International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 4 July-Aug 2023, pp: 2292-2297 www.ijprajournal.com ISSN: 2249-7781

Big Data Analytics of Maharashtra's State Weather Pattern: Insights and Implications

A. S. Waghmare[1], P. R. Kolhe [2], V. D. Jadhav[3], D. C. Vhatkar[4], D. R. Korade[4]
[1]*M. Tech, College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*
[2]*Associate Processor (CAS), College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*
[3]*Technical Assistant AKMU, Dr. BSKKV, Dapoli Maharashtra, India*
[4]*M. Tech, College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*

Submitted: 15-08-2023 Accepted: 25-08-2023

ABSTRACT
Weather plays an important role in every aspect of human life. Every segment of human society is directly impacted. The agriculture industry, the tourism industry and government organisation all place a lot on weather forecasts. For humans to be ready for unfavourable climate condition, prior weather knowledge can be highly helpful. The environment is currently being seriously affected by climate change. Extreme changes in the weather are referred to as climate change. It presents a serious hazard to human life. People find it challenging to predict the climatic conditions because of the unexpected changes in the weather. Numerous meteorological variables such as temperature, humidity, rainfall, wind speed etc., are crucial in the test of weather conditions. Big data analysis is used for sort your data by date, concealed patterns and applicable information that can yield better results. By collecting and analysing large datasets related to weather data and make data-driven decisions. Huge amounts of weather data from numerous sensors for different weather characteristics are being collected and this data will only increase in the future.

Key words – Climate, Weather Forecast, Data Analytics, Dashboard.

I. INTRODUCTION

Maharashtra State is situated north of 14^{o} N and south of 22^{0}N in the north of peninsular India. The Maharashtra state around Gujarat, Madhya Pradesh, Chhattisgarh, Karnataka, Andhra Pradesh this state borders and Arabian sea it on its western side. The Maharashtra has a coastline of 720 km. The coastal districts of thane, Mumbai City, Mumbai Suburban, Raigad, Ratnagiri and Sindhudurg are divided.

The area spans 800 kilometres from west to east. The ridge creates a significant climatic barrier since it cuts across at a right angle to the monsoon stream. In contrast to the eastern Ghats, where rainfall declines to less than a tenth within a short distance from the Ghats, the western slopes and the coastal districts have extremely strong monsoon rains. Rainfall in the state occurs primarily from June to September, when the southwest monsoon season occurs. The state experiences significant rains along the coast (about 2000 mm), meagre rains in the rain shadow regions in the centre (around 500 mm), and medium rains in the east (roughly 1000 mm).

There are four meteorological division viz., Konkan, Madhya Maharashtra, Marathwada and Vidarbha in the state.

A. Climate

The climate of Maharashtra can be classified under the following main types

1. **Monsoon:** In this category includes coastal strip and nearby ghats region is distinguished by an annual rainfall of more than 100 cm districts. All year long, the average daily temperature exceeds 22^{o}C. Daily average relative humidity is high, typically above 60%. The coldest month's mean daily temperature throughout the remaining area according to this climatic type ranges between 18^{O}C and 22°C.
2. **Dry Climate:** In this category includes the semi-arid region districts. The typical daily temperature ranges from in the winter, temperatures range between 18^{O}C and 22^{O}C, and in the remaining months, temperatures are greater than 22^{O}C. The southwest monsoon season accounts for most of the region's modest annual rainfall of 60 to 90 cm. The average daily relative humidity is below 50% throughout the year, with the exception of the monsoon season, when it drops below 30% for two to three months in the summer in the central regions of the region.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 4 July-Aug 2023, pp: 2292-2297 www.ijprajournal.com ISSN: 2249-7781

3. **Tropical Rainy:** In this category includes the Vidarbha and Marathwada region districts. There is more than 70 cm of precipitation only during the monsoon season. Except for the summer, when it can drop as low as 30% for a month or two, the average relative humidity is greater than 60%. throughout the winter, the average daily temperature ranges from 18^{O}C to 22^{O}C, while it is over 22^{O}C throughout the other months.

B. Sea Level Pressure and Winds

The air pressure drops southward and is greater over India in January. But there is less gradient. Along the coast of Maharashtra, the pressure is constant. The pressure gradient over the interior is negligible as a result light breezes are coming from the north or northeast. After January, pressure starts decreases, April low-pressure area forms which causes pressure gradient reverse. In Maharashtra monsoon season until September winds are stronger and pressure still significant.

C. Humidity

More than 80 % of the time from June to October month. Winter afternoon are lowest, with most regions seeing drop to around 60%. The monsoon's early and late phases can have uncomfortable weather. After October, there is a noticeable drop in humidity during the day, and with the temperature also falling, the days become pleasantly chilly.

D. Rainfall

Rainfall in Maharashtra state varies greatly, from 600 cm over the Ghats to less than 60 cm in Madhya Maharashtra. The Western Ghats and nearby coastal strip that are exposed to the southwest monsoon have the greatest rainfall, sometimes reaching 200 cm. Over the Ghats, there may be more than 500 cm of yearly rainfall. Rainfall drops down quickly and is at its lowest on the plateau and eastern slopes.

II. REVIEW OF LITERATURE

Veershettyet al., (2015) worked on developing a framework for analysing weather data using Hadoop. The weather parameters for extraction and analysis were temperature and annual precipitation. Pig and Hive performance comparisons for weather data are displayed. HIVE's effectiveness has been demonstrated to produce improved outcomes. The suggested analytical engine can scale more effectively on a Hadoop cluster.

A. Gayathri et al., (2016) worked on the investigation of data mining for weather forecasting. There are several sorts of forecasting, including now casting, short term, medium range and long-range forecasting. It is possible to extract value using techniques like decision trees and back analysis by using various weather big data which may be characterised as a large set of parameters and diverse data mining approaches. In the area of the weather forecasting, big data is more widespread.

Mishra et al., (2017) Data that is collected hourly, daily, weekly, monthly and yearly is known as a time-series. Data mining algorithms employ the time-series data that has been collected in this way over a period of time to forecast future events in areas like climate, education, stock and other areas.

III. MATERIAL AND METHOD

A. Materials

Despite not being traditionally regarded as a Big Data Analytics tool, Microsoft Excel can nonetheless perform some big data tasks, particularly with the introduction of Power Query and Power Pivot. Excel can now connect to, clean up and analyse many more datasets, than it was previously able to. Excel has limits when working with large datasets, though, as compared to specialised Big Data tools like Hadoop or Spark. Here are few examples of how Excel can be applied to Big Data Analytics: Power Query, Power Pivot, Data Analysis and Data Visualization.

B. Methodology

Performing big data analytics on weather data involves several steps to collect, process, analyze, and interpret the data effectively. Here's a generalized process you can follow:

1. Define Objectives: Clearly outline the objectives of your analysis, such as understanding at current conditions, wind and clouds, pressure changes, rainfall data, humidity temperature to determine how the atmosphere involves in the future. What is the problem face in future?
2. Data Collection: The kaggle website was utilised to gather the data for this project. The information covered the 30 -month period from May 2020 to December 2022.
3. Data Cleaning and Preprocessing: It is important pre-processing step in data mining process. In order to enhance the quality of the data and to produce better results. The characteristics are examined and

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 4 July-Aug 2023, pp: 2292-2297 www.ijprajournal.com ISSN: 2249-7781

any null values are eliminated. Duplicate records are also eliminated and outliers are imputed.

4. Data Selection: At this point, the dataset's data that would be useful for the analysis was selected. The meteorological dataset contained attributes. The meteorological dataset had nine (9) attributes, their type and description in represented in Table 1.

5. Data Integration, Exploration, Visualization and Analysis: It integrate data from multiple sources into a centralized data repository making it accessible for further analysis. Explore the data through descriptive statistics and visualization to pressure changes, rainfall data, humidity and temperature. Apply various data analytics techniques, such as clustering, classification, regression to extract meaningful pattern and trends from the weather data.

Table 1: Attributes of Metrological Dataset

Attribute	Type	Description
Year	Numerical	Year Considered
Month	Numerical	Month Considered
Min. Temp.	Numerical	The Daily Minimum Temperature
Max. Temp.	Numerical	The Daily Maximum Temperature
Wind Speed	Numerical	Wind Run in km/hr
Rainfall	Numerical	The Daily Rainfall
Visibility	Numerical	The Daily Total Visible Distance
Humidity	Numerical	The Daily Humidity
Solar Radiation	Numerical	The Daily Amount of Solar Radiation

IV. RESULT AND DISCUSSION

It has been noted that weather analytics is extremely beneficial to many facts of human society. Some of the most crucial variables for analysing meteorological data include temperature, pressure, humidity, rainfall and wind speed. Climate scientists combine data from various stations in the area to create averages to better understand climate on a bigger scale. Each station's readings are numerically evaluated when the data are combined to take into consideration the percentage of the averaging area that they each represent. This prevents places with plenty if weather stations from being overrepresented in comparison to places with few stations.

According to the statistics, there are changes in temperature, rainfall, solar radiation, relative humidity, wind speed and visibility when change date. Here, a trend line graph aids in the analysis of temperature variation in the future. It has been demonstrated that weather fluctuates, so people can adapt and take precautions to stay safe. The current issue of the state is groundwater level being adapted is said to be remedied by water resource development.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 4 July-Aug 2023, pp: 2292-2297 www.ijprajournal.com ISSN: 2249-7781

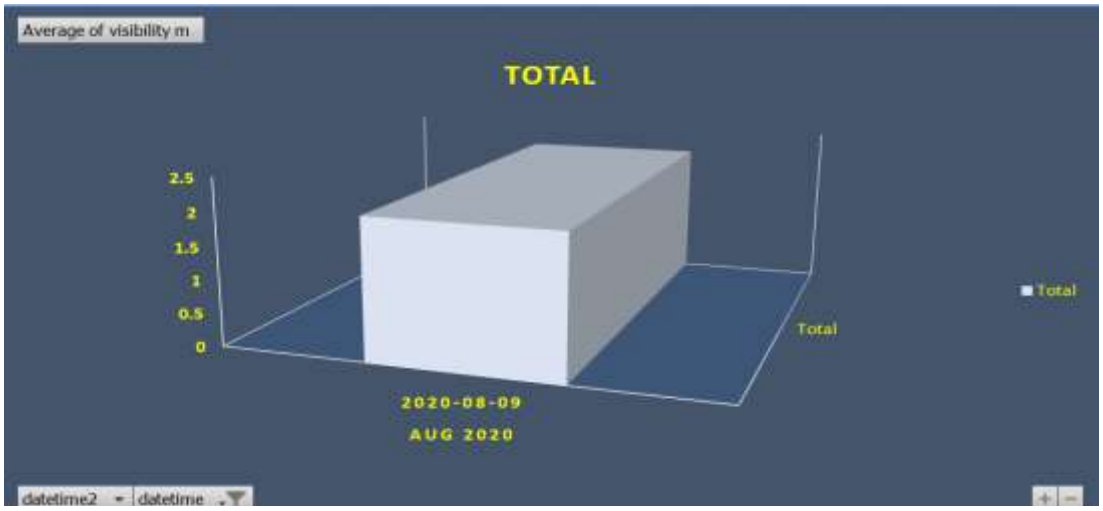

Fig No.1: Pivot of Visibility

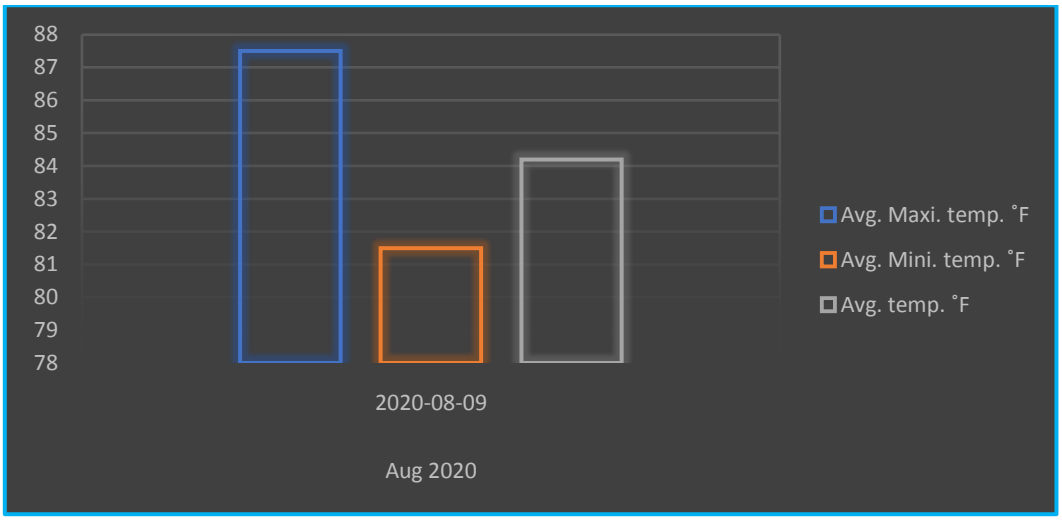

Fig No.2: Pivot of Temperature

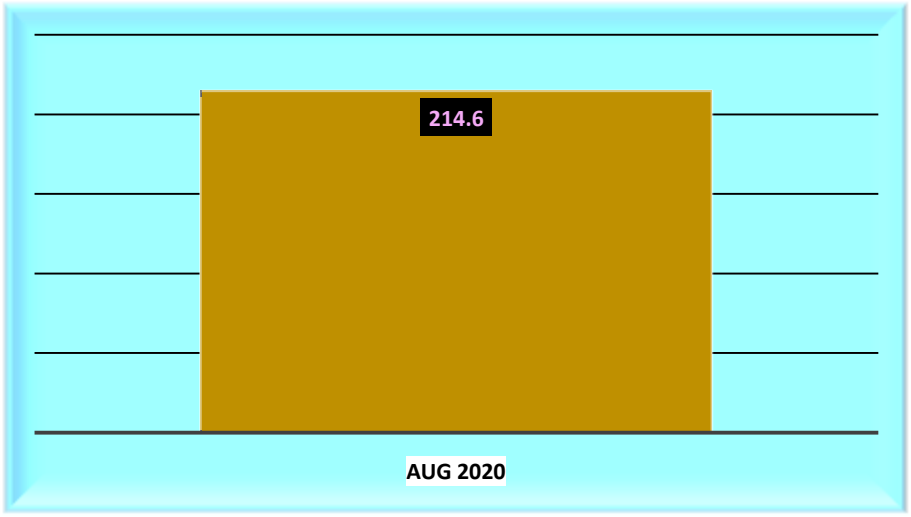

Fig No.3: Pivot of Solar Radiation

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 4 July-Aug 2023, pp: 2292-2297 www.ijprajournal.com ISSN: 2249-7781

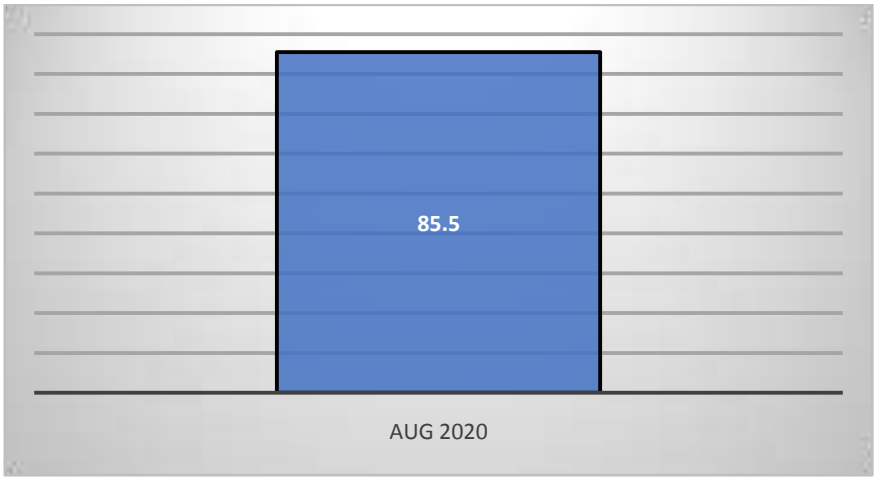

Fig. No.4: Pivot of Humidity

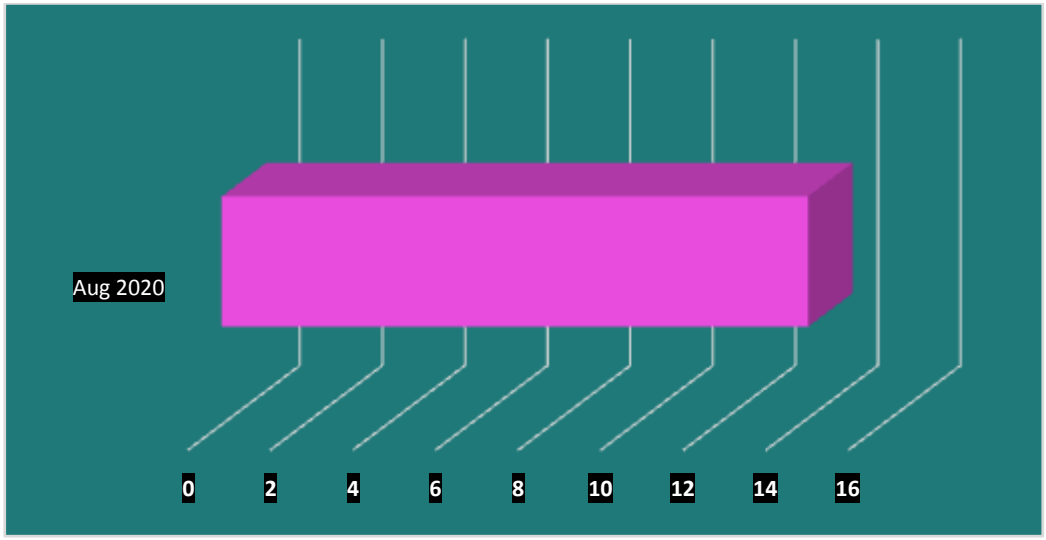

Fig No.5: Pivot of Precipitation

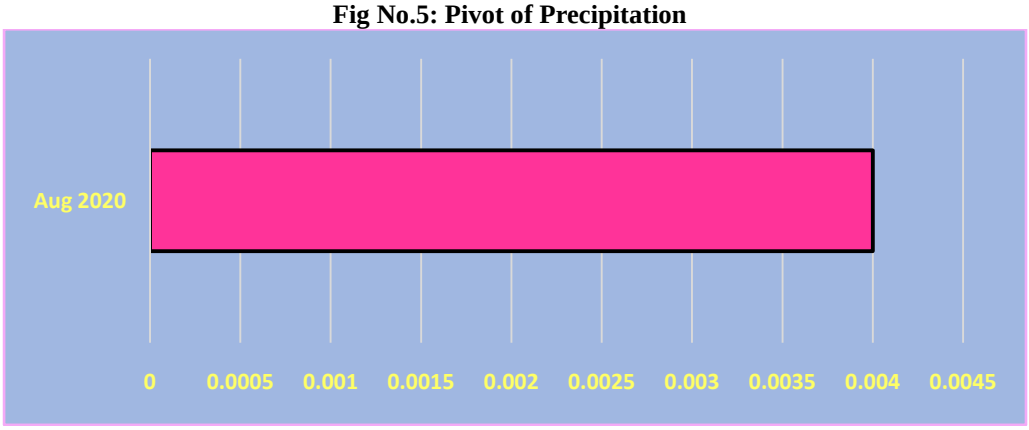

Fig. No.6: Pivot of Windspeed

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 4 July-Aug 2023, pp: 2292-2297 www.ijprajournal.com ISSN: 2249-7781

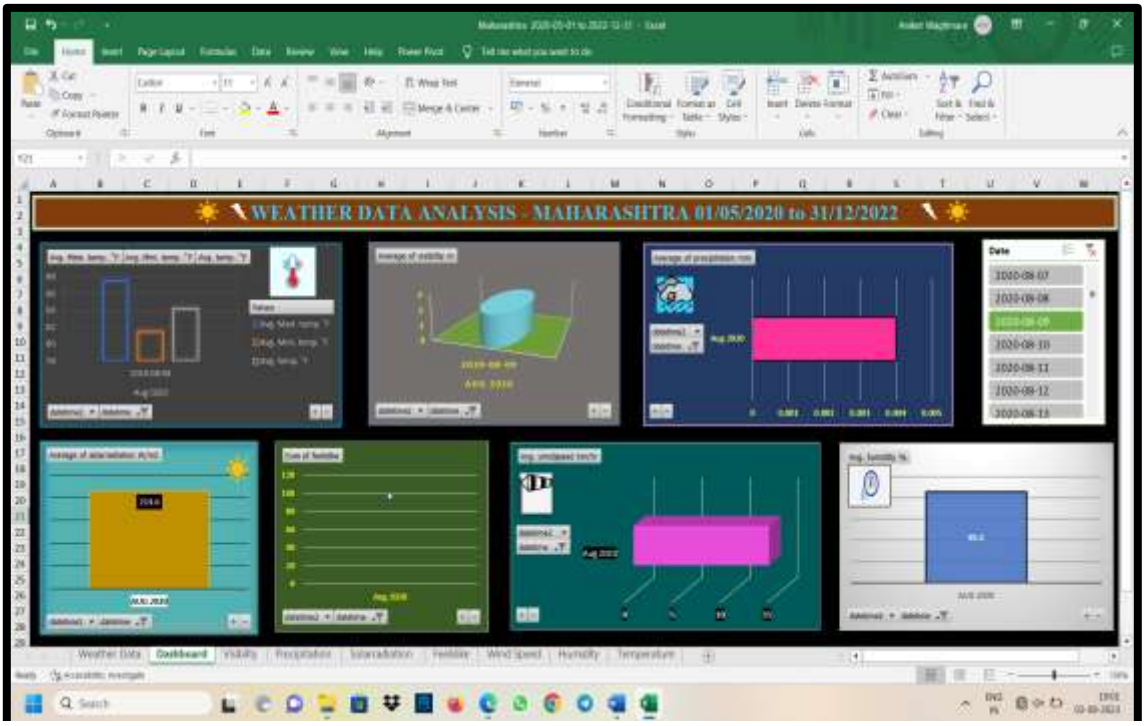

Fig No.7: Dashboard of Weather Data

V. CONCLUSION

The study provides the findings of data mining done on gathered meteorogical data. Weather analytics has a significant impact on human society, including industrial farming, news agencies, government planning, tourism, athletic events and agriculture. To manage this weather data, big data technologies like Hadoop and Spark can be effectively installed. The daily maximum temperature, minimum, humidity and precipitation are can be seen by the initial data exploration study. Numerous research on weather analysis, particularly for temperature have been conducted. All significant meteorological variables, including temperature, pressure, humidity and wind speed must be analyzed. This has the potential to be expanded to include any sizeable data sets with a variety attributes and factors for efficient analysis and exact prediction

REFERENCES

[1]. A Gayathri, M. Revathi, J. Velmurugan, (2016). A Survey on Weather forecasting y Data Mining, IJARCCE, ISSN: 2278-1021, 5(2), 298-300.

[2]. Climate of Maharashtra, National Climate Centre Office of the Additional Director General of Meteorological, Pune.

[3]. Krishna GV, (2015), A review of weather forecasting models-based on data mining and Artificial neural networks, Computer Science and engineering, GITAM university, 6,214-222.

[4]. Microsoft (n.d.-b). Power Pivot: Powerful data analysis and data modeling in Excel. Retrieved from https://support.office.com/en-us/article/Power-Pivot-Powerfuldata-analysis-and-data-modeling-in-Excel-A9C2C6E2-CC49-4976-A7D7-40896795D045.

[5]. N. Mishra, H. K. Soni, S. Sharma, and A. K. Upadhyay, (2017), A Comprehensive Survey of Data Mining Techniques on Time Series Data for Rainfall Prediction, J. ICT, 11, 168.

[6]. Veershetty Dagade, Mahesh Lagali, Supriya Avadhani and Priya Kalekar, (2015). Big Data Weather Analytics Using Hadoop, IJETCSE, ISSN: 0976-1353,14(2).