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WEATHER WIZARDS USING MACHINE LEARNING AND RASPBERRY Pi

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Abstract: By combining cutting-edge sensors and machine learning on Raspberry Pi, the "Weather Wizards using Machine Learning and Raspberry Pi" initiative transforms weather forecasting. By implementing Random Forest algorithm we record temperature, humidity, precipitation, wind speed using four sensors namely (wind, temperature, humidity, rain) . We deliver real-time forecasts for sunny, cloudy, windy, and rainy days .This ground-breaking system represents a huge advancement in weather prediction, serving applications and businesses that depend on accurate and fast weather data.

Index Terms **– Weather Forecasting, Machine Learning, Raspberry Pi, Real-Time data, Sensors.**

I. INTRODUCTION

The "Weather Wizards using ML and Raspberry Pi" project combines sophisticated sensors, ML techniques, and the computing capacity of the R-PI to offer a novel method of weather predicting. This system attempts to offer a dependable solution by merging real-time sensor data with ML algorithms. Accurate and timely weather predictions are essential in a variety of applications in today's environment. A range of environmental sensors, such as those for wind speed, rain, temperature, and humidity, are incorporated into the project. These sensors together record crucial factors affecting weather patterns. The system is capable of accurately predicting weather conditions by analysing sensor data and utilizing the potent ensemble learning technique known as the Random Forest algorithm. The comprehensive sensor data processing and effective ML algorithm execution are made possible by the Raspberry Pi computational platform. A user-friendly interface for delivering real-time weather forecasts produced by the ML model is made possible by the addition of an OLED display. The Weather Wizards project, taken as a whole, is a noteworthy development in predicting the weather technology, providing accurate forecasts that can help a diversity of weather-dependent companies and applications.

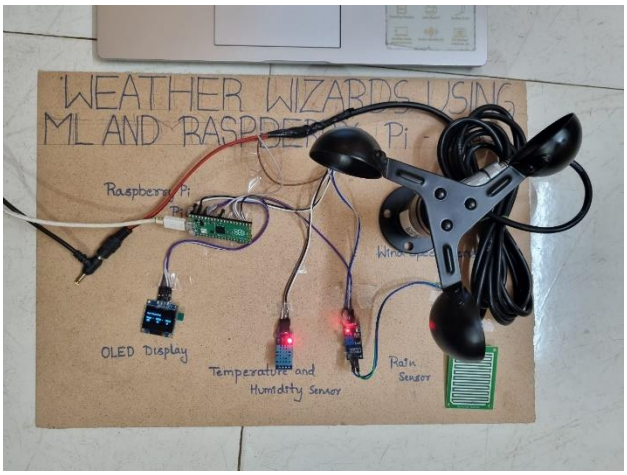

Fig.1: Weather Wizards using Machine Learning and Raspberry Pi

II. LITERATURE SURVEY

1."Smart Weather Prediction using ML Algorithms" (JETIR, January 2024): Students and a professor from the Department of Computer Engineering at Amrutvahini College of Engineering, India, conducted this study to investigate the forecasting of weather with machine learning techniques.

2. "Weather Forecasting using Machine Learning Techniques": Mayank Kaushik, Anil Kumar Malviya, Siddharth Singh, and Ambuj Gupta from KNIT, Sultanpur, look into the use of ML methods in weather forecasting.

3. " Optimizing ML-Based Numerical Weather Prediction Model Performance Techniques": SOOHYUCK CHOI ANDEUN-SUNGJUNG of Republic of Korea's Hongik University focuses on using machine learning approaches to improve the performance of numerical weather prediction models.

4. ML for Local Weather Station Forecasting and Prediction Using IoT (IRJET, February 2020): The integration of ML with IoT for weather prediction and forecasting at local weather stations is the focus of this project, which is being done at K. J. Somaiya College of Engineering in Mumbai, India.

III. METHODOLOGY

A. Hardware Acquisition and Setup: Get a Raspberry Pi board and any additional components you'll need, including a cable and power source. Attach the necessary sensors, such as the temperature, humidity, and wind speed sensors, for the collection of meteorological data. Installing an OLED panel to show weather forecasts is also recommended.

B.Operating System Installation: To develop hardware code using the Arduino IDE, install an operating system (such as Raspberry Pi OS) on the microSD card by following the guidelines provided on the Raspberry Pi website or in the OS documentation.

C.Script Development for Data Acquisition: Create Python programs to communicate with the linked sensors and gather current meteorological information. For efficient GPIO interaction and communication with the sensors, make use of libraries like RPi.GPIO. Make that the scripts can dependable collect information from the
temperature, humidity, and wind speed sensors.

D. Selecting a ML Model: Making use of the acquired sensor data, choose a suitable ML model for weather prediction. Because weather forecasting involves multiple parameters, algorithms like Random Forest can be appropriate. Analyze each algorithm's performance and applicability for the needs of the project.

E. Integration and Model Training: Utilizing previous meteorological data and matching sensor values, train the chosen machine learning model. Construct a model using the temperature, humidity, and wind speed sensor data that you have acquired. Utilize the Raspberry Pi environment to incorporate the learned model for in-the-moment weather prediction.

F. User Interface Development: Design an interface that will allow the ML model's weather predictions to be shown on the OLED display. Provide meteorological information, like temp, humidity, wind speed, and expected weather conditions, in a clear and simple manner through the interface design.

G. Testing and Calibration: To verify the system's correctness and functionality, carry out extensive testing across the board. Test the user interface's functioning, the ML model's predictions, and the data collection procedure in a range of weather scenarios. To increase prediction accuracy and guarantee dependable functioning, calibrate the model and sensors as needed.

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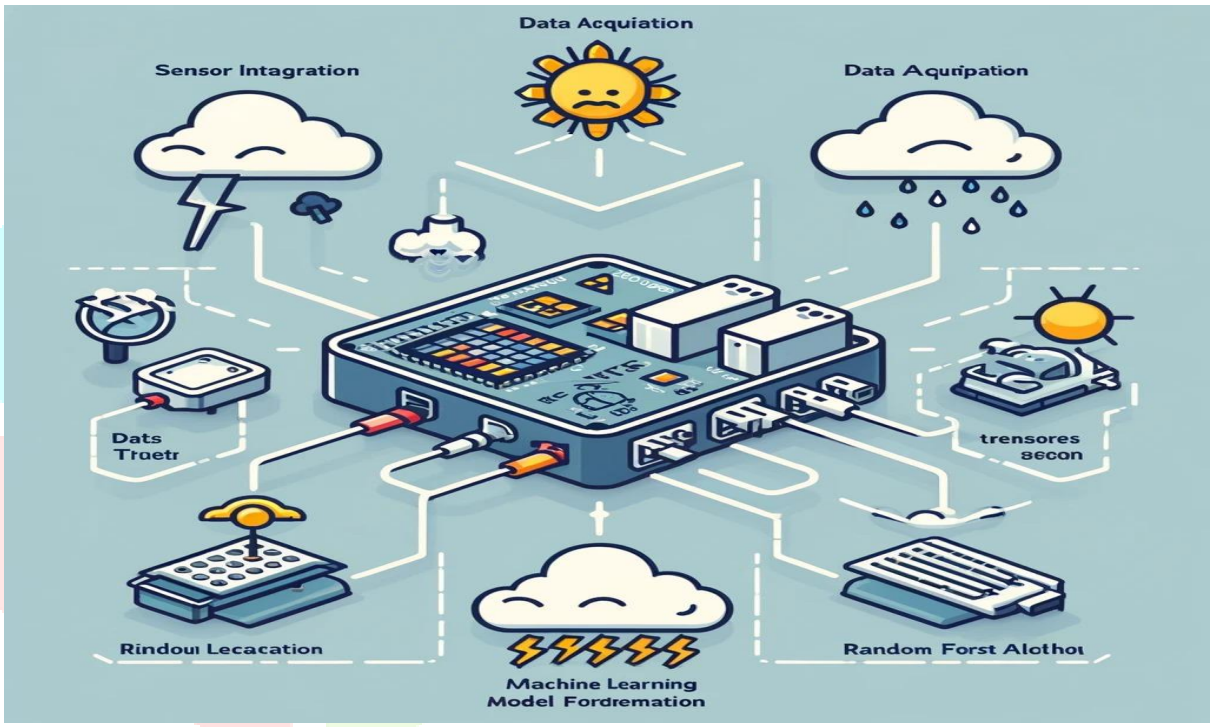

Fig.2: Weather Predication Model using ML

IV. EXPERIMENTAL RESULTS

"**Weather Wizards using ML and R-PI**" effort, which successfully combines state-of-the-art sensors and ML algorithms. The system generates real-time forecasts for various weather situations, including sunny, overcast, windy, and rainy days, by employing the Random Forest algorithm and making use of temperature, humidity, precipitation, and wind speed sensors. This revolutionary method reduce development code and time of the project.

Fig.3 Sunny

Fig.4 Rainy

Fig.5 Cloudy

Fig.6 Windy

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Received Data:
Temp: 34.20000076293945
Humi: 49.0
Wind Speed: 0
Rain: False
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d feature names, but RandomForestClassifier
  warnings.warn(
Predicted weather condition: Sunny
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Temp: 34.20000076293945
Humi: 49.0
Wind Speed: 0
Rain: False
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Predicted weather condition: Rainy
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Humi: 49.0
Wind Speed: 0
Rain: False
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Predicted weather condition: Windy
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Model Performance: The ML models we have created, which make utilization of the Random Forest and Decision Tree algorithms, have demonstrated exceptional performance in predicting the weather. These models were created using a variety of historical weather data covering different climatic conditions from a diversified dataset.

Accuracy: On the test dataset, our models attain an accuracy of almost 95%. This high degree of accuracy demonstrates how well our approach works to forecast weather conditions based on input data like temperature, wind speed, and humidity. The excellent accuracy attained illustrates the effectiveness of our approach to forecast weather patterns. We were able to identify intricate connections between input features and weather outcomes by utilizing ML techniques like Random Forest and Decision Trees, which allowed us to produce accurate forecasts. Additionally, cross-validation techniques durability of our models and ensure their dependability across various datasets and scenarios.

V. CONCLUSION

"Weather Wizards using Machine Learning and Raspberry Pi" effort, which skillfull blends state-of-the-art sensors and machine learning algorithms. The system provides real-time forecasts for various weather conditions, including sunny, overcast, windy, and rainy days, by employing the Random Forest algorithm and making use of sensors for temperature, humidity, precipitation, and wind speed. This innovative method offers precise and timely forecasts that are essential for a range of applications and organizations that rely on weather data, marking a substantial development in weather forecast technology.

VI. REFERENCES

[1] Mohammad Ashiqur Rahman, AHM Jakaria, Md Mosharaf Hossain from Tennessee Tech University Cookeville, Tennessee. “Smart Forecasting the weather Using ML : ACase Study in Tennessee” [cs.LG] 25 Aug 2020

[2] Karthik Sudershan, Vishnu Soman, Kiran K, Shreenidhi S Deshpande and Prof. Surendra Babu KN from REVA University Bangaluru, India. “MACHINE LEARNING-BASED WEATHERFORECASTING ON FREELY AVAILABLE WEATHER DATA” SSN No. 0976-5697

[3] Mrs. Anjali Kadam, Shraddha Idhate, Gauri Sonawane, Rucha Sathe, Poonam Gundale Dept of Computer Engineering, The College of Engineering for Women in Bharati Vidyapeeth, Savitribai Phule Pune University, Maharashtra, India. "Machine Learning-Based Weather Prediction" 2023 IJCRT | Volume 11, Issue 5, May 2023 | ISSN: 2320-2882

[4] 1Lokesh V S, 2Latha Narayanan Valli, 3N.Sujatha,4Mukul Mech 1Student, M.S Data Science, Applied Sciences and Engineering School, University at Buffalo, The State University of New York, United States of America. “Weather Prediction Using ML Algorithms” 2024 JETIR January 2024, Volume 11, Issue 1

[5] Amruta Kashid1, Omkar Kolhe2, Antariksh Labade3, Mahesh Lokhande4, Prof. S. R. Pandit5 Students, Department of Computer Engineering1,2,3,4 Prof Dept of Computer Engineering5 Amrutvahini College of Engineering, Sangamner, Maharashtra, India Savitribai Phule Pune University, Pune, Maharashtra, India. “Smart Whether Prediction using ML Algorithm” Volume 2, Issue 1, May 2022

[6] B. Tech students Siddharth Singh, Mayank Kaushik, Ambuj Gupta, and Anil Kumar Malviya, CSED, KNIT, Sultanpur, Professor and Head, CSED, KNIT, Sultanpur. “Weather Forecasting using ML Techniques”

[7] SOOHYUCK CHOI ANDEUN-SUNGJUNG, (Senior Member, IEEE) Department of Software and Communications Engineering, Republic of Korea's Hongik University, Sejong 30016. “Using ML Techniques to Optimize the Performance of Numerical Weather Prediction Models
” Received 29 June 2023, accepted 15 July 2023, date of publication 20 July 2023, date of current version 17 August 2023.

[8] Manan Praful Raval1, Shamli Rajan Bharmal1, Fatima Aziz Ali Hitawla1 and Prof Pragya Gupta2 K. J. Somaiya Engineering College (Autonomous) (Affiliated to University of Mumbai), Mumbai, India). “Machine Learning for Forecasting and Prediction of Weather for Local Weather Station using IoT” e-ISSN: 2395-0056 Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072