Machine learning based weather prediction and monitoring system using IoT.

PROJECT REPORT

Submitted to

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

(*An Autonomous Institute of Government of Maharashtra and Affiliated to Kaviyitri Bahinabai Chaudhari North Maharashtra University,Jalgaon)*

In partial fulfilment of the requirement for the Degree of

BACHELOR OF TECHNOLOGY in

Electronics And Telecommunication Engineering.

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GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

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CERTIFICATE

This is to certify that the project dissertation, "**Machine learning based weather prediction and monitoring system using IoT**" which is being submitted here with for the partial fulfilment of the requirement for the **Degree of Bachelor of Technology in Electronics and Telecommunication Engineering**. Is the result of the work completed by **GURU HARSH ,MADANKAR MAYUR, NIMSARKAR PUSHPAK, DAWARE DHRUV,** under my supervision and guidance, with the declaration of students the work embodied in this project report has contributed to the best of my knowledge and belief.

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DECLARATION

I hereby declare that the Project entitled, **"Machine learning based weather prediction and monitoring system using IoT."** was carried out and written by me under the guidance of Dr. **S. C. Kulkarni** Assistant Professor, Department of Electronics and Telecommunication Engineering, Govt. College of Engineering, Jalgaon. This work has not previously formed the basis for the award of any degree or diploma or certificate nor has been submitted elsewhere for the award of any degree.

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ABSTRACT

Weather monitoring systems play a crucial role in various aspects of our lives, from agriculture and disaster management to aviation and transportation. Traditional weather monitoring systems rely on a network of static weather stations that collect data on various meteorological parameters. However, these systems are often limited in their coverage and scalability, especially in remote or sparsely populated areas.

The Internet of Things (IoT) has revolutionized data collection and analysis, providing a ubiquitous and interconnected network of devices that can continuously gather and transmit real-time data. This has opened new possibilities for weather monitoring, enabling the deployment of dense networks of low-cost IoT sensors that can provide comprehensive and granular weather data.

Machine learning has emerged as a powerful tool for analysing and interpreting large datasets, making it well-suited for weather monitoring applications. Machine learning algorithms can be used to extract meaningful insights from weather data, such as identifying patterns, trends, and anomalies. This information can then be used to predict future weather events, generate alerts for potential hazards, and optimize resource allocation.

The proposed system offers several advantages over traditional weather forecasting methods. Firstly, it is more scalable and can be easily deployed in remote areas with limited infrastructure. Secondly, it is more adaptable and can learn from new data as it becomes available, improving its forecasting accuracy over time. Thirdly, it can provide more granular forecasts at a local level, which is particularly useful for applications such as agriculture and urban planning.

(Keywords: Machine Learning (ML), Internet of Things (IoT), forecasting,Machine learning algorithms,weather monitoring)

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1. INTRODUCTION

IoT based Weather monitoring and forecast systems can be used in a variety of places including work places, schools, colleges, offices for monitoring temperature, humidity and pressure and displaying the results on a user-friendly website. This makes IoT based weather monitoring and forecast projects extensively useful in various organizations. The sensors monitor various parameters in the environment for example-Temperature, Pressure and Humidity. The sensed data is then sent to the open source platform through the wi-fi module. The data is displayed on the Thing speak channel in the form of graphs. Also, the data stored in the cloud is extracted in the form of a CSV file. Then the data is fed to a machine learning model which uses Time series analysis algorithm, it processes the data into data frames. The model helps to display the forecasted values on the server. This is an effective way of monitoring weather of a specific zone in order to take preventive measures in case of emergencies or any hazards. The development of IoT-based commands using this project leads to the development of another aspect of technology that can deal with control of appliances and gadgets using the internet.

This Machine learning based Weather Forecasting System is a monitoring system that is supposed to be implemented in existing weather stations, without any changes in the existing infrastructure. This system lets the user or an engineer to monitor and predict the rainfall from this hardware setup without any additional installations. In the microcontroller, the user can program actions what should happen with electrical devices in the network depending on the sensors sensing surrounding environment. It can sense various parameters such as wind speed, wind direction, surrounding temperature, humidity, soil moisture, light luminosity amd even rainfall management.There will be a receiving section and input section separately, so they can exchange information with the Personal Computer. People can control the power supply of electrical devices in order to create an interactive environment to facilitate the control without changing any available device. People can enjoy the high technology and simplicity modern life style. Each device will be with standard setup and while adding it into the network; it can be given a task to do. The machine learning technology is made use of to wade away the problem of having historical backup thereby making the whole system to be user friendly.

2. COMPONENTS DESCRIPTION

3. CIRCUIT DIAGRAM

4. WORKING OF SYSTEM

5. FUTURE SCOPE

Hyperlocal Weather Forecasting: Move beyond city-level forecasts to provide hyperlocal predictions for specific neighborhoods or even individual buildings. This would be valuable for targeted weather alerts, optimizing energy usage, and managing agricultural resources.

Early Warning Systems for Extreme Events: Develop AI-powered systems that can analyze real-time data from various sensors to predict and issue early warnings for extreme weather events like floods, heatwaves, and tornadoes. This could save lives and property by allowing for timely evacuations and preventive measures.

Air Quality Monitoring and Prediction: Integrate air quality sensors into the network to monitor air pollution levels in real-time and predict future trends. This information can be used to issue air quality alerts, inform public health decisions, and guide individuals in making informed choices about outdoor activities.

Personalized Weather Recommendations: Use user location, preferences, and health data to provide personalized weather recommendations for activities like exercise, travel, or outdoor events. This would help individuals make informed decisions to stay safe and comfortable in different weather conditions.

Explainable AI for Weather Prediction: Develop AI models that can explain their reasoning behind weather predictions. This would build trust and transparency in the system, allowing users to understand how the predictions are made and make informed decisions based on them.

6. CONCLUSION

The conclusion is drawn that a very reliable, efficient and less cost product has been developed which can make life more comfortable and securable. This project does not require any hard installations and can be easily installed in old installations. So, it is easily compatible with old systems. Since the project is prediction based and thus doesn't require any extra cost of installing software. Our project will prove to be efficient for many weather monitoring stations, as it will help them in having an alternative solution when there is any absence of the high cost weather monitoring setup. The rainfall prediction is done with the use of machine learning at minimal costs. The complete weather forecasting setup is flexible enough to be installed anywhere and make weather predictions without much historical experience.

7. REFERENCES

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