Project Title:
IoT-Based Weather Station Monitoring Temperature, Humidity, Rain, Flood, and Pollution using ESP32 and Blynk

Objective:
The goal of the project is to create an IoT-enabled weather station that monitors environmental factors like temperature, humidity, rainfall, flooding, and pollution using an ESP32 microcontroller. The collected data will be displayed in real-time through the Blynk mobile app, enabling users to remotely track local weather conditions. In the event of severe flooding, an overflow drainage system will be triggered automatically or can be activated remotely.

Introduction:

In the era of smart technologies, IoT-based weather monitoring systems offer an efficient and affordable solution for tracking environmental conditions. Weather stations provide valuable data that can be used for climate research, farming, disaster prevention, and general public awareness. The project leverages the ESP32, a powerful microcontroller with built-in WiFi and Bluetooth, to collect environmental data from multiple sensors. The Blynk app is utilized to provide a user-friendly interface for real-time monitoring on a mobile device.

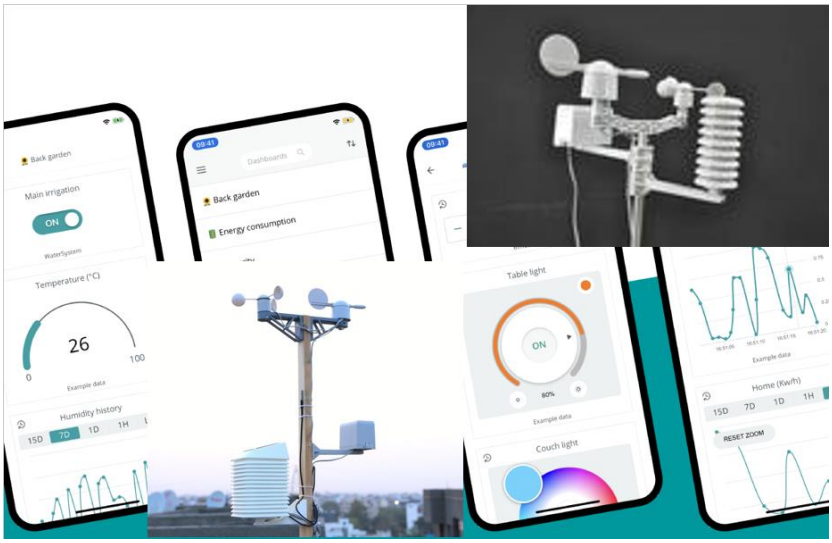
Components and Modules:

1. **ESP32 Microcontroller**: A Wi-Fi-enabled microcontroller for collecting data and transmitting it to the cloud.
2. **DHT11/DHT22 Sensor**: Measures ambient temperature and humidity.
3. **Rain Sensor Module**: Detects the presence of rain and its intensity.
4. **Water Level Sensor**: Detects rising water levels, indicating potential flood conditions.
5. **Air Quality Sensor (MQ135 or PMS5003)**: Monitors pollution by detecting harmful gases and particles in the air.
6. **Blynk Application**: A cloud platform that visualizes sensor data in real time via a smartphone app.

Features:

1. **Temperature Monitoring**: Measures ambient temperature using the DHT11/DHT22 sensor and sends data to the Blynk app.
2. **Humidity Monitoring**: Monitors relative humidity levels, crucial for environmental monitoring.
3. **Rain Detection**: A rain sensor detects the presence of rain and changes in rainfall intensity.

4. **Flood Detection**: A water level sensor triggers alerts when water levels rise, helping prevent flood-related damage.
5. **Air Quality Monitoring**: The air quality sensor detects harmful gases and pollutants, alerting users to poor air quality conditions.
6. **Mobile-Based Monitoring**: The data from the sensors is sent to the Blynk app for real-time monitoring and logging on mobile devices.
7. **Remote Accessibility**: Users can monitor environmental data from anywhere via WiFi, offering a smart and connected solution.
8. **3D Printed IoT Weather Station**
9. **Solar Power Management System**



Working Principle:

The weather station uses an ESP32 microcontroller as the central processing unit. Sensors connected to the ESP32 measure environmental parameters like temperature, humidity, rain, flood, and air pollution. These sensors provide either analog or digital signals that are read by the ESP32, which processes the data and sends it to the Blynk cloud over Wi-Fi.

The Blynk app, installed on a smartphone, retrieves this data from the cloud and displays it using customizable widgets (e.g., graphs, gauges, and labels). Users can view real-time readings or access historical data for analysis. The system also allows for notifications or alerts if certain conditions (like rain, flood, or poor air quality) are detected.

Applications:

- **Agriculture**: Helps farmers monitor weather conditions for efficient irrigation and crop protection.
- **Disaster Management**: Monitors flood and rain conditions to provide early warnings.
- **Pollution Monitoring**: Alerts users of rising air pollution levels, beneficial in urban areas.
- **Home Automation**: Automates home systems based on weather conditions (e.g., closing windows during rain).

This project demonstrates how IoT technology can be applied to environmental monitoring through a weather station that uses the ESP32 microcontroller and Blynk application. The system not only tracks vital weather conditions but also provides remote access to the data, making it a practical solution for both personal and professional use cases.