

## AI-Driven IoT Concept: Smart Agriculture Simulation System

### 1. Sensors Needed

- Soil moisture
- Soil temperature
- Soil electrical conductivity (EC)
- Soil pH
- Air temperature
- Relative humidity
- Rain gauge
- Wind speed/direction
- Solar irradiance/PAR
- NDVI/multispectral camera
- RGB camera
- Leaf wetness sensor
- Canopy height sensor

### 2. Proposed AI Model to Predict Crop Yields

- Baseline model: XGBoost/LightGBM for tabular sensor data
- Advanced model: Transformer/LSTM + CNN for multimodal sensor and image data
- Inputs: soil metrics, weather data, NDVI, management data
- Outputs: yield prediction (kg/ha), uncertainty intervals
- Evaluation: MAE, RMSE,  $R^2$

### 3. Data Flow Diagram Explanation

Sensors → Edge Gateway → Cloud Ingestion → Feature Processing → AI Model Training/Serving  
→ Dashboard & Actuation → Feedback Loop