

SMART WEATHER STATION

The Weather Station is an IoT-based system using NodeMCU ESP8266 to monitor temperature, humidity, rain, and light levels with sensors like DHT11, rain sensor, and LDR. It displays real-time data locally on an Serial Monitor and remotely on an Adafruit IO dashboard, with IFTTT integration for automated email alerts on critical weather conditions.

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INTRODUCTION

- This project presents a Smart Weather Monitoring System built using the **NodeMCU ESP8266**, a microcontroller with **built-in Wi-Fi** support, ideal for IoT applications.
- The system collects environmental data using **DHT11** (temperature & humidity), a **rain sensor** (precipitation detection), and an **LDR** (ambient light monitoring).
- Real-time data is displayed on a 16x2 I2C LCD display for immediate local viewing.
- Sensor data is simultaneously sent to the **Adafruit IO Cloud Platform**, enabling remote access and historical data visualization through a web dashboard.
- **IFTTT** (If This Then That) integration allows automated email alerts to users when predefined thresholds (e.g., rain detected, high humidity, low light) are exceeded.

OBJECTIVE

To design and implement a low-cost, IoT-based smart weather monitoring system using **NodeMCU ESP8266** that provides **real-time environmental data** and **automated alerts** via cloud integration.

METHODOLOGY

- **Sensor Integration:** Connect DHT11, Rain Sensor, and LDR to NodeMCU ESP8266 for environmental data collection.
- **Data Processing:** NodeMCU processes sensor data and formats it for display and transmission.
- **Local Display:** Real-time data is shown on a 16x2 I2C LCD for immediate viewing.
- **Cloud Upload:** Sensor readings are sent to Adafruit IO for remote monitoring and storage.
- **Automation & Alerts:** IFTTT is used to send email alerts when predefined weather conditions are detected.

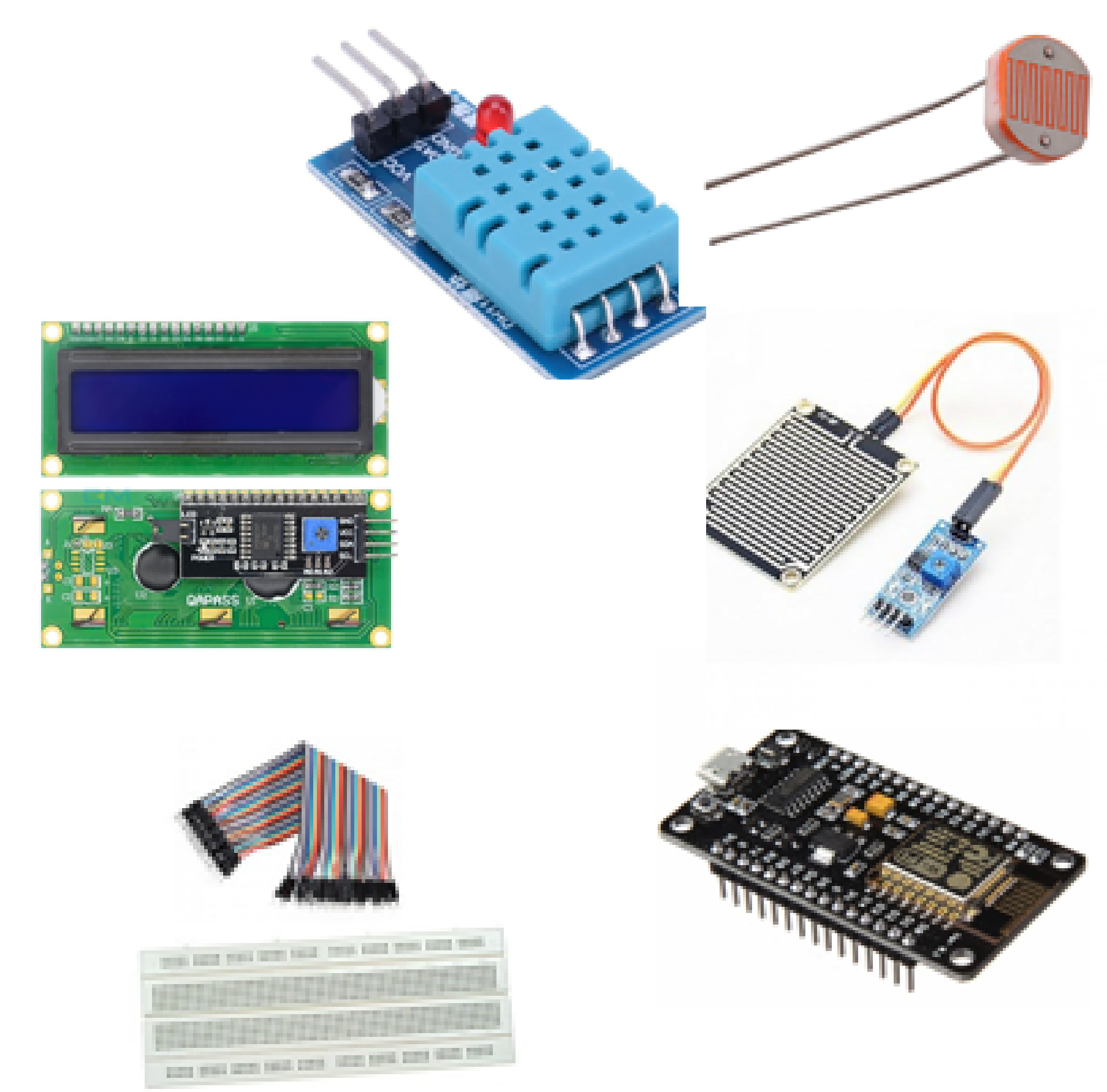
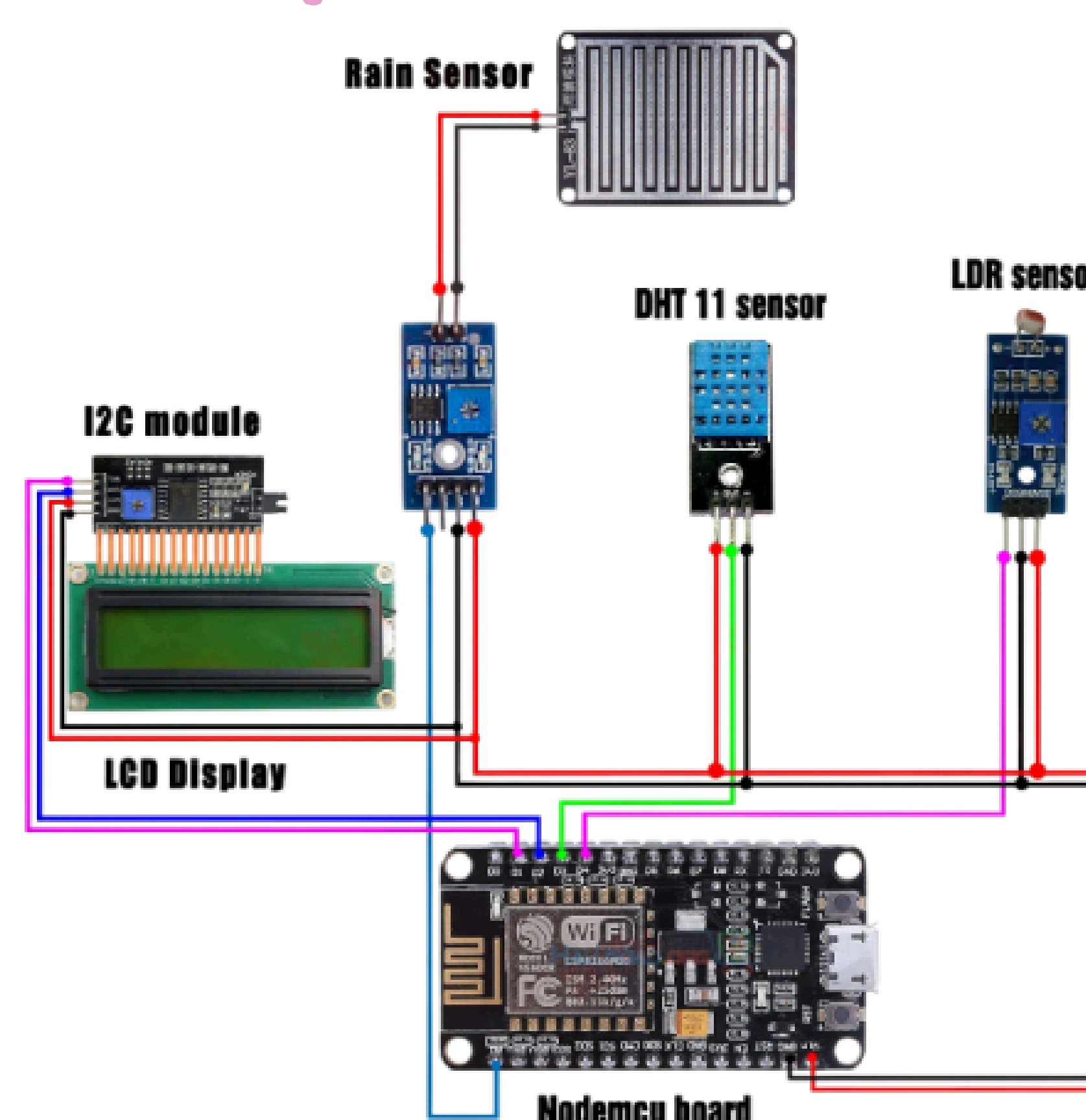
RESULTS

- **Accurate Data Collection:** Successfully captured real-time temperature, humidity, rain, and light intensity.
- **Serial Monitor Display:** Sensor readings were accurately displayed on the serial monitor for easy debugging and observation.
- **Remote Monitoring:** Sensor data was transmitted and visualized effectively on the Adafruit IO dashboard.
- **Email Alerts Functional:** IFTTT triggered automated alerts when threshold conditions were met.



ANALYSIS

- **Sensor Integration:** The DHT11, rain sensor, and LDR connect to the NodeMCU ESP8266, sending analog and digital signals to measure temperature, humidity, light, and rainfall levels for accurate monitoring.
- **Power Supply:** The system operates on a 5V supply, with the energy-efficient NodeMCU ensuring stable data collection and transmission while minimizing power consumption.
- **Wireless Communication:** The NodeMCU's Wi-Fi module transmits data to Adafruit IO for remote monitoring, enabling automated actions via IFTTT to trigger alerts based on weather conditions.



CONCLUSION

- Developed a smart, IoT-based weather monitoring system using NodeMCU ESP8266, collecting real-time data on temperature, humidity, rain, and light.
- Enabled both local display and remote monitoring via Adafruit IO cloud dashboard, with IFTTT automation to trigger email alerts for critical weather conditions.
- Presented a low-cost, scalable solution ideal for educational, agricultural, and smart home applications.
- **Real-Time Data Analysis:** Enabled continuous data collection and trend analysis, allowing users to make informed decisions based on up-to-date environmental conditions.

