

Soil Quality Analysis

Objectives

- **Analyze soil composition data to determine fertility levels and provide actionable insights.**

Technologies

- **XGBoost**
- = ○ **LangChain & OpenAI's GPT models**
- **ReactJS for frontend development**
- **Flask APIs**

Workflow

- **Train XGBoost on a soil quality dataset**
- **Simulate IoT sensor data of soil composition. Use the trained XGBoost model to predict fertility status**
- **Pass the fertility status and soil composition to LLM via LangChain to get actionable insights**

Workflow Continued ...

- **Develop frontend using ReactJS**
- **Create Flask APIs to bridge frontend and backend functionalities**
- **[Optional] Deploy the chatbot on a hosting service.**

Example Insights

Scenario 1: Soil determined as "Less Fertile"

- Possible LLM insight: "The soil has a low Nitrogen content. Consider using a nitrogen-rich fertilizer to enhance soil fertility."

Scenario 2: Soil determined as "Fertile"

- Possible LLM insight: "The soil has balanced nutrient levels. Maintain its quality by periodic testing and avoiding over-watering."

Benefits to Farmers

- Farmers get real-time feedback on soil health
- Optimized fertilizer and water usage based on soil needs.
- Promote sustainable farming practices by enhancing soil health without overuse of resources.

Future Steps

- Expand training data to cover more soil types and regions
- Further IoT and AI/ML advancements for real-time, on-field applications.
- Update LLM's data for richer and more precise soil insights.



**Thank you
& Welcome**