impacted by climates like agribusiness, air traffic, water resources, and the travel industry. Weather estimating is an area of meteorology which is performed by collecting data from different sources connected with the current state of the weather like precipitation, mild, wind, and haze. It is the really difficult assignment for researchers. Hadoop and MapReduce are viewed as significant procedures used to dissect a huge data set. In the time of IoT, the meteorological office utilizes various kinds of sensors to get dampness and temperature and so on. MapReduce technology for the circulated calculations over exceptionally enormous datasets with the assistance of the tremendous number of PCs to successfully investigate the weather data. The value of MapReduce with Hadoop will accelerate the processing of data, where the volume of data is expanding consistently.

2. K. Xylogiannopoulos (2019) et.al proposed Multivariate Motif Detection in Local Weather Big Data. As of late, there are exceptionally frequent reports of calamities credited to climate change and there are a few reports that these extreme phenomena will additionally influence individuals as weather fiascos as well as by implication with the deficiency of normal resources, for example, water or food because of the climate change. Towards this bearing, there is progressing research that reviews weather phenomena by gathering data on the outer layer of the globe as well as at the various levels of the air. Having such a huge volume of data, conventional numerical weather prediction models will be unable to acclimatize those data and concentrate knowledge helpful for the prediction of extreme phenomena. In this manner, the examination of weather data has been changed into a big data investigation issue which might empower weather researchers to more readily comprehend the interrelations of the weather factors and utilize the knowledge found to further develop their prediction models.

3. Y. -B. Yang (2019) et.al proposed Spatio-Temporal data mining on MCS over Tibetan Plateau using satellite meteorological datasets. The study of "Mesoscale Convective Systems" (MCS) clouds, including the investigation of their life cycles, directions and evolvment patterns, stays a significant and testing issue in meteorology, by which serious weather circumstances, or, "mesoscale weather events" are much of the time caused, for example, solid breezes, weighty downpour falls, rainstorms and tropical storms. This paper presents an automatic meteorological data mining approach in view of dissecting and mining heterogeneous remote detected image datasets. The cloud structures are firstly distinguished and tracked in satellite remote detected images, after which heterogeneous cloud highlights and properties are separated and coordinated to shape a brought together dataset. The C4.5 decision tree calculation and reliance network analysis are then utilized to find helpful knowledge for weather forecasting, by which a gathering of induction rules and a conceptual model for metrological environment factors are produced. Trial results have shown that the system lessens the weighty workload of manual weather forecasting and gives significant interpretations to the forecasted results.

4. A. Juneja (2019) et.la proposed Big Data Quality Framework: Pre-Processing Data in Weather Monitoring Application. Big Data has turned into an unavoidable piece of all ventures and business areas today. All associations in any area like energy, banking, retail, equipment, networking, and so forth all create a colossal quantum of heterogeneous data which whenever mined, handled and investigated accurately can uncover hugely helpful examples for business heads to apply to produce and develop their organizations. Big Data helps in procuring, processing and analyzing a lot of heterogeneous data to infer significant outcomes. The quality of information is impacted by the size, speed and format in which data is produced. Consequently, the Quality of Big Data is of extraordinary significance and significance. We propose addressing different parts of the crude data to further develop its quality in the pre-processing stage, as the crude data may not be usable with no guarantees. We are investigating processes like Cleansing to fix as much data as doable, Noise channels to eliminate awful data, also sub-processes for Integration and Filtering alongside Data Transformation/Normalization. Big Data is assembled from different sources to plan a framework equipped for gauging weather in light of ongoing a dangerous atmospheric devotion concerns. Big Data is a science and interaction relying upon numerous advances and is still in a developing phase.

5. I. Atif (2021) et.al proposed Development of Interactive Dashboards and Intelligent Data Analytics for Visual Decision-Making in the Underground Mining Environment: The Sterkfontein Cave Case Study. Multipurpose sensors introduced at numerous areas in underground mining conditions give data about the wellbeing, security and mine circumstances in close to constant. Nonetheless, it is more critical to change over this data into key insight, and that implies the communication of the right information to the ideal individuals with flawless timing to empower them to pursue ideal and informed choices on risk control and

interaction improvement. The Sterkfontein caves are a world legacy site, and throughout the course of recent years, some deformation was recorded inside the caverns. Potential reasons remember urbanization for the encompassing region, unlawful dolomite mining before, weathering, man-made archeological exercises and consistent pouring of contaminated and acidic water into the caverns framework. Corrosive water has a high potential to break up the delicate dolomite, and make new and extend existing stone cavities, which can weaken rock formations. The Wits Mining Institute (WMI) has introduced a geotechnical and geo-ecological remote sensor network inside the caverns for observing and to acquire a superior comprehension of deformation in a cavern framework. In this examination, data analytics and visualization ideas have been applied to the data gathered from the sensors to recognize the patterns or examples inside the caverns. The consequences of this study showed that intuitive clever dashboards are vital to further developing underground data bits of knowledge in close to continuous and give the profound comprehension expected to shrewd navigation. The concentrate convincingly delineates that successful sensor-based close to ongoing communication and visualization frameworks will make the underground mining climate more secure and take into consideration better choices on how and when to act.

6. S. A. Yadav (2020) et.al proposed An Analysis of Data Mining Techniques to Analyze the Effect of Weather on Agriculture. With the developing requirements of the Agriculture area, the ranchers and partners need to pursue significant choices affected by different elements like soil type, contamination level, stickiness, temperature, precipitation, geographic characteristics and so on. This ponders on the different data mining strategies that analyze the ecological elements that influence the farming parameters. These methods give answers for different dynamic issues looked by the agriculture area today. In this paper, we center around advancing the impact of weather on agriculture utilizing different methods like Correlation Analysis, multidimensional displaying, k-implies, ANN, SVM, KGclassification, PAM, CLARA, DBSCAN and so on. Albeit the vulnerabilities connected with weather are a big concern they can be analyzed and introduced as a contribution for additional examination. Different data mining procedures have been thought that analyze the different climatic parameters and foresee the farming yield. Much more exploration is as yet forged ahead with the impact of weather on agriculture as the parameters differ contingent upon the district and we have different data mining methods that proficiently work with immense multidimensional datasets.

7. Fatmasari (2018) et.al proposed Web Scraping Techniques to Collect Weather Data in South Sumatera. A few urban areas in South Sumatra have a few weather estimation focuses claimed by a few distinct foundations like BMKG, AngkasaPura, Lapan, and others. Nonetheless, getting the most recent weather data exhaustively inside a predetermined period compelled the bureaucratic course of every establishment. While the accessibility of weather datasets is required in directing exploration in the field of data analytics to anticipate the weather and investigations for DSS that

require weather examples. Then again, a few websites give constant weather data to certain urban areas. For that in this exploration, we use web scratching technology to gather weather data in certain urban areas in South Sumatera encompassing on certain websites. Web scratching technology is a method for recovering the items in a page separately. The data assortment cycle will keep on rushing to deliver the weather dataset of urban areas in South Sumatra. Once the datasets are gathered, extensive examination will be created to anticipate the weather as well as weather examples investigation for decision making in agriculture and transportation.

8. R. Y. Yasmin (2017) et.al proposed a classification of sequential patterns for numerical and time series multiple source data preliminary application on extreme weather prediction. Classification in light of consecutive examples has turned into a vital strategy in data mining. Making predictions for ready advance notice frameworks and vital decisions is helpful. Additionally, the need to further develop the speed execution of successive example mining likewise increments. Notwithstanding, past explores in this space utilize all out data as info. There is a need to process numerical data and group successive examples found from the data. High exactness numerical data are challenging to mine. Also, numerical data to be mined comprises of numerous observational boundary data. This study proposes a structure to defeat the issue. The structure proposes to arrange the data in preprocessing and set it up to be prepared as contribution for consecutive example mining and the ensuing classification process. Lessening data intricacy by doing arrangement in preprocessing is extremely valuable for ordering successive examples. It is normal to speed up execution while keeping up with adaptability. Additionally, it can keep up with classification precision since it doesn't dispose of the importance of unique data.

9. X. Wang (2016) et.al proposed Micro-Scale Severe Weather Prediction Based on Region Trajectories Extracted from Meteorological Radar Data. To foresee small size weather in view of district directions separated from meteorological radar data. Moving locales addressing small size serious weather are removed from radar data and shaped into directions and in light of the framed directions, we anticipate where the districts will move and their future extension by the methodology of straight regression, which prompts the prediction of extreme weather. In our plan, areas addressing extreme weather are removed from radar data and are shaped into directions by the moving connection of the districts. Then, at that point, we utilize the methodology of direct regression to foresee the future locales in light of these directions, by which we can know where the miniature size extreme weather will be and its degree. In our future work, we will consolidate different factors into our direct regression strategies, like breeze, to make a more exact prediction, and we will additionally inspect the setting of the prediction window.

10. Zhang (2021) et.al proposed Weather Radar Echo Prediction Method Based on Convolution Neural Network and Long Short-Term Memory Networks for Sustainable e-Agriculture. As one of the primary reference data of weather

gauge, weather radar reverberation picture is vital to the security of agrarian creation. Different radar reverberation designs address different heartbreaking weather, like hail, serious convection, etc. Weather radar reverberation shape prediction can assist meteorologists with making a decision about the future changes of grievous weather, help to stay away from the damage of extreme weather to agriculture, and limit rural financial misfortunes. With the utilization of profound learning in the meteorological field, the profound learning technique shows extraordinary potential in radar reverberation prediction. Nonetheless, there are not many examination strategies to anticipate the difference in weather radar reverberation shape. This paper presents a radar reverberation prediction strategy in view of c Convolutional Neural Networks and Long Short-Term Memory organizations, which can actually foresee the state of weather radar reverberation. The genuine data is utilized to prepare and test our model. Tests demonstrate the way that the model can accurately foresee the difference in reverberation shape. The quantitative assessment of the model purposes recognition likelihood, misleading problem rate, basic achievement record, and heidke expertise score. The model can't surely know the subtleties of the radar reverberation picture. Exclusively by considering the form information of radar picture, the fundamental shape of radar reverberation picture can be acquired. Radar reverberation prediction doesn't think about reverberation force information.

11. Fakherldin (2019) et.al proposed Weather Data Analysis Using Hadoop: Applications and Challenges. Weather data is exceptionally critical in each part of human regular routine. It assumes a significant part in numerous areas, for example, agriculture, the travel industry, government arranging, industry, etc. The weather has an assortment of parameters like temperature, strain, moistness and wind speed. The meteorological office conveyed sensors for each weather boundary at various geological areas to gather data. This data is put away generally in the unstructured format. Accordingly, a big measure of data has been gathered and filed. Along these lines, stockpiling and processing of this big data for accurate weather prediction is an enormous challenge. Hadoop an apache item is utilized to help big data sets in a conveyed climate. Hadoop enjoys the best upper hands over adaptable and issue open minded dispersed processing advancements. Utilizing this system, the sensor's data can be analyzed proficiently. The significant advantage of the Hadoop structure speeds up the processing of immense data. Where the volume of data is expanding consistently.

12. Jayanthi (2017) et.al proposed Weather data analysis using spark — an in-memory computing framework. Weather anticipating is an inspirational challenge in human progress. There is a change in logical concentration toward taking care of this issue. Weather is a mind boggling peculiarity that includes the unique communication of a few powers. There is various numerical weather models and calculations that have been created and upheld to foresee weather determining. Weather determining assumes an exceptionally pivotal part in different fields like agriculture, government arranging, businesses, foreseeing stock investigation and so on. Different

sensors are sent at various topographical areas to gather weather data consistently. The best challenge is to store and analyze the tremendous volume of data in a successful way. Big data innovations are utilized to resolve these issues and challenges utilizing conveyed processing. Hadoop MapReduce is utilized to analyze the weather data. In any case, the flash is an arising technology that acts in-memory registering which is more effective than Hadoop MapReduce. RDD transformation activities are applied to the weather dataset and analyzed. At last, the most elevated normal precipitation and most elevated normal temperature values are figured for the best ten weather stations and showed. The work can be reached out by expanding the volume of data and the quantity of cycles.

13. Jaroensutasinee (2013) et.al proposed online weather data analysis and visualization tools for applications inecoinformatics. As enormous amounts of actual data are generally gathered for Ecoinformatics research, it is hard for them to be cleaned, shared, imagined, and analyzed by research partners. To determine this trouble, this study presents online weather data examination and visualization cyber infrastructures comprising of online weather data investigation and visualization tools and close to continuous web-based weather data entries. To defeat speed and openness issues, we fostered these tools with numerous advancements - for example distributed computing, internet figuring XML (webMathematica), and double access data transformation. Instrument specification sheets and manuals are accessible for download. Google Map was utilized as a geographic information framework (GIS) instrument to show the area of locales, limits, enormous water bodies, mountains, and streets. With the advancement of a cyber infrastructure to get to weather data, these shrewd online insightful and visualization tools can eliminate the snags to knowledge investigation and revelation. Also, these tools can be utilized for understanding and instructing understudies in the study of Ecology and Ecoinformatics.

14. Lok C. (2005) et.al proposed Weather data analysis and design implications for different climatic zones in China. Building and Environment. Building goes about as a climatic modifier, isolating the indoor assembled climate from the outer climate depicted by the predominant long haul weather circumstances. The climate of a specific area will in general impact the shapes and types of the nearby structures and directs the sorts of natural control required. There is in many cases a particular correspondence between extraordinary structural elements and different climatic zones. In excess of a happenstance individuals in various regions of the planet seem

to have come up freely with comparative structure plan arrangements in their undertakings to conquer the nearby overarching ominous outer weather circumstances. The warm exhibition and energy investigation of a structure are dependent upon a wide scope of dynamic collaborations between the structure and its structure administrations frameworks and are enormously impacted by the everyday, occasional and yearly changes in the overarching nearby weather circumstances. In this review, the five significant climatic sorts in China were inspected by analyzing the deliberate long haul weather data from five urban areas. A few general climatic qualities and weather examples appropriate to endlessly assembling administrations plans were distinguished.

15. Basak (2004) et.al proposed Weather Data Mining Using Independent Component Analysis. The technique has been applied to dig for designs in weather data utilizing the North Atlantic Oscillation (NAO) as a specific model. We observe that the most grounded independent components match the noticed brief weather examples comparing to the NAO. We additionally approve our outcomes by coordinating the independent component exercises with the NAO list. The information from these Spatio-temporal signs can be separated utilizing data mining techniques. The variety in the weather factors can be seen as a combination of a few independently happening Spatio-temporal signs with various qualities. Independent component analysis (ICA) has been broadly concentrated in the area of sign and picture processing where each sign is seen as a combination of a few independently happening source signals. Under the suspicion of non-Gaussian combinations, it is feasible to separate the independently happening signals from the blends under specific notable requirements. Along these lines, in the event that the suspicion of independent stable action in the weather factors remains constant then it is likewise conceivable to extricate them utilizing a similar technique of ICA. It is extremely challenging to analyze the NAO to observe the actual relationships between's different modes that interface to create the NAO peculiarity. Notwithstanding, ICA gives a blending grid that gives a sign of how the different modes cooperate (in a direct way). Third, we accepted a straight combination of different independent components. In additional examination, this suspicion can be loose and nonlinear independent component analysis can be performed on these sorts of Spatio-temporal data sets to find significantly more significant characteristics.

3. PROPOSED METHODS, MERITS AND DEMERITS

Authors	Proposed Method	Merits	Demerits
V. Suryanarayana (2019)	Novel Weather Data Analysis Using Hadoop and MapReduce	The word Big Data refers to strategy utilized in everyday life all over the place and it is a clever technology and it would likewise going to govern the world in coming age.	The word Big Data refers to the technique utilized in everyday life wherever it is a clever technology it would likewise going to administer the world in the approaching generation.

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K. Xylogiannopoulos (2019)	Multivariate Detection in Weather Big Data	Motif Local	Innovative changes brought various kinds of sensors like surface sensors, radars, and weather satellites.	The big data analytics issue permitting strategies from the data analytics field to be tried in weather.
Y. -B. Yang (2019)	Spatio-Temporal data mining on MCS over Tibetan Plateau using satellite meteorological datasets		the weighty workload of manual weather forecasting and gives significant interpretations to the forecasted results	It doesn't foresee the outcomes of bigger flames, is that it requires disconnected preparing with chronicled data.
A. Juneja (2019)	Big Data Quality Framework: Pre-Processing Data in Weather Monitoring Application		Data from this multitude of sources should be united homogeneously to shape a solitary and last wellspring of truth for the data to be utilized in the Big Data framework.	Semi-organized and unstructured data that represent a troublesome errand to be handled utilizing traditional techniques and databases.
I. Atif (2021)	Development of Interactive Dashboards and Intelligent Data Analytics for Visual Decision-Making in the Underground Mining Environment		Progressed data examination and visualization code Tableau has been utilized to create close to constant dashboards for decision-production in the underground mining climate.	Data organizing is a troublesome and arduous cycle for getting sorted out, processing, recovering.
S. A. Yadav (2020)	An Analysis of Data Mining Techniques to Analyze the Effect of Weather on Agriculture		Clustering is utilized in data mining to bunch data into 'groups' with a negligible distance between them.	Different vulnerabilities about the different horticultural parameters like which are the abrogating parameters that influence crop development.
Fatmasari (2018)	Web Scraping Techniques to Collect Weather Data in South Sumatera		Making weather conjectures are profoundly reliant upon noticed data and the methodology and techniques for weather estimating utilized	To get the most recent weather data exhaustively in a specific period is extremely challenging because of the bureaucratic cycle to each unique organization.
R. Y. Yasmin (2017)	Classification of sequential patterns for numerical and time series multiple source data preliminary application on extreme weather prediction		For starter execution reason and effortlessness, not every one of the weather factors gathered is utilized as an assessment object.	Likewise, perception data from the sensor happens persistently or sequential in time so the data volume is exceptionally high.
X. Wang (2016)	Micro-Scale Severe Weather Prediction Based on Region Trajectories Extracted from Meteorological Radar Data		Directions have been inspected in meteorological investigation, and are utilized in analyzing the hint of tropical storm and typhoon.	The radar crude data are apportioned into various polygons with various qualities, and assuming they are with similar worth, they are not nearby.
Zhang (2021)	Weather Radar Echo Prediction Method Based on Convolution Neural Network and Long Short-		The echo data detected by weather radar is used to determine the intensity distribution of echo and	Obtaining long-term data using the radar echo extrapolation method is difficult because of the

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	Term Memory Networks for Sustainable e-Agriculture	the moving speed and direction of the echo body.	complex changes in the radar echo.
Fakherldin (2019)	Weather Data Analysis Using Hadoop: Applications and Challenges	Contrast with processing the sensor data with the Hadoop system which eliminates the adaptability bottleneck.	. The result of every mapper is a bunch of matches (key, Value) where the key is comprised of the station name, date.
Jayanthi (2017)	Weather data analysis using spark an in-memory computing framework	Hadoop is a bunch situated data processing framework that can scale to great many servers.	Weather data can be gathered in various data sources like Kafka, flume and so on.
Jaroensutasinee (2013)	Online weather data analysis and visualization tools for applications in ecoinformatics.	Google Map was used as a geographic information system (GIS) tool to display the location of sites, boundaries, large water bodies, mountains, and roads.	Difficult to reduce the overheads caused by TCP/IP processing and interrupt handling unless OS code modification or a hardware change is implemented.
Lok C. (2005)	Weather data analysis and design implications for different climatic zones in China	The complete amount of the temperatures in the period during which the temperature is more noteworthy than or equivalent to 10 IC.	The effects of wind data on thermal designs and energy analysis of buildings are difficult to define and quantify
Basak (2004)	Weather Data Mining Using Independent Component Analysis	Independent component analysis has been used to mine for the spatio-temporal stable activities in the sea level pressure in the north Atlantic region.	Difficult to obtain a quantified index to characterize the overall changing nature of the weather phenomenon.

CONCLUSION

This review paper narrates different data mining techniques and methodology for weather prediction. The techniques have been applied to dig for designs in weather prediction utilizing the datasets for review. Among all these methodologies specified the Bayesian Classification is the one used mostly for the purpose of prediction as this can be applied for the large amount of data with ease. This also obtains data accuracy with time complexity when compared to the other methods.

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