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**PlantShield: AI-Driven Disease Diagnosis and**

**Smart Sensor-Based Irrigation System**

Idea Proposal: Capstone Project idea

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**Idea Proposal Submission**

**1. Project Idea:**

The project is meant to produce a system for detecting plant diseases using images of the leaves with machine learning-based technology. The users input a picture of the leaf, and the system would identify the disease, along with proper treatment methods. The system also includes a smart watering feature using sensor data that includes soil moisture, air temperature, and humidity levels. watering system will follow a rule-based approach, programmed directly into the Arduino using thresholds defined by research on plant water requirements. This approach ensures efficient water usage, avoiding water wastage and under-watering. The goal is to support farmers and gardeners in maintaining healthy plants, conserving water, and reducing crop loss.

**2. Relevance to Sustainable Development Goals (SDGs):**

The project supports **SDG 2: Zero Hunger** by helping ensure healthy crops and reducing agricultural losses and **SDG 12: Responsible Consumption and Production** through efficient water use. It promotes sustainable farming practices by integrating technology to optimize crop management.

**3. Literature Examples:**

a. **Using Deep Learning for Image-Based Plant Disease Detection**

**Explanation**: This study verifies the applicability of deep CNNs in identifying plant diseases from leaf images. With a public dataset that has more than 54,000 images, the model could classify 14 crop species and 26 diseases with an accuracy of 99.35%, thus proving the effectiveness of deep learning for plant disease diagnosis.

Link: <https://www.frontiersin.org/journals/plant-science/articles/10.3389/fpls.2016.01419/full>

b. **Smart Water Management Platform: IoT-Based Precision Irrigation System**

**Explanation**: This paper discusses the development of an IoT-based smart water management platform aimed at precision irrigation in agriculture. The system combines sensors and technologies meant to ensure optimized water use toward productive and sustainable practices.

Link: <https://www.mdpi.com/1424-8220/19/2/276>

**4. Describe Your Data:**

The leaf disease dataset includes labeled images categorized by plant type and disease, with 38 directories containing around two thousands images each and a total of 70,295 (data format: images). Preprocessing for leaf images includes image resizing and augmentation to strengthen the disease detection model.  
dataset link: <https://www.kaggle.com/code/imtkaggleteam/plant-diseases-detection-pytorch>

Moreover, the watering system relies on **real-time sensor inputs**, which include soil moisture, air temperature, and humidity values. Pre-established thresholds are programmed into Arduino.

**5. Approach (Machine Learning or Deep Learning):**

The project will use CNN, which is part of deep learning, with training in Python and the Jupyter Notebook for detecting diseases. For the smart watering feature, a rule-based system will be programmed directly into the Arduino to automate irrigation based on sensor readings and predefined thresholds sourced from research papers. Django will integrate it from the backend, while React will integrate it into the front end, developing a user-friendly interface with the farmer or gardener.