

Plant Disease Classification

Shravani Uppanlawar, Ghanshyam Wadaskar, Piyush Raipure, Hitakshani Thombre,

Vipin Bopanwar, Prof. Sachin Dhawas

Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, India

Abstract: *Plant diseases significantly impact agricultural productivity, leading to economic losses and food insecurity worldwide. Timely and accurate detection of plant diseases is critical to mitigate these effects and ensure sustainable farming practices. This project explores the use of deep learning techniques for detecting plant diseases based on leaf images.*

The system leverages convolutional neural networks (CNNs), specifically pre-trained models like ResNet and MobileNet, fine-tuned on the publicly available PlantVillage dataset. The dataset consists of thousands of labeled images of healthy and diseased leaves from various crops. To enhance model performance and generalization, data augmentation techniques such as rotation, flipping, and brightness adjustments were applied during preprocessing.

The proposed system achieves high classification accuracy, validated using metrics such as precision, recall, and F1-score. Additionally, visualization tools like Grad-CAM are used to interpret model predictions, highlighting regions of the leaf that influence the decision-making process. The model is further optimized for deployment on mobile and web platforms, enabling real-time disease diagnosis.

This approach offers an efficient, scalable, and user-friendly solution for farmers and agricultural experts, aiding in early disease detection and contributing to improved crop management and yield. Future work involves expanding the dataset, incorporating more plant species, and integrating the model with IoT devices for field application

Keywords: convolutional neural networks