# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590014.

A Internship Report

On

## "AIoT-based Smart Weather Monitoring System"

*Submitted in partial fulfillment of the requirement for the award of degree of*

**BACHELOR OF ENGINEERING**

By


**Prajwal Sangamesh Motagi (1AP21EC010)**

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**Under the guidance of:**
**Sai Charan Theja**

**2024 – 2025**


**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**A P S COLLEGE OF ENGINEERING**

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# Evaluation Sheet

**Title of the Project: AIot - based Smart Weather Monitoring System**

**Name of the Students: Prajwal Sangamesh Motagi**
**Pragathi A**
**Umesh D C**

External Supervisor:

_____

Internal Supervisor:

_____

_____

Date:

Place:

# Project Completion Certificate

I, **Prajwal Sangamesh Motagi** (1AP21EC010), hereby declare that the material presented in the Project Report titled **"AIot-based Smart Weather Monitoring System"** represents original work carried out by me in the **Department of Electronics and communication** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

- I have not manipulated any of the data or results.
- I have not committed any plagiarism of intellectual property and have clearly indicated and referenced the contributions of others.
- I have explicitly acknowledged all collaborative research and discussions.
- I understand that any false claim will result in severe disciplinary action.
- I understand that the work may be screened for any form of academic misconduct.

**Date**: **Student Signature**:

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In my capacity as the supervisor of the above-mentioned work, I certify that the work presented in this report was carried out under my supervision and is worthy of consideration for the requirements of the B.Tech. Internship Work.

**Advisor's Name**: **Sameerana C P** **Guide Name: Sai Charan Theja**

**Advisor's Signature** **Guide Signature**

# Project Completion Certificate

I, **Pragathi A** (1AP21CS034), hereby declare that the material presented in the Project Report titled **"AIot-based Smart Weather Monitoring System"** represents original work carried out by me in the **Department of Computer Science** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

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**Advisor's Name**: **Sameeranna C P** **Guide Name: Sai Charan Theja**

**Advisor's Signature** **Guide Signature**

# Project Completion Certificate

I, **Umesh D C** (1AP21CS052), hereby declare that the material presented in the Project Report titled **" AIot-based Smart Weather Monitoring System"** represents original work carried out by me in the **Department of Computer Science and Engineering** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

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# ABSTRACT

The Weather Monitoring and Reporting System that is based on the Internet of Things (IoT) is used to provide real-time updates on weather conditions such as temperature, humidity, moisture, and rain levels. For instance, if scientists or nature analysts need to monitor changes in a specific environment like a volcano or a rainforest, they may face limitations with an SMS based weather monitoring system that only sends messages to a few recipients, and the time required for sending messages increases with the number of mobile numbers. In such cases, individuals would need to visit specific sites to access information on the weather conditions, which is visible to everyone.

Due to drastic changes in climate, weather forecasts are becoming increasingly unpredictable. As a result, Weather Reporting Systems are being primarily used for real-time monitoring of continuously changing weather and climatic conditions in controlled areas like homes, industries, and agriculture. The IoT platform, ThingSpeak, is utilized for displaying weather parameters and information globally. This information is also displayed on an OLED using two-way microcontroller communication via Wi-Fi hotspots. Reports on weather conditions for particular places that are based on satellite systems may not provide exact weather conditions, which can be problematic when accurate weather reports are needed in real-time. In the Weather Reporting System, all weather parameters sensors are controlled by an ESP32 microcontroller acting as the server that sends all the data collected by sensors to the ThingSpeak database, which is visible worldwide and displayed on the OLED using a Wemos DI mini as the client microcontroller. The collected data is then compared to weather forecast data and statistics generated by forecast stations. To simplify data analysis, all collected data is saved in Google Sheets format using the IFTT tool. This system monitors changes in weather conditions occurring in the environment and provides users with the quickest way to access information

# CHAPTER 1

# INTRODUCTION

Smart weather monitoring system allows for weather parameter reporting over the Internet. It allows the people to directly check the weather states online without the need of a weather forecasting agency. System uses temperature, humidity as well as rain with humidity sensor to monitor weather and provide live reporting of the weather statistics. The system constantly monitors temperature using temperature sensor, humidity using humidity sensor and also for rain. Weather monitoring system deals with detecting and gathering various weather parameters at different locations which can be analysed or used for weather forecasting.

The aim of this system is achieved by technologies such as Internet of Things (IOT) and Cloud. The idea of internet of things is to connect a device to the internet and to other required connected devices. Using Internet the information from the IOT device can easily be transferred to the cloud and then from the cloud to the end user. Weather Monitoring is an essential practical implementation of the concept of Internet of Things, it involves sensing and recording various weather parameters and using them for alerts, sending notifications, adjusting appliances accordingly and also for long term analysis. Also we will try to identify and display trends in parameters using graphical representation. The devices used for this purpose are used to collect, organize and display information. It is expected that the internet of things is going to transform the world by monitoring and controlling the phenomenon of environment by using sensors/devices which are able to capture, process and transmit weather parameters. Cloud is availability of computer system resources like data storage, computing power without direct active management of user. The data captured is transmitted to the cloud so that the data could be further displayed. Besides this, the system consists of components such as Arduino UNO board which is a microcontroller board consisting of 14 digital pins, a USB connection and everything used to support microcontroller; DHT11 is Temperature and humidity sensor which is used for detecting these mentioned parameters; WIFI module is used to convert the data collected from the sensors and then send it to the web server. So, in this way weather conditions of any location can be monitored from any remote location in the world.

The system constantly transmits this data to the micro controller which now processes this data and keeps on transmitting it to the online web server over a wifi connection. This data is live updated to be viewed on the online server system. Also system allows user to set alerts for particular instances. In today's world many pollution monitoring systems are designed by different environmental parameters. Existing system model is presented IOT based Weather monitoring and reporting system where you can collect, process, analyze, and present your measured data on web server. Wireless sensor network management model consists of end device, router, gateway node and management monitoring center After receiving the data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server. Less formally, any device that runs server software.

## 1.1 Objective

The objective of a weather monitoring system is to collect and analyze real-time atmospheric data, including temperature, humidity, wind speed, and pressure. It aims to provide accurate weather forecasts for informed decision-making in various sectors. Additionally, it helps in detecting and predicting severe weather events to ensure safety and preparedness.

## 1.2 Problem Statement

- First, gathering data is easy on land, but difficult in the air and at sea, where no one lives, and in the air, which is also not a good place for a meteorological instrument.
- Second, there are limitations to a computer, which is used to make all current weather forecasts: Weather forecasts can, of course, become more precise as computational power increases.
- The method a computer uses to solve equations is one reason for different weather patterns. The main problem is to gather data from all possible environments.
- Further this acquired data is to be used to monitor and report weather so as to be prepared for any adverse weather conditions.

# CHAPTER 2

# APPLICATION

- **Agriculture**:
  - Optimizes crop planning, irrigation, and harvesting.
  - Predicts pests, diseases, and frost conditions.

- **Disaster Management**:
  - Provides early warnings for extreme weather events.
  - Aids in risk assessment and recovery efforts.

- **Transportation**:
  - Enhances safety in aviation, shipping, and road transport.

- **Renewable Energy**:
  - Improves efficiency of solar and wind energy production.

- **Urban Planning**:
  - Assists in designing smart cities with effective drainage and infrastructure.

- **Environmental Monitoring**:
  - Tracks air quality, pollution, and climate changes.

- **Recreation and Tourism**:
  - Supports event planning and outdoor activities.

- **Healthcare**:
  - Monitors weather-triggered health issues like allergies and heatstroke.

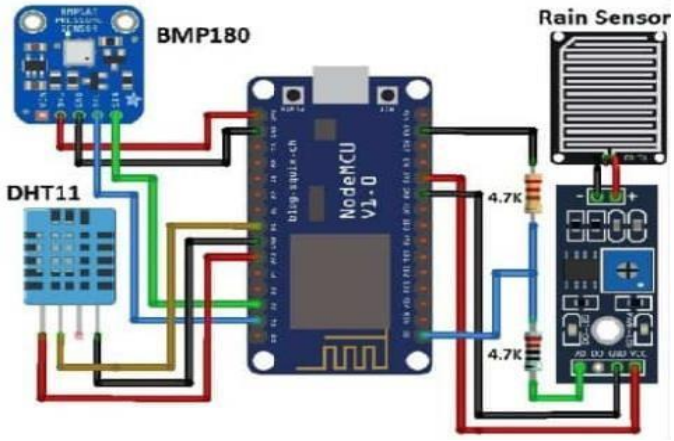
- **Industrial Applications**:
  - Enhances operations in industries like construction, mining, and logistics.

# CHAPTER 3

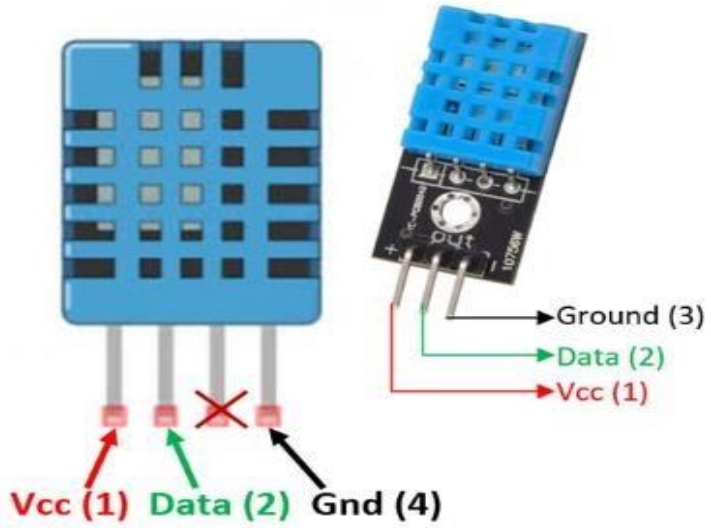
# COMPONENTS

## 3.1 Hardware Components

- **Circuit Diagram:**




- **DHT11 Sensor:**
  Used for measuring temperature and humidity. Connected to the GPIO pin of the system (e.g., Raspberry Pi).



- **Rain sensor:**

  The rain sensor module/board is shown below. Basically, this board includes nickel coated lines and it works on the resistance principle. This sensor module permits to gauge moisture through analog output pins & it gives a digital output while moisture threshold surpasses. This module is similar to the LM393 IC because it includes the electronic module as well as a PCB. Here PCB is used to collect the raindrops. When the rain falls on the board, then it creates a parallel resistance path to calculate through the operational amplifier.


- **Raspberry Pi:**

  Serves as the core processing unit to interact with sensors, control the GPIO pins, and run the Flask application.

- **LED:**
  Connected to GPIO pin 12. Used for visual feedback, such as turning on/off based on temperature thresholds.

- **LCD Display:**
  Used to display information such as the city name and temperature. The pins involved for this are:
  - RS (Register Select): GPIO 15
  - Enable (E): GPIO 12
  - Data Pins: GPIO 23, 21, 19, 24


## 3.2 Software Components:

1. **Flask Framework –**

   For building the web application.

2. **Twilio API –**

   Sends SMS alerts to the user.

3. **Adafruit Libraries –**

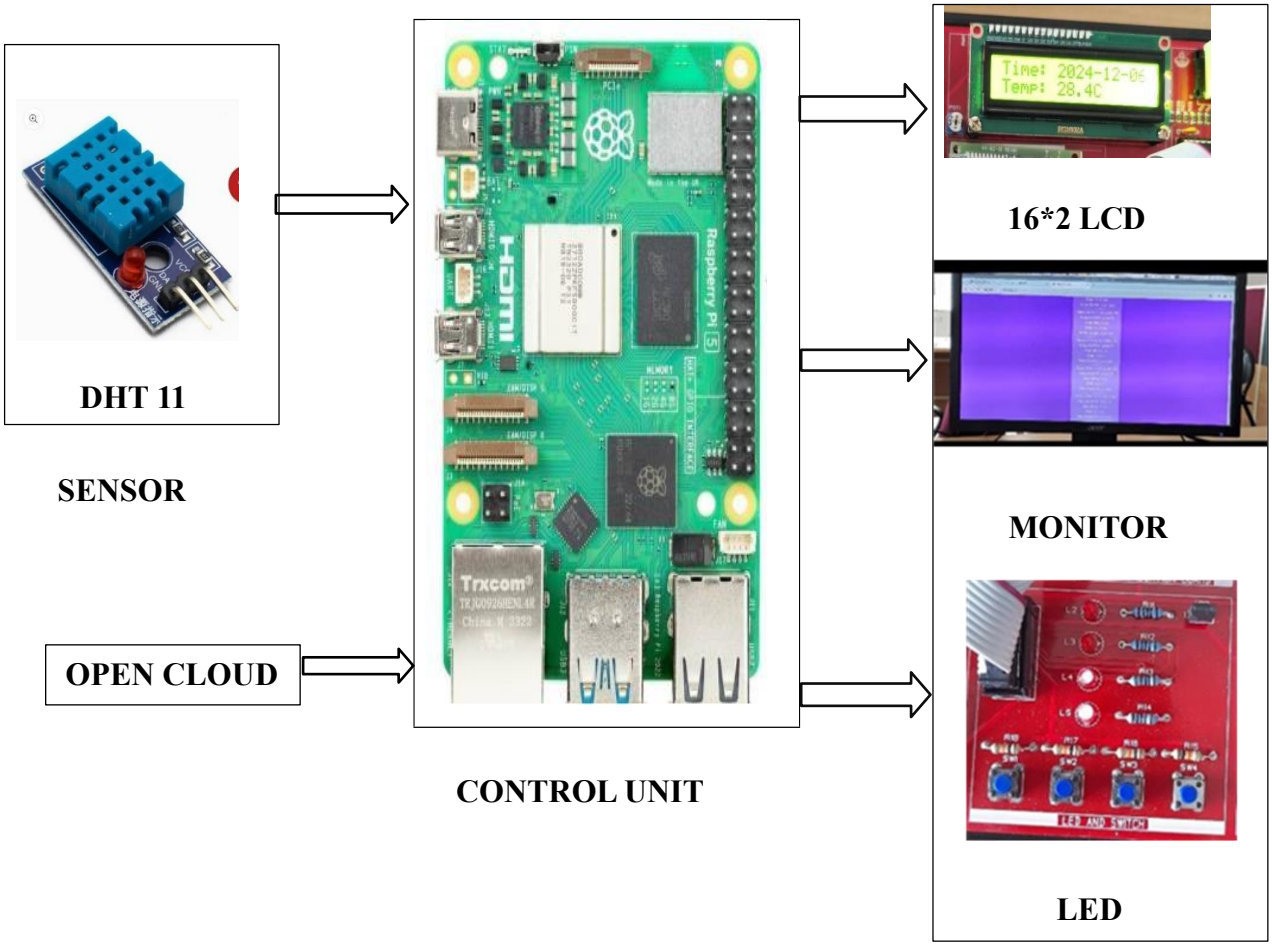
   Interfaces with the sensors.

4. **Python –**

   Implements the logic for hardware interaction and web application functionalities.

# CHAPTER 4

# FLOWCHART



# CHAPTER 5

# CONCLUSION

A weather monitoring system is a vital tool for tracking and analyzing atmospheric conditions in real-time. Its applications span diverse fields such as agriculture, disaster management, transportation, and environmental protection. By leveraging advanced technologies like IoT, AI, and satellite imaging, weather monitoring systems are becoming more accurate, efficient, and accessible.

These systems not only enhance decision-making and safety but also contribute to addressing global challenges like climate change and natural disasters. With continuous advancements, they hold the potential to play a transformative role in creating resilient and sustainable societies.

# CHAPTER 6

# FUTURE WORK

- **Integration with IoT and Smart Cities:**
  Seamless integration with IoT-enabled devices for real-time weather updates. Supporting smart city infrastructure by managing traffic, drainage, and public safety during extreme weather.

- **AI and Machine Learning Integration:**
  Enhanced weather prediction using AI algorithms for long-term forecasting. Personalized alerts based on user-specific needs (e.g., agriculture, travel).

- **Improved Data Accuracy and Coverage:**
  Deployment of more sensors in remote and inaccessible areas. Use of satellite and drone technology for wider and more precise monitoring.

- **Climate Change Monitoring:**
  Advanced tools for detecting and analysing climate change patterns. Supporting global sustainability efforts by monitoring greenhouse gases and pollution.

- **Mobile and Wearable Integration:**
  Real-time weather updates and alerts on personal devices. Wearable tech for individuals working in weather-sensitive environments (e.g., construction, agriculture).

- **Disaster Preparedness and Response:**
  Advanced systems for predicting and responding to extreme weather events. Enhanced disaster management planning with real-time feedback and coordination.

- **Global Collaboration:**
  Unified international weather databases for better global forecasting. Open-access platforms to share weather data across nations for research and policy-making.

# CHAPTER 7

# APPENDIX

**Acronyms and Abbreviations:**

- API: Application Programming Interface
- CSV: Comma-Separated Values
- IoT: Internet of Things
- SMS: Short Message Service
- DHT11: Digital Humidity and Temperature Sensor

## 7.1 Pseudo Code

```
BEGIN WeatherMonitoringSystem

  // Initialize components
  Initialize Sensors (Temperature, Humidity, Pressure, Wind Speed, Rainfall, etc.)
  Initialize Data Storage System
  Initialize User Notification System

  WHILE System is Active DO

    // Step 1: Data Collection
    Read Temperature from Temperature Sensor
    Read Humidity from Humidity Sensor
    Read Pressure from Pressure Sensor
    Read Wind Speed from Wind Sensor
    Read Rainfall Data from Rain Gauge
```

// Step 2: Data Processing

IF Data is Invalid THEN

Log Error

CONTINUE

Process Weather Data:

Calculate Heat Index

Determine Weather Conditions (Sunny, Cloudy, Rainy, etc.)

Generate Weather Report

// Step 3: Data Storage

Store Processed Data in Database:

Timestamp, Temperature, Humidity, Pressure, Wind Speed, Rainfall, Weather Condition

// Step 4: Alert Generation

IF Extreme Weather Detected THEN

Generate Alert Message

Notify Users via Email/SMS/App Notification

// Step 5: User Interface Update

Update Dashboard/Graph with Latest Weather Data

Provide Forecast or Historical Data Access

```
        // Step 6: Optional Features
        IF AI Predictions Enabled THEN
            Use Machine Learning to Predict Future Weather Trends

        Wait for Next Data Collection Interval

    END WHILE

    Shut Down System Safely
    Release Resources

END WeatherMonitoringSystem
```