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Leaf Disease Detection

PROJECT REPORT

Proper watering

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Leaf Disease Detection

1. Introduction

1.1 Project Overview

This project presents a web-based application for detecting diseases in plant leaves using Deep learning. Users can upload leaf images and receive instant predictions about the leaf's health status or specific disease

1.2 Importance in Agriculture

- Prevents crop losses through early detection
- Reduces unnecessary pesticide use
- Increases agricultural productivity
- Supports sustainable farming practices
- Enhances food security

2. Objectives and Target Users

2.1 Main Goals

Develop an accurate Deep learning model for leaf disease detection Create a user-friendly web interface. Provide instant and reliable disease predictions. Contribute to improved plant health management

2.2 Target Users

- Farmers
- Gardeners
- Agricultural researchers
- Plant enthusiasts
- Agricultural extension workers

3. Methodology

3.1 Data and Preprocessing

Dataset: "leaf-disease-detection-dataset" from Kaggle
Preprocessing: Images resized to 128x128 pixels
Data augmentation: Random flipping, rotation, and zooming normalizing

3.2 Model Architecture and Training

Architecture:

- Convolutional Neural Network (CNN)
- Multiple convolutional and max pooling layers
- Dropout layers for preventing overfitting
- Dense layers for classification

Training:

- Optimizer: Adam (learning rate: 0.0001)
- Loss function: Categorical Crossentropy
- Metrics: Accuracy
- Epochs: 10
- Batch size: 32

4. Implementation

4.1 System Architecture

Client-side: Streamlit web interface

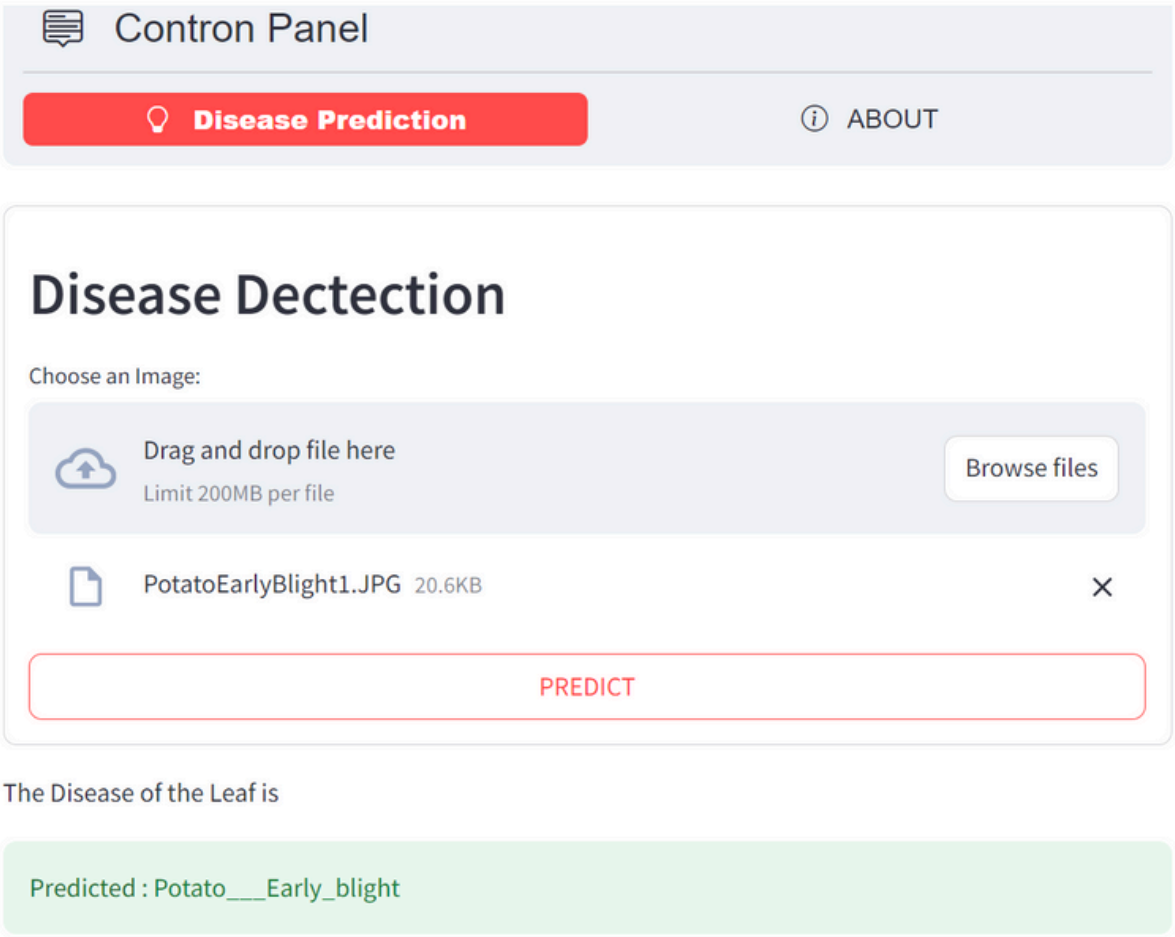
Server-side: Python backend for image processing and model inference

4.2 Key Functions

- model_prediction(test_image): Processes images and generates predictions
- Streamlit interface functions for user interaction and result display

4.3 User Interface

- Clean, intuitive design with navigation menu
- Image upload functionality
- Prediction display area
- "About" section with project information



5. Results and Performance

5.1 Model Accuracy

- Training Accuracy: 97.87%
- Test Accuracy: 96.60%

5.2 Disease Detection Capabilities

Can identify 38 different leaf conditions across various plant species

5.3 Limitations

- May struggle with diseases not in the training data
- Performance affected by image quality and lighting
- Potential difficulty with mixed or early-stage infections

6. User Guide

6.1 Using the Application

- Navigate to the application URL
- Select "Disease Prediction" from the menu
- Upload a leaf image
- Press "PREDICT"
- View the prediction result

6.2 Interpreting Results

- Application displays the predicted leaf condition (e.g., "Apple__Black_rot" or "Apple__healthy")
- Users should use this as a starting point for further investigation

7. Future Enhancements

7.1 Potential Improvements

1. Expand the dataset
2. Implement real-time detection using device cameras
3. Add disease information and treatment recommendations
4. Develop a mobile application

7.2 Scalability Considerations

- Cloud deployment for increased user load
- Model optimization for mobile devices
- API development for integration with other agricultural software

8. Conclusion

This project successfully developed a high-accuracy leaf disease detection system. It demonstrates the practical application of Deep learning in agriculture, providing a valuable tool for quick and accurate plant leaf disease identification. The system has the potential to improve crop management, support sustainable agriculture, and contribute to food security by promoting healthier crop production.

Thank you

Green Today, Greener Tomorrow"