Project Report

Student Name: Adnan Irshad
UID: 24MCI10189
Branch: MCA(AI-ML)
Section/Group: 24MAM-1B
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Subject Name: IOT Lab
Subject Code: 24CAH-723

Aim: IoT-Based Smart System to Monitor Air Quality, Temperature, and Humidity Using Blynk Platform

Objectives:

The primary objective of this project is to design and implement a smart IoT-based monitoring system capable of detecting hazardous gases and monitoring temperature variations in real time to ensure environmental safety and prevent potential accidents.

This system utilizes the MQ2 gas sensor to detect the presence of combustible gases such as LPG, methane, hydrogen, and smoke, and the DHT11 sensor to measure ambient temperature and humidity. The sensor readings are processed by the NodeMCU (ESP8266) microcontroller, which is equipped with built-in Wi-Fi for wireless data transmission. The collected data is then uploaded to an IoT cloud platform (like ThingSpeak or Blynk), allowing users to monitor air quality and temperature remotely through a web or mobile dashboard.

To enhance safety, the system incorporates LED indicators (and optionally a buzzer) that provide instant visual alerts when gas concentrations or temperature levels exceed safe thresholds. This real-time feedback mechanism ensures timely detection of potential gas leaks or overheating conditions, reducing risks to life and property.

Ultimately, the project aims to demonstrate the effective integration of IoT technology, sensor networks, and wireless communication to build a low-cost, energy-efficient, and scalable smart monitoring solution suitable for homes, laboratories, and industrial environments.

Components Required:

S.No.	Name of Component	Qty.
1	NodeMCU (ESP8266)	1
2	DHT11 (Temperature & Humidity Sensor)	1
3	MQ2 Gas Sensor	1
4	LEDs (Indicators)	2
5	Breadboard	1
6	Jumper Wires	11

Details of Components:

1. NodeMCU:

The NodeMCU board is a low-cost, open-source IoT development platform that combines an ESP8266 Wi-Fi microchip with onboard USB and GPIO features. It supports programming through the Arduino IDE, making it easy for beginners and professionals to build IoT-based applications. The board enables seamless integration with cloud-based platforms such as Blynk, allowing real-time data monitoring, remote control of devices, and automation through the internet.

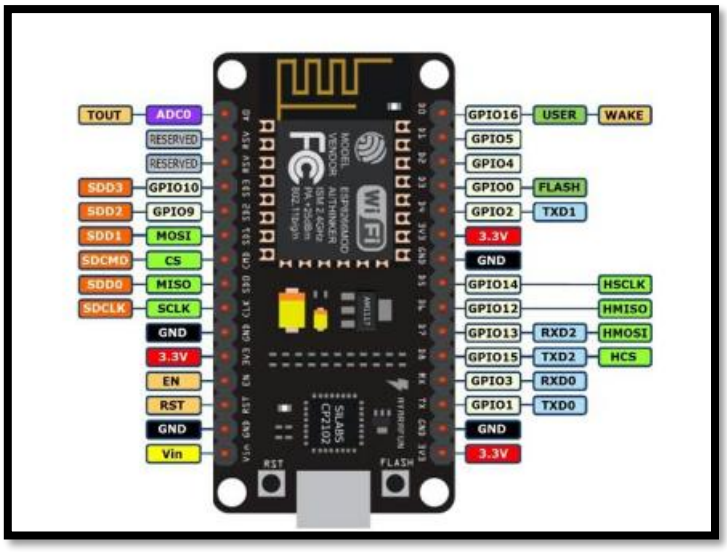


Figure 1 : NodeMCU Board

2. Gas Sensor (MQ2):

The MQ2 Gas Sensor is an analog sensor used to detect gases like LPG, methane, smoke, alcohol, and carbon monoxide in the air. It consists of a sensing material that changes its resistance when exposed to gas molecules, allowing the sensor to produce a measurable analog voltage output. The MQ2 is commonly used in air quality monitoring and safety systems, making it ideal for detecting hazardous gases in a smart home environment.

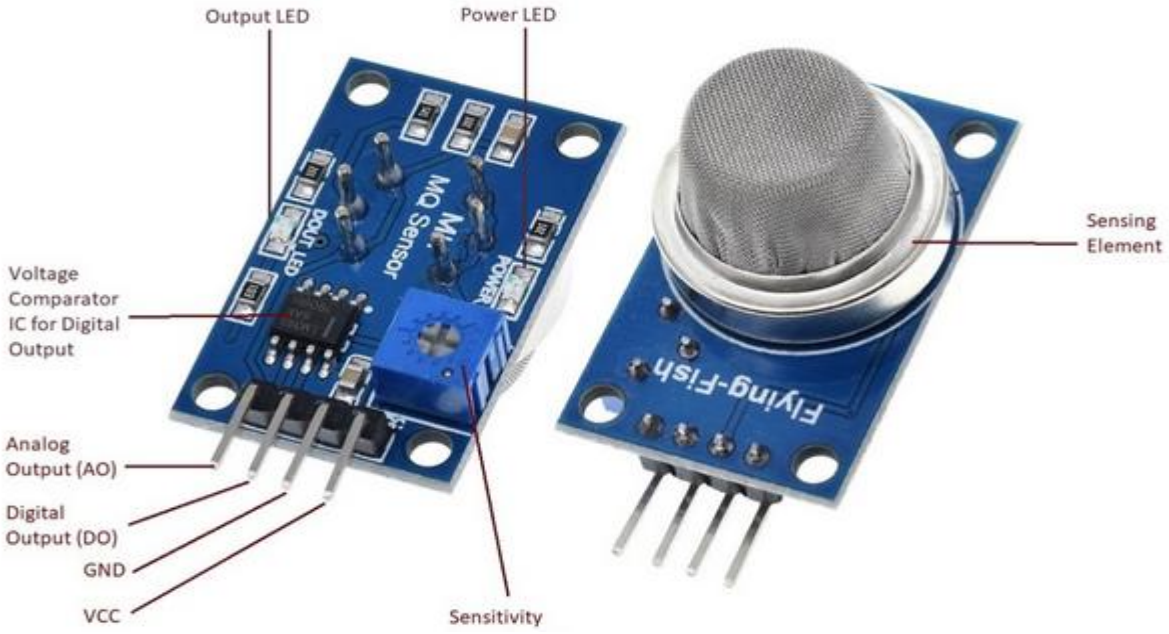


Figure 2 : Gas Sensor

3. DHT11 Sensor:

The DHT11 is a digital sensor used for measuring temperature and humidity. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and provides a calibrated digital signal output.

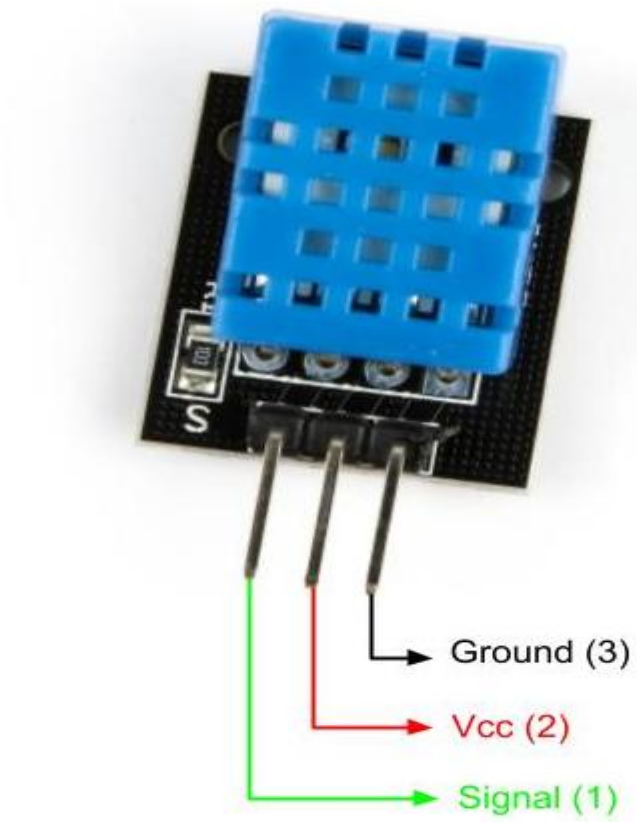


Figure 3 : DHT11

4. LED:

LEDs are used as indicators to show system status. They glow when certain conditions like high temperature or poor air quality are detected, providing quick visual alerts.

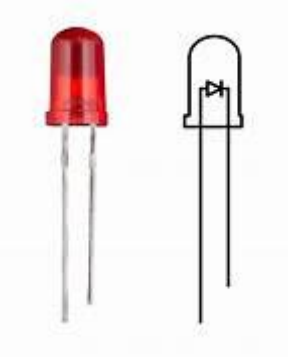


Figure 4 : LED

5. Breadboard:

A breadboard is used to connect and test all components without soldering. It helps in easy circuit design and quick modifications.

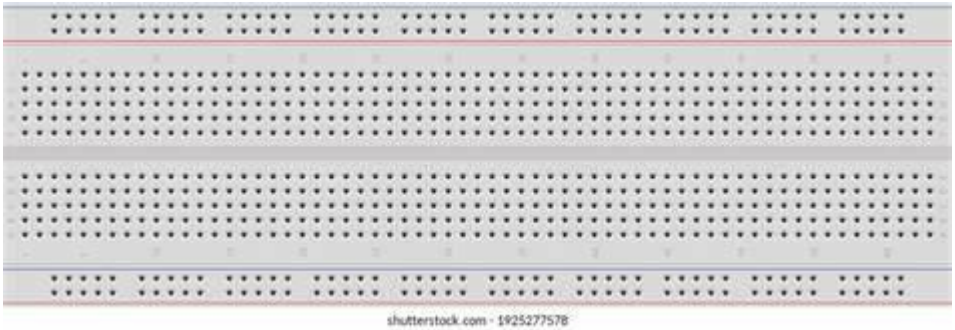


Figure 5 : Breadboard

Block Diagram of Designed Model:

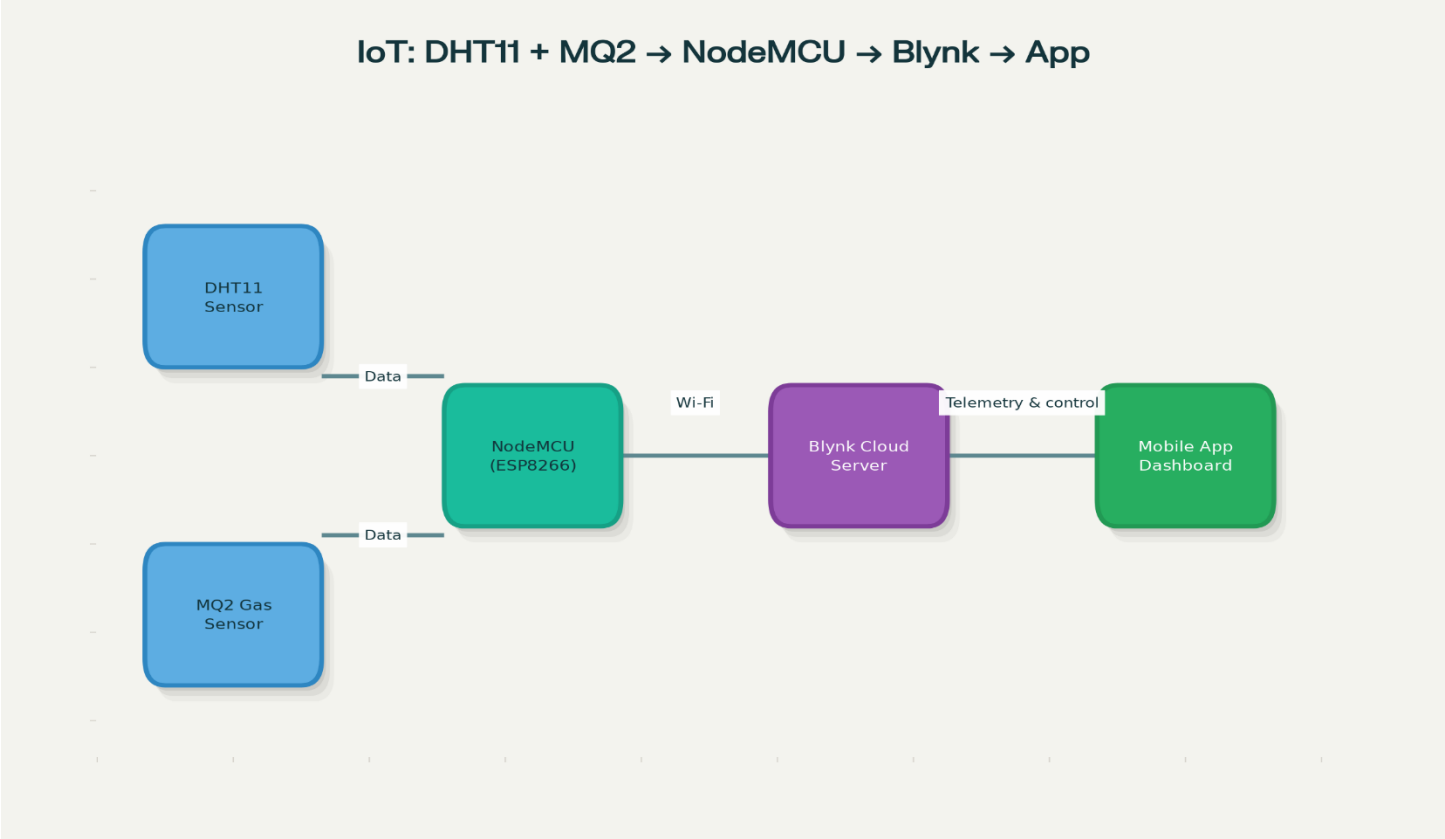


Figure 6 : Block Diagram of Model

Working of Designed Model:

1. The NodeMCU (ESP8266) microcontroller serves as the central unit, responsible for reading sensor data, processing it, and sending it to the cloud through its built-in Wi-Fi module.

2. The MQ2 gas sen sor detects the presence of combustible gases such as LPG, methane, hydrogen, and smoke by sensing changes in its internal resistance when exposed to these gases.

3. The analog output from the MQ2 sensor is fed into the NodeMCU's ADC pin, which converts it into a digital value representing the gas concentration.

4. The DHT11 sensor simultaneously measures temperature and humidity and sends this data digitally to the NodeMCU.

5. The microcontroller continuously reads and processes data from both sensors to monitor environmental conditions in real time.

6. When the gas concentration or temperature crosses the predefined threshold values, the LED indicators are activated to provide a visual alert of unsafe conditions.

7. The processed sensor data is transmitted via Wi-Fi to an IoT cloud platform such as ThingSpeak or Blynk, enabling remote access and monitoring on a smartphone or computer.

8. The cloud platform visualizes the readings in the form of graphs or dashboards, allowing users to track trends and receive alerts in real time.

9. This combination of sensors, microcontroller, and IoT connectivity creates an efficient, low-cost, and smart environmental monitoring system suitable for homes, laboratories, and small industries.

Pictures of Prototype:

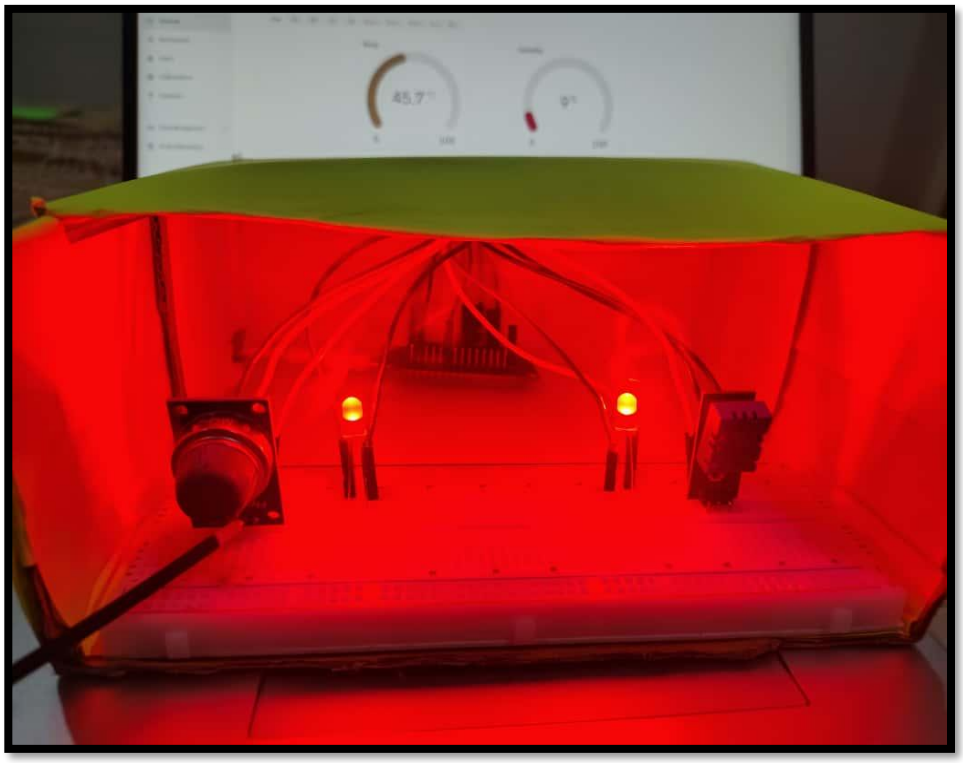
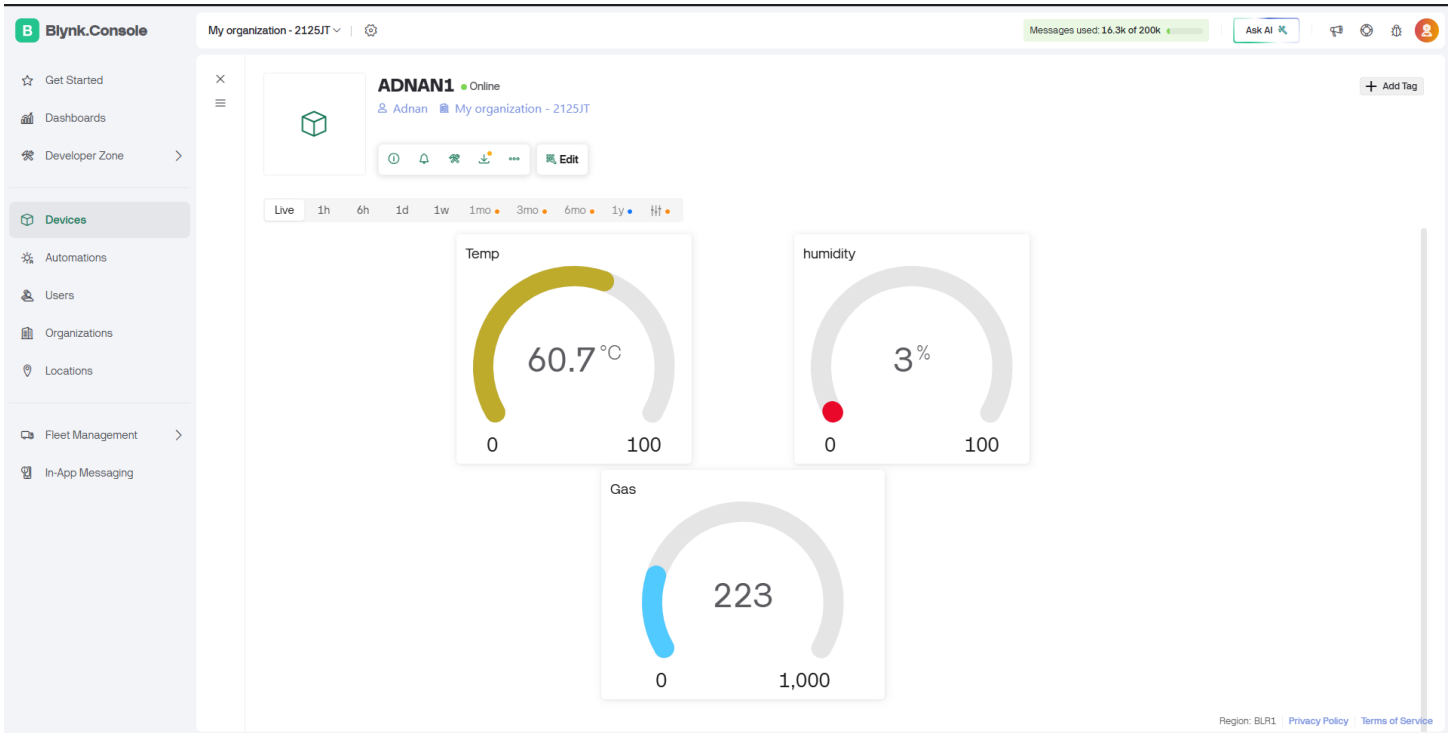
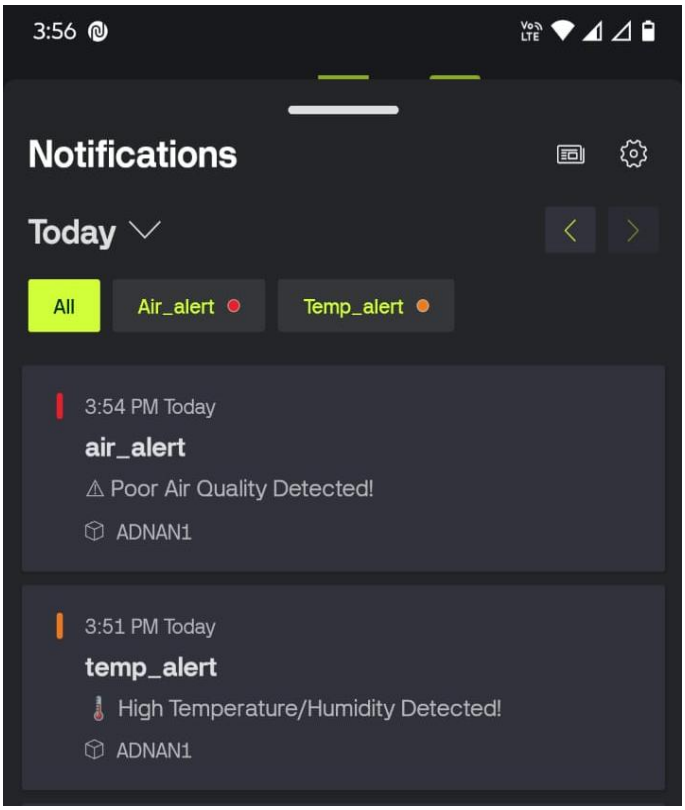


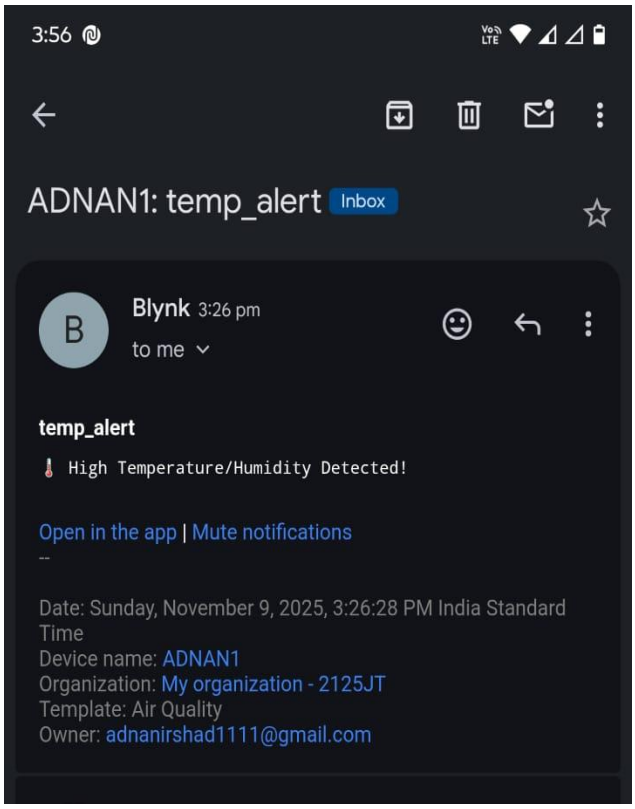
Figure 2 : Designed Model

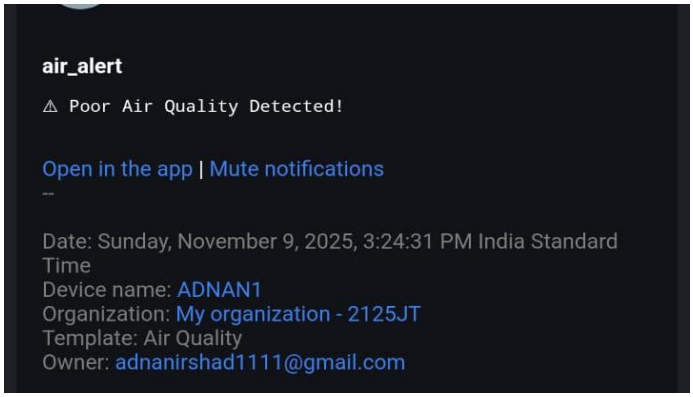
Output of Deigned Model/Prototype



Real-time Notification Alerts







Learning outcomes (What I have learnt):

1. How IoT integrates sensors with cloud-based platforms for smart home automation.
2. How to use Blynk IoT to visualize and monitor live data remotely.
3. Understanding the working of DHT11 and MQ2 sensors for environment monitoring.
4. How to use NodeMCU and event-based programming to send alerts automatically.