AI-Driven Crop Disease Prediction and Management System

This project is a Flask-based web application designed to assist farmers and agricultural experts with:
- Crop Recommendation
- Fertilizer Recommendation
- Plant Disease Detection via Image Upload

Leveraging machine learning and deep learning models, the app provides intelligent agricultural insights based on user inputs.

Tech Stack

- Frontend: HTML, CSS (via Jinja templates)
- Backend: Python (Flask)
- ML/DL Models: Random Forest for crop recommendation, ResNet9 for plant disease classification
- Libraries: PyTorch, NumPy, Pandas, PIL, Torchvision
- API Integration: OpenWeatherMap API for real-time temperature and humidity

Project Structure

```
project/
├── app.py
├── config.py
├── models/
│   ├── plant_disease_model.pth
│   └── RandomForest.pkl
├── utils/
│   ├── disease.py
│   ├── fertilizer.py
│   └── model.py
├── templates/
│   ├── index.html, crop.html, etc.
├── static/
├── Data/
│   └── fertilizer.csv
```

Features

- Crop recommendation based on soil parameters and weather
- Fertilizer suggestion to balance soil nutrients
- Plant disease detection from leaf images using deep learning
- Real-time weather integration for personalized suggestions

Setup Instructions

1. Clone the repository:
   git clone https://github.com/your-username/your-repo-name.git
   cd your-repo-name

2. Create a virtual environment:
   python -m venv venv
   source venv/bin/activate # Windows: venv\Scripts\activate

3. Install dependencies:
   pip install -r requirements.txt

4. Set your OpenWeatherMap API key in config.py:
   weather_api_key = 'your_openweathermap_api_key'

5. Run the app:
   python app.py
   Visit http://127.0.0.1:5000 in your browser.

Image Upload Guidelines for Disease Detection

- Upload a clear image of the plant leaf.
- Supported file types: .jpg, .jpeg, .png
- Ensure good lighting and no background clutter.

Models Used

Crop Recommendation:
- Algorithm: Random Forest Classifier
- Features: N, P, K, temperature, humidity, pH, rainfall

Disease Detection:
- Architecture: CNN
- Dataset: PlantVillage
- Classes: 38 plant-disease categories