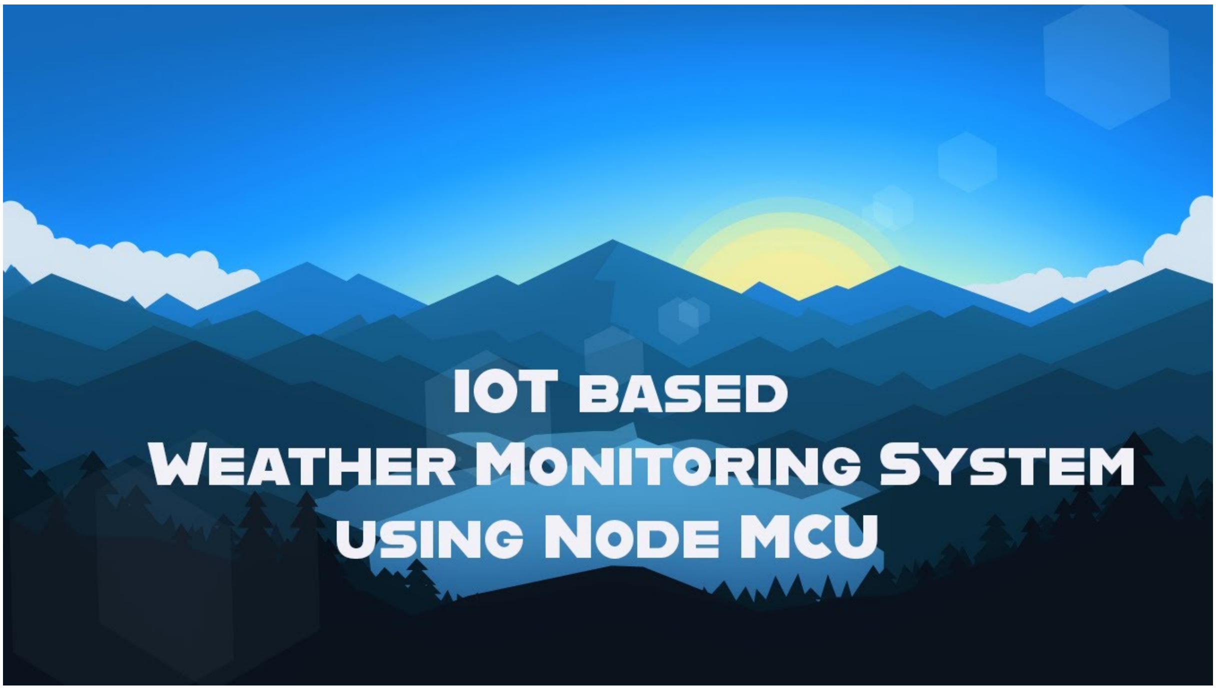
IoT-Based Weather Monitoring System

Name: Adidev Anil(2),
Muhammed Midhilaj(41),
Rayyaan Muhammed Thaha(46)

S3 ER
Department: Electronics and Computer Engineering

October 17, 2025

Project Report on IoT-Based Weather Monitoring System



ABSTRACT

This project presents an **IoT-based weather monitoring system** that measures **temperature**, **humidity**, **rain detection**, and **ambient light intensity** in real time. Using sensors such as **DHT11**, **rain sensor**, and **LDR**, the system collects environmental data and transmits it via **Wi-Fi** using the **ESP8266 NodeMCU**. The data is logged to an **IoT platform** for remote monitoring through a smartphone or web dashboard. This solution is **cost-effective**, **scalable**, and useful for applications like smart agriculture and environmental monitoring.

1 INTRODUCTION

Weather monitoring plays a vital role in agriculture, disaster management, and daily activities. Traditional manual observations are often time-consuming and inaccurate. The advent of **IoT technology** enables automatic measurement, recording, and transmission of weather parameters. This project designs and implements an **IoT-enabled weather monitoring system** to measure temperature, humidity, rain, and light intensity in real time.

2 OBJECTIVES OF THE PROJECT

1. To design a **real-time IoT-enabled weather monitoring system**.
2. To measure **temperature** and **humidity** using the **DHT11 sensor**.
3. To detect **rain presence** using a **rain sensor**.
4. To measure **light intensity** using an **LDR sensor**.
5. To transmit collected data to an **IoT cloud platform**.
6. To provide **remote access** to weather data via a mobile/PC dashboard.
7. To provide a **scalable** and **cost-effective** monitoring solution for agriculture and smart environments.

3 BLOCK DIAGRAM OF THE SYSTEM

A logical block diagram illustrating the system architecture is shown in Figure 1.

4 EXPLANATION

- **DHT11 Sensor:** Measures **temperature** and **humidity** and provides a digital output to the microcontroller.
- **Rain Sensor:** Detects **presence or absence of rain** by sensing water droplets on its sensing pad, outputting an analog or digital signal.

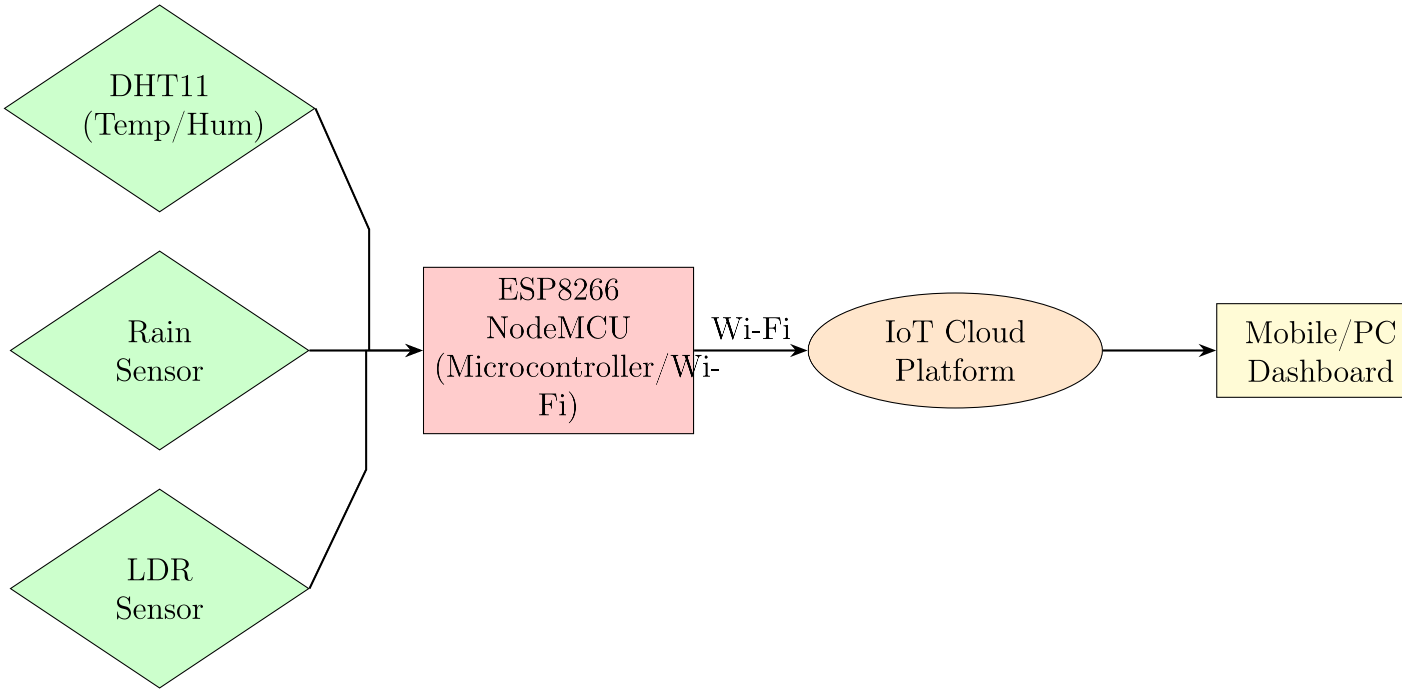


Figure 1: Block Diagram of the IoT Weather Monitoring System

- **LDR (Light Dependent Resistor):** Measures **ambient light intensity** (luminosity) by changing its resistance based on the light level.
- **ESP8266 NodeMCU:** A Wi-Fi-enabled **microcontroller** that processes the sensor data, connects to the Wi-Fi network, and transmits the compiled data to the cloud.
- **IoT Cloud Platform:** A service (e.g., **ThingSpeak** or **Blynk**) that securely **stores** the real-time weather data and makes it accessible for remote viewing.
- **Mobile/PC Dashboard:** The user interface that allows the user to **monitor** the weather parameters remotely and visualize trends.

5 CIRCUIT DIAGRAM WITH DETAILED COMPONENTS

5.1 Components Required

- **ESP8266 NodeMCU** – Wi-Fi-enabled microcontroller
- **DHT11 Sensor** – Temperature and humidity measurement
- **Rain Sensor Module** – Rain detection
- **LDR Sensor** – Ambient light measurement
- Breadboard, jumper wires, resistors (e.g., 10kΩ for LDR pull-down)
- Power supply (5V)

5.2 Circuit Diagram

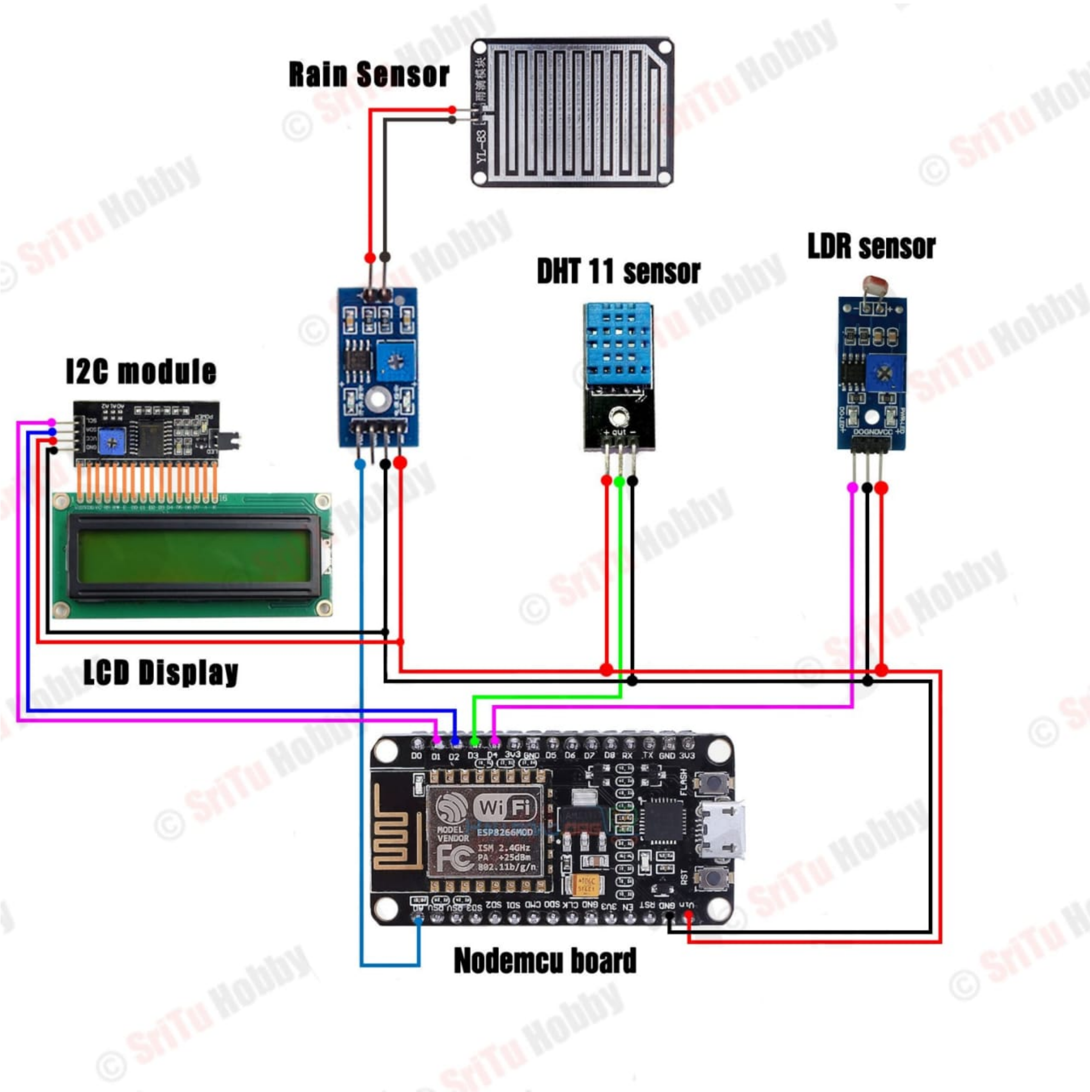


Figure 2: Circuit Diagram of Weather Monitoring System

6 WORKING PRINCIPLE

The system operates by continuously polling data from the sensors. The **DHT11 sensor** measures temperature and humidity, the **rain sensor** detects rain presence, and the **LDR** monitors ambient light levels. The **ESP8266** microcontrollers processes this sensor data, connects to the local Wi-Fi network using programmed credentials, and then sends the aggregated data packet to a predetermined **IoT cloud platform** (e.g., ThingSpeak or Blynk) using HTTP or MQTT protocols. Users can access and monitor the weather data remotely through a smartphone application or web dashboard, enabling **real-time weather tracking** and facilitating automated notifications or **alerts** based on predefined thresholds.

7 EXPECTED OUTPUTS/OUTCOMES

The successful implementation of this project is expected to deliver the following outcomes:

1. **Real-time measurement** of temperature (°C), humidity (%RH), rain detection (Present/Absent), and light intensity (Analog/Lux value).
2. **Remote monitoring** through an IoT dashboard on a mobile device or PC.
3. Automated **alerts** for rain detection or significant environmental changes (e.g., high temperature).
4. **Data logging** for long-term weather analysis and trend identification.
5. A **scalable** and **cost-effective** solution suitable for applications like smart agriculture and general environmental monitoring.

8 CONCLUSION

The proposed IoT-based weather monitoring system using **ESP8266**, **DHT11**, rain sensor, and **LDR** is demonstrated to be a **low-cost**, **reliable**, and **scalable** solution. It achieves its objectives by enabling **real-time weather data collection** and transmission to cloud platforms, significantly enhancing data accessibility for practical applications such as **agriculture** and **environmental awareness**.