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# Comparative Study to determine Accuracy for Weather Prediction using Machine Learning

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***Abstract*—As there are different Weather Prediction algorithms, this paper gives a comparative study to determine accuracy for weather prediction on the basis of temperature, rainfall, humidity pressure etc. The objective is to design an accurate weather prediction classification model.**

***Keywords— Machine learning, weather sensors, ESP8266, weather prediction, weather station***

## I. Introduction

A variety of daily atmospheric occurrences make up the weather. We can now obtain an accurate weather forecast practically everywhere in the world because to advances in data science and technology. Every person's life is greatly impacted by the weather since it tells us whether it will rain or be sunny. Weather station employing machine learning to determine the climatic condition parameter based on humidity, pressure, temperature, and rain is the name of our project. In order to predict what might be expected, weather forecasting uses a variety of methods and technologies, including machine learning and recurrent neural networks. We are utilizing a method known as machine learning in our paper. Simply said, machine learning is what enables a system to learn without being programmed. One of the most intriguing technologies that has been developed is machine learning. This effectively makes the computer human-like.

Using the references, we consulted, we were able to compare the accuracy of different Machine Learning algorithm used for Weather Prediction. Weather updates and information are taken from the weather station. Additionally, we were able to use a microcontroller to measure the meteorological data, such as temperature, pressure, humidity, and rainfall.The problem with weather forecasting is that it can take a lot of time and resources which is not completely accurate, and is practically impossible to predict the future with certainty. The national weather service has always kept an eye on the atmospheric factors that affect the weather, but as technology evolved, we started using more effective tools to gather -*additional data to utilize. Our meter logistics can now predict events more accurately and quickly than before thanks to technology. Weather satellites actually keep an eye on the planet from space, gathering and analyzing data. There are three different kinds of weather satellites: deep space satellites, geostationary satellites, and satellites in polar orbit. The acronym AWIPS stands for Advanced Weather Information Processing System, which combines the information from all preceding technologies into a graphical user interface enabling forecast users to prepare and analyze the information. Additionally, it processes data from radios on ASOS, etc., using supercomputers.

The idea mainly focuses on forecasting weather prediction for a particular area. This can be done by extracting knowledge from a particular data set using linear regression we predict the weather on the basis of temperature, rainfall, humidity, pressure etc. The objective is to design an effective weather prediction classification model. Our main approach is to gently enhance the model to perform its function accurately for predicting the weather.

This section serves as an introduction to our paper and provides a brief overview of weather forecasting. The literature review we used as a source for our paper is discussed in the next section. The proposed methodology is described in section three, which also includes a flowchart and a block diagrams Results and comments are presented in the next section.

## II. Literature Survey

| Paper | Methodology | Outcome | Research gap |
|---|---|---|---|
| [1] | Data is stored in cloud & created in the form of CSV,XML, JSON files. | Data can be predicted by implementing arduino UNO, it shows result of two successive years and for future years it shows an standard error. | ANN results in the increase in outcome of the model. The correlation between the temperature and the humidity is found to be 0.4-0.6 |
| [2] | The main methodology used for designing this project is a WiFi module | The weather station made measures the temperature, humidity and pressure, | This project mainly concerns in recording the weather conditions, by |

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| Paper | Methodology | Outcome | Research gap |
|---|---|---|---|
| | and they have used arduino mega. | which can connect to internet and have a data logger. | adding few features we can predict the weather. |
| [3] | The data analytics and machine learning algorithms is used for forest classification and predicting various weather conditions. | The main outcome of the paper it is of low cost and a portable solution for weather prediction. | Due to consequent confusion matrix the size of test set is 1835, where 5504 data sets are used for training and 1835 are used for testing. |
| [4] | To observe the meterological information by considering the midst monthly or annually. | The wavelet of SVM and RBF NN by utilizing HPSOGA gives a very useful execution productively. | SOM measures nearby climate upto 24 hours ahead. The water level forecast is broken down as RMSE values are used for different mining approaches. |
| [5] | For seeing climate gauge, equations to deploy variables for weather forecasting. Point forecast model, tensor expectation model. | The mathematical model gives the understanding of how the time series is used to predict weather. | The point expectation model is only used in area of thick climate station, and it ranges from 2 to 3 km to lead momentary neighborhood in the corresponding area of climate. |
| [6] | The data analysis is done by decision tree, K-NN and random forest algorithms. | These algorithms measure maximum temperature, minimum temperature and maximum cold. It is to predict weather in rain, hot, cold conditions. | The random forest algorithm provides the best accuracy when compared to other algorithms where accuracy is 80%, error values is 0.025 |
| [7] | The project is implemented using microcontroller, | This project has been made using actuators and | This project has been made to record and |
| | Open weather maps and hardware such as actuators ,weather sensors etc. | few sensors to obtain the weather condition of a room and have compared it with the data from weather station. | compare the data with the weather station data. One can add machine learning and use weather API's to add more features to this. |
| [8] | The main technique used in this project is machine learning .The neural networking concept is used. | In this project they have made it clear that we need to use sklearn concept for small and localized area and we need to use tensor flow for larger area. | In this project comparison of two methods and their ranges has been classified .to increase the accuracy furthermore we can have a hardware part which records the weather and then predicts using machine learning. |
| [9] | This project uses IOT and Machine learning techniques to predict weather, for the initial implementation NodeMCU ESP8266 is used. | This project monitors temperature ,light and humidity.it is developed in indoor environment the values are recorded in spreadsheet and then used for prediction. | Temperature ,light and humidity are monitored and predicted in this project. Many more weather sensors can be added and be used to get more accurate results .This can be further improvised and used in many more applications. |
| [10] | The main technology used in this paper are IOT, cloud and Machine learning. | The values of temperature and humidity are monitored .This is achieved by using few technique like machine learning. | Weather parameters such as humidity and temperature are measured. The prediction can be made more accurate by adding few more weather sensors and different algorithms. |
| [11] | This paper mainly uses IOT and big data to predict | This system predicts weather using temperature, | This paper concentrates on big data and IOT for |

| Paper | Methodology | Outcome | Research gap |
|---|---|---|---|
| | the weather. | humidity, pressure, wind speed and wind direction. it predicts using deep learning concepts. | weather prediction. we can add a hardware weather station and then use the Machine learning concepts to further predict. |

## III. PROPOSED METHEDOLOGY

This paper presents the weather prediction using Machine learning techniques. The initial step is to record the weather condition in a particular location. This recorded values will be fed into the complete trained machine. Once the machine is trained it will be able to predict the future weather condition of that particular place. This is implemented using microcontroller and few weather sensors.

The hardware set up comprises of few sensors and a microcontroller BMP280 (Pressure-Humidity sensor), DHT22 (Temperature-Humidity sensor) and ESP8266(Microcontroller)

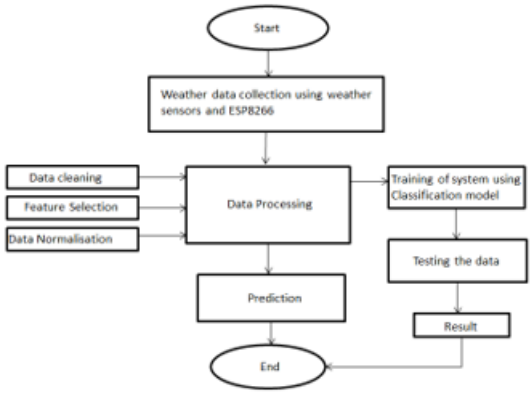


Fig. 1. Flowchart

Fig-1 presents the different stages involved in the weather prediction system using classification model approach.

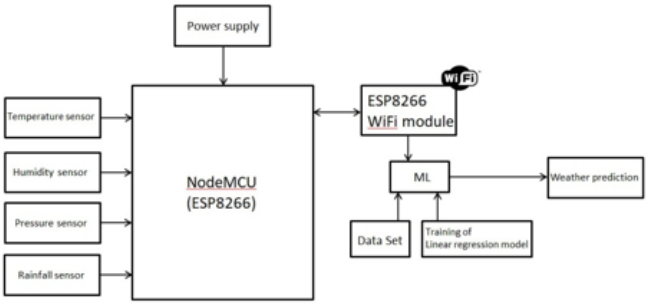


Fig. 2. Block Diagram

The above block diagram in Fig-2 explains the proposed technique. The DHT22 and BMP280 sensors sense the following weather parameters Temperature & Humidity and Pressure respectively.

## IV. RESULTS AND DISCUSSIONS

In this research, we were able to predict the weather conditions using machine learning techniques. The basic system was made using few weather sensors to record the values of rain, temperature, humidity and pressure. These recorded values were used to predict the future weather. The system was trained using weather APIs and the recorded values were then fed into the system. The trained model was then used to give the desired output. In future more weather sensors can be put on to increase the accuracy of the trained system.

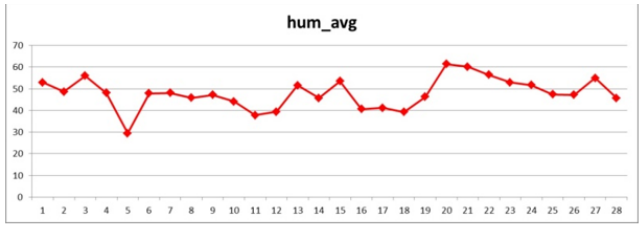


Fig. 3. Average Humidity for a span of 28 days

Fig-3 presents the average humidity for a span of 28 days.

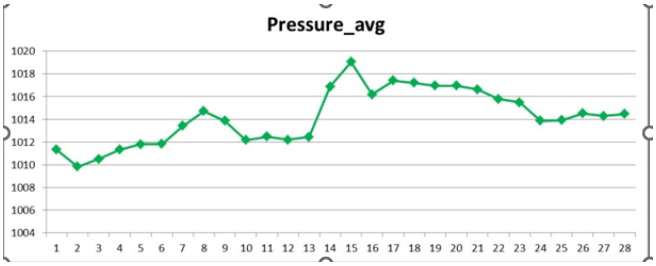


Fig. 4. Average Pressure for a span of 28 days

Fig-4 presents the average Pressure for a span of 28 days.

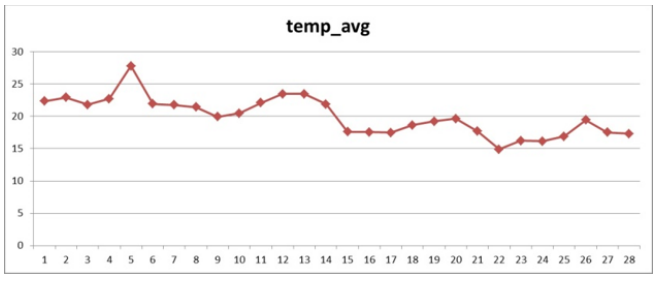


Fig. 5. Average Temperature for a span of 28 days

Fig-5 presents the average Temperature for a span of 28 days.

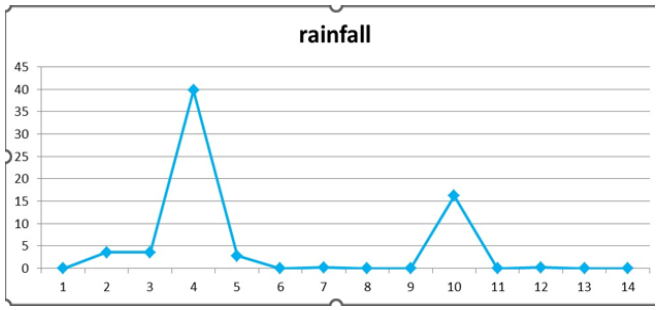


Fig. 6. Average Rainfall for a span of 28 days

Fig-6 presents the average Rainfall for a span of 28 days.

## V. Conclusion

This section introduces a quick evaluation of the accuracy of different Machine learning algorithms used for weather prediction. This paper provides future researchers with a more simple method to choose the most efficient method to satisfy the needs. We now know the outcome of different algorithms which helps us in further optimization of the designs.

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