



Plant Disease Prediction System Using Machine Learning

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ABSTRACT

Agriculture is an important sector for food production and economic growth. Plant diseases reduce crop quality and productivity, causing financial loss to farmers. This project proposes a Real-Time Plant Disease Detection System using Deep Learning techniques. Users can upload plant leaf images through a website, and the system analyzes the image using CNN and MobileNetV2 models to detect whether the leaf is healthy or diseased. The system provides fast and accurate disease prediction along with remedy suggestions for farmers.

Keywords: Deep Learning, CNN, MobileNetV2, Plant Disease Detection, Machine Learning, Smart Agriculture.



I. INTRODUCTION

Agriculture plays a major role in economic development and food production. Plant diseases are one of the major factors affecting crop productivity and quality. Traditional disease detection methods depend on manual observation, which requires more time and expert knowledge.

With the advancement of Artificial Intelligence and Deep Learning, automated disease detection systems can be developed. This project presents a web-based plant disease detection system using CNN and MobileNetV2 models. Users upload leaf images, and the system predicts diseases automatically. The proposed system helps farmers identify diseases early and improve agricultural productivity.

II. PROBLEM STATEMENT

Plant diseases reduce crop growth and productivity. Farmers often face difficulties in identifying diseases during the early stages. Manual disease detection requires agricultural experts and may not provide accurate results.

Traditional systems lack automation and real-time analysis. Therefore, an intelligent system is required to analyze plant leaf images and predict diseases using Deep Learning techniques.

III. OBJECTIVES

Primary Objectives

1. To develop a web-based plant disease detection system.
2. To detect diseases using Deep Learning techniques.
3. To identify healthy and diseased leaves.
4. To provide real-time prediction.
5. To improve agricultural monitoring using AI.

Secondary Objectives

1. To use CNN and MobileNetV2 models.
2. To preprocess plant leaf images.
3. To provide remedy suggestions.
4. To improve prediction accuracy.
5. To support smart agriculture systems.



IV. LITERATURE REVIEW

Several researchers have used Machine Learning and Deep Learning techniques for plant disease detection. Earlier methods used image processing and statistical analysis with lower accuracy.

Recent Deep Learning models such as CNN, MobileNet, ResNet, and Xception provide better classification accuracy. Researchers use datasets like PlantVillage along with image preprocessing and data augmentation techniques to improve performance.

The proposed system improves existing methods by providing a real-time web-based disease detection platform using CNN and MobileNetV2 models.

V. PROPOSED SYSTEM

The proposed system is a web-based plant disease detection system using Deep Learning. Users upload plant leaf images through the website, and the system analyzes the image using CNN and MobileNetV2 models.

The system performs:

- Image upload
- Image preprocessing
- Feature extraction
- Disease prediction
- Result display

The system predicts whether the leaf is healthy or diseased and displays the disease name, prediction accuracy, and remedy suggestions.

Advantages of Proposed System

1. Fast prediction
2. High accuracy
3. Real-time analysis
4. Easy to use
5. Reduced manual work
6. Supports farmers

VI. SYSTEM ARCHITECTURE

1. Image Upload Module

Users upload plant leaf images through the website.

2. Image Preprocessing Module

This module performs:

- Image resizing
- Noise removal
- Image enhancement

3. Feature Extraction Module

The CNN model extracts:

- Leaf texture
- Color patterns
- Disease spots

4. Prediction Module

The system predicts:

- Disease type
- Healthy or diseased leaf
- Prediction accuracy



5. Result Generation Module

The result displays:

- Disease name
- Accuracy percentage
- Remedy suggestions

Step 5: Disease Prediction

The trained model predicts the disease from uploaded images.

Step 6: Result Display

Prediction results are displayed on the website.

VIII. ALGORITHM

Algorithm: Plant Disease Detection

Input:

- Plant leaf image

Output:

- Disease prediction
- Healthy/Diseased status

Steps:

1. Start the system.
2. Upload leaf image.
3. Preprocess image.
4. Extract features.
5. Load CNN/MobileNetV2 model.
6. Analyze image.
7. Predict disease.
8. Display result.
9. Stop the system.

VII. METHODOLOGY

Step 1: Dataset Collection

Plant leaf images are collected from PlantVillage and Kaggle datasets.

Step 2: Data Preprocessing

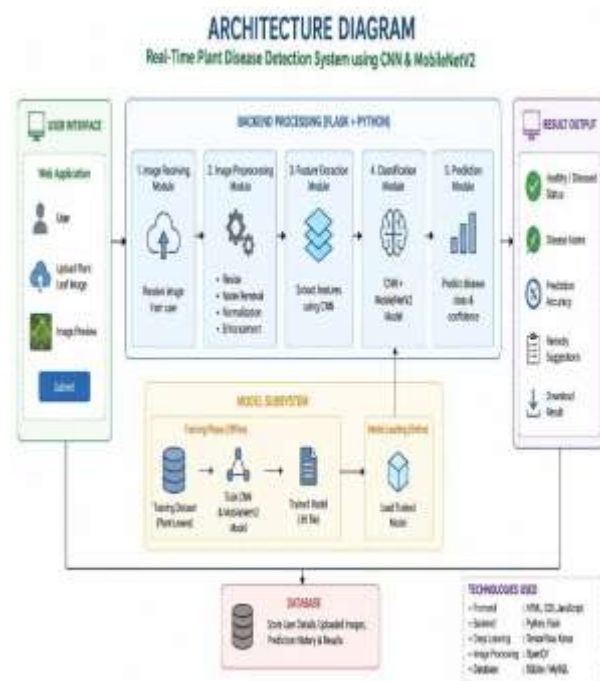
Images are resized, cleaned, and normalized.

Step 3: Data Augmentation

Techniques like rotation, flipping, and zooming are applied.

Step 4: Model Training

CNN and MobileNetV2 models are trained using leaf images.



IX. DATASET DESCRIPTION

Dataset	Description
PlantVillage	Plant disease dataset
Rice Leaf Dataset	Rice diseases
Tomato Dataset	Tomato diseases
Maize Dataset	Maize leaf diseases



Disease Classes

- Leaf Rust
- Rice Blast
- Bacterial Blight
- Healthy Leaf

X. IMPLEMENTATION

Technology Purpose

HTML	Website structure
CSS	Styling
JavaScript	Frontend
Python	Backend
Flask	Web framework
TensorFlow	Deep Learning
OpenCV	Image Processing

XI. RESULTS AND DISCUSSION

The proposed system successfully predicts plant diseases from uploaded leaf images. The system provides accurate and real-time prediction results.

Accuracy Results

Model	Accuracy
CNN	95%
MobileNetV2	97%
Xception	98%

The results show that MobileNetV2 provides high accuracy and better real-time performance.

XII. ADVANTAGES

1. Fast disease detection
2. High prediction accuracy
3. Reduced manual work
4. Easy to use
5. Supports smart agriculture
6. Real-time monitoring

XIII. APPLICATIONS

1. Smart Agriculture
2. Crop Monitoring Systems
3. AI-based Farming
4. Agricultural Research
5. Disease Detection Platforms

XIV. FUTURE SCOPE

1. Mobile application support
2. Real-time camera detection
3. Cloud database integration
4. AI chatbot support
5. Multi-disease detection

XV. CONCLUSION

The Real-Time Plant Disease Detection System using Deep Learning provides an efficient solution for agricultural disease monitoring. The system analyzes plant leaf images and predicts diseases using CNN and MobileNetV2 models.

The proposed system helps farmers identify diseases early, reduce crop damage, and improve agricultural productivity using Artificial Intelligence



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