AI-Driven IoT Smart Agriculture Simulation System

Prepared by: Nolin Masai

---

1. Sensors Needed

To monitor and optimize agricultural conditions, the system would use:

- **Soil Moisture Sensor:** Measures soil water content to manage irrigation.
- **Temperature Sensor:** Tracks ambient and soil temperature for crop growth.
- **Humidity Sensor:** Monitors air moisture levels affecting transpiration.
- **Light Intensity Sensor:** Measures sunlight exposure for photosynthesis.
- **pH Sensor:** Determines soil acidity or alkalinity.
- **Nutrient Sensor (NPK):** Detects nitrogen, phosphorus, and potassium levels.
- **Rainfall Sensor:** Records precipitation data.
- **CO_2 Sensor:** Monitors carbon dioxide concentration for plant growth.
- **Wind Speed Sensor:** Assesses wind conditions affecting evaporation and pollination.

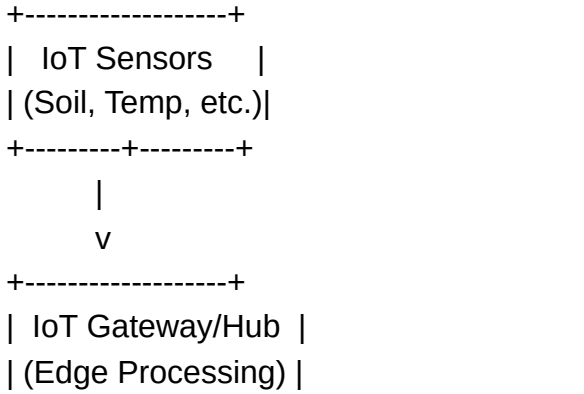
---

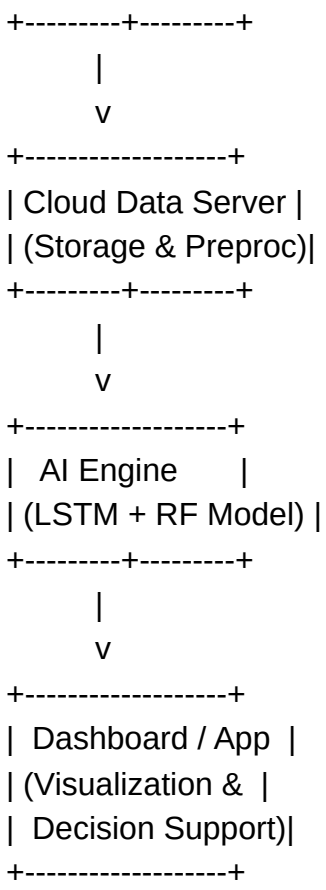
2. Proposed AI Model for Crop Yield Prediction

- **Model Type:** Hybrid model combining **LSTM (Long Short-Term Memory)** networks for time-series environmental data and **Random Forest Regression** for static soil and nutrient data.
- **Inputs:**
  - Real-time IoT sensor data (soil moisture, pH, NPK, temperature, humidity)
  - Historical weather and yield data
  - Crop type and growth stage
- **Outputs:**
  - Predicted crop yield (tons/hectare)
  - Recommended irrigation and fertilization schedules
- **Training Data:** Historical yield records, satellite imagery, and IoT sensor logs.

---

3. Data Flow Diagram





---

4. System Architecture Overview

- **Layer 1: Sensor Layer** – Collects environmental and soil data.
- **Layer 2: Communication Layer** – Transmits data via Wi-Fi, LoRa, or 5G to the cloud.
- **Layer 3: Cloud Processing Layer** – Stores, cleans, and preprocesses data.
- **Layer 4: AI Analytics Layer** – Runs predictive models for yield forecasting and resource optimization.
- **Layer 5: Application Layer** – Displays insights through dashboards and mobile apps for farmers.

System Summary

The AI-driven IoT smart agriculture system integrates real-time sensor data with predictive analytics to optimize crop management. It enhances decision-making by forecasting yields, recommending irrigation schedules, and improving resource efficiency.