Task 2: AI-Driven IoT Concept — Smart Agriculture System

Author: Davis Ongeri

Tools: AI + IoT (Sensor Network + Cloud/Edge AI Model)

Objective

Design a **Smart Agriculture System** using **AI and IoT** to monitor farm conditions in real-time and **predict crop yields**, helping farmers make data-driven decisions for better productivity and sustainability.

System Overview

This system integrates **sensors** deployed in the field with an **AI model** that processes the collected data and provides predictions and actionable insights to farmers.

Sensors Required

Sensor Type	Purpose
Soil Moisture Sensor	Monitors water availability for crops
Temperature Sensor	Tracks ambient conditions
Humidity Sensor	Measures atmospheric moisture
Light Sensor	Gauges sunlight exposure
Soil pH Sensor	Assesses soil acidity/alkalinity
NDVI Camera (optional)	Measures plant health via image analysis

Proposed AI Model

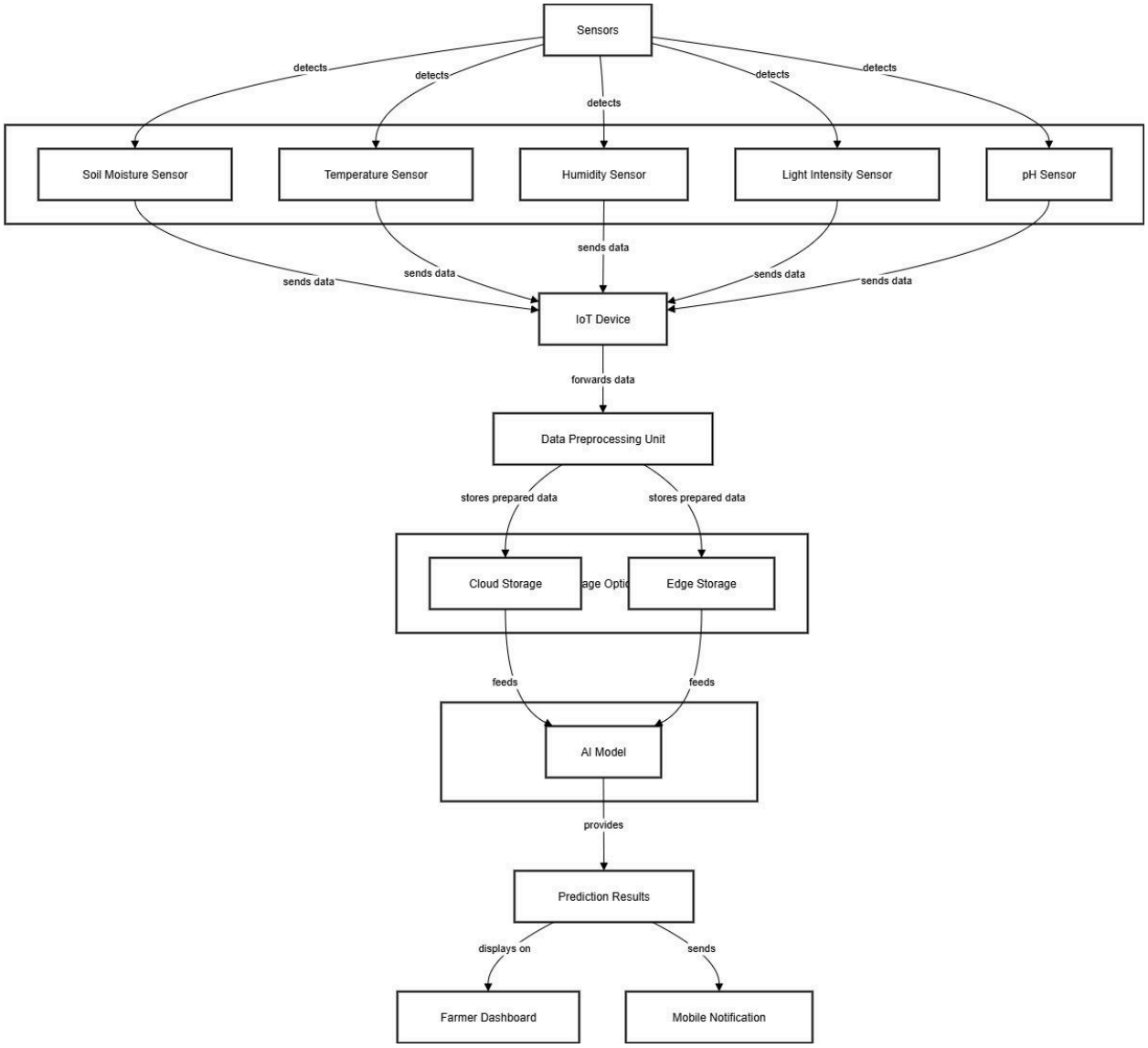
- **Model Type:** Supervised Regression Model (e.g., Random Forest Regressor or LSTM for time-series)

- **Target Output:** Crop yield (e.g., kg per hectare)
- **Inputs:**
    - Real-time sensor data (moisture, temperature, pH, etc.)
    - Historical weather and crop yield data
    - Satellite or drone imagery (optional for plant health)

The AI model learns patterns between environmental conditions and crop performance, enabling it to forecast yields early in the growth cycle.

Data Flow Diagram

Below is a conceptual flow of the smart agriculture system:



Benefits

- **Efficient Resource Use:** Smart irrigation based on real-time soil needs
- **Higher Yields:** Predictive AI helps optimize planting and harvesting schedules
- **Sustainability:** Reduces water waste and prevents over-fertilization
- **Accessibility:** Works with low-cost microcontrollers like ESP32, and can be deployed to low-connectivity areas using edge AI