Crop Prediction and Recommendation System

Objective

Project Guide

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Project Members

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Project Objective

The main goal of this project is to assist farmers in making informed decisions about crop selection and management through an intelligent agricultural platform. Using technology, this project aims to solve problems like crop failure, resource wastage, and improve overall agricultural productivity.

Proposed System

We propose a digital platform that uses machine learning to predict suitable crops and provide recommendations based on soil and climate parameters. The system will analyze various environmental factors and provide data-driven suggestions for optimal farming practices.

Changes We Are Bringing

1. Smart Crop Prediction:

- AI-powered crop recommendations based on soil and climate data
- Elimination of guesswork in crop selection

2. Resource Optimization:

- Precise fertilizer recommendations based on soil nutrition levels

- Optimal irrigation scheduling based on environmental conditions

3. **Climate Impact Analysis:**
    - Real-time assessment of weather conditions
    - Impact prediction on crop growth and yield
4. **Fertilizer Management:**
    - Customized fertilizer recommendations
    - Balanced nutrition management
5. **Irrigation Planning:**
    - Smart water management suggestions
    - Drought prevention strategies
6. **Pest Management:**
    - Timely pesticide recommendations
    - Prevention of crop diseases

Features

1. **Crop Prediction**:
    - Analyzes soil parameters (N-P-K values, pH)
    - Considers environmental factors
    - Provides confidence scores for predictions
2. **Fertilizer Recommendation**:
    - Customized fertilizer suggestions
    - Dosage recommendations
    - Cost-effective solutions
3. **Climate Analysis**:

    - Temperature impact assessment
    - Humidity effect analysis
    - Rainfall pattern evaluation
4. **Irrigation Scheduling**:
    - Water requirement calculations
    - Timing recommendations
    - Efficiency optimization
5. **User Interface**:
    - Simple and intuitive design
    - Easy parameter input
    - Clear result visualization
6. **Data Management**:
    - Historical data tracking
    - Result comparison
    - Progress monitoring

Technologies

- Frontend: ReactJS
- Backend: Flask (Python)
- Database: Pickle (Model Storage)
- ML Framework: Scikit-learn, XGBoost
- Model: XGBoost classifier for high accuracy
- API Development: Flask API for model inference and endpoints
- Data Preprocessing: Feature scaling, encoding, and cleaning

Why XGBoost?

- High accuracy in crop yield prediction (R^2 value of 0.9391)
- Handles complex relationships between soil and environmental factors
- Fast and efficient with parallel processing

Limitations:

- Does not provide recommendations for fertilizers, irrigation, or pesticide use
- Future updates may include real-time data integration and expanded agricultural factors