AI in SOFTWARE ENGINEERING

WEEK 6: AI Future Directions

Task 2: AIdriven IoT

1. Sensors needed

-Soil Moisture Sensors: To measure the volumetric water content in the soil

-Soil Temperature Sensors: To monitor soil temperature, impacting seed germination and root growth.

-Air Temperature and Humidity Sensors: To assess ambient environmental conditions affecting plant transpiration and disease susceptibility.

-Light Intensity Sensors (PAR/Lux): To measure Photosynthetically Active Radiation (PAR) or general light levels, vital for photosynthesis.

-pH Sensors: To monitor soil acidity/alkalinity, which significantly impacts nutrient availability.

-Nutrient Sensors (N, P, K): To measure the levels of essential macronutrients in the soil, guiding fertilization strategies.

-Rainfall Sensors: To record precipitation, aiding in water management and irrigation planning.

-Camera Sensors (RGB, Multispectral/Hyperspectral): For visual inspection of crop health, pest detection, and early disease identification through spectral analysis.

2. Proposed AI Model for Crop Yield Prediction:

A Recurrent Neural Network (RNN) with Long Short-Term Memory (LSTM) units is proposed for crop yield prediction. This model is particularly well-suited for time-series data, which is characteristic of agricultural sensor readings.

Why RNN-LSTM? Agricultural data is inherently sequential (daily temperature, moisture, nutrient levels change over time), and past conditions significantly influence future outcomes. LSTMs can effectively capture long-term dependencies in time-series data, allowing the model to learn complex relationships between historical environmental conditions, growth stages, and final crop yields.

Inputs: The model will take as input a time series of aggregated sensor data (daily/weekly averages or specific readings), historical weather data, historical yield data for the specific crop and region, and potentially satellite imagery data (NDVI, EVI).

Outputs: The primary output will be a predicted crop yield (e.g., tons per hectare) for a given future period (e.g., end of season, next harvest cycle).

Training: The model will be trained on a large dataset of historical sensor readings, environmental data, and corresponding actual crop yields.

3. Sketch a data flow diagram (AI processing sensor data)