Crop Recommendation System Based on Vertical Farming with IoT

# Project Overview

This document outlines the changes and enhancements made to the original Crop Recommendation System, focusing on incorporating IoT (Internet of Things) for real-time data collection, prediction, and decision-making for crop recommendation in vertical farming environments.

# Enhancements Implemented

## 2. Real-Time Dashboard

A real-time dashboard was implemented using Flask and AJAX. The dashboard displays live sensor data and the recommended crop. It updates automatically every few seconds, providing the user with real-time insight into the environmental conditions and crop recommendations.

## 3. AJAX for Real-Time Updates

AJAX was used to fetch real-time data from the Flask backend without reloading the page. This allows the dashboard to automatically update with the latest sensor data every 3 seconds.

## 4. Database Logging (Future Enhancement)

In future, the system can be enhanced to log all predictions and sensor data into a database (e.g., SQLite or MySQL). This will allow the system to keep track of all past predictions, facilitating data analysis and tracking the performance of the system over time.

## 5. Prediction Logging and Admin View (Future Enhancement)

An admin interface can be added to allow administrators to view past predictions, sensor data, and filter the data by crop, environmental conditions, or date. This would help in tracking the performance of the system and evaluating the efficiency of crop recommendations.

## 6. Improved User Interface

The user interface was enhanced with modern styling using CSS and a responsive layout. The form inputs now include validation checks for numerical values and appropriate ranges, preventing users from entering invalid data.

## 7. Weather API Integration (Future Enhancement)

The system can be further improved by integrating a weather API (e.g., OpenWeatherMap) to automatically fetch temperature and humidity data based on the user's location. This would remove the need for the user to manually input temperature and humidity, making the system more autonomous and user-friendly.

## 8. Data Visualization (Future Enhancement)

For enhanced insights, charts (using libraries like Chart.js or Plotly) can be added to visualize sensor data trends, such as temperature and humidity over time, as well as the correlation between the environmental conditions and crop recommendations.

## 9. Mobile App Version (Future Enhancement)

A mobile app version of the system could be developed using Flutter or React Native, enabling users to access crop recommendations and monitor their vertical farm on their smartphones. The app could also include push notifications for real-time updates.

## 10. Crop Profile Page (Future Enhancement)

A crop profile page can be added to display detailed information about the recommended crop, including ideal growing conditions, harvest times, and benefits. This will help users make better-informed decisions on which crops to grow based on the recommendations.

## 11. PDF Report Generation (Future Enhancement)

A feature to generate downloadable PDF reports can be added. These reports will contain sensor data, crop recommendations, and relevant charts. This will make it easier for users to share their farm status and make decisions based on the reports.