

Plant Disease Detection using CNN

1. Introduction

Plant diseases can severely affect crop yield and quality, posing a threat to global food security. Traditional methods of disease identification are time-consuming and require expert knowledge. This project aims to build an automated plant disease classification model using deep learning techniques.

1.1 Problem Statement

Manual identification of plant diseases is not scalable and is prone to errors, especially in large-scale agricultural operations. An automated system using CNN (Convolutional Neural Networks) can assist farmers in identifying diseases quickly and accurately.

2. Objectives

- To build a CNN-based image classification model for plant disease detection.
- To use a labeled image dataset split into training, validation, and test sets.
- To achieve high accuracy in disease classification across multiple plant species.

3. Methodology

The dataset was organized into three folders: train, validation, and test. Each folder contained subfolders for 13 different plant

species, each with multiple disease types. We used TensorFlow's ImageDataGenerator to preprocess the images, including rescaling. A Convolutional Neural Network (CNN) was constructed using Keras with multiple Conv2D and MaxPooling layers, followed by Dense layers. The model was compiled with categorical crossentropy loss and trained for 10 epochs.

4. Technologies Used

- Python
- TensorFlow and Keras
- Google Colab
- Matplotlib and NumPy

5. Results and Conclusion

The CNN model achieved over 99% accuracy on the training data and 95.38% accuracy on the test data. The model demonstrates strong performance in classifying diseases in plant leaf images. This system can be used as a practical tool for early plant disease detection, potentially benefiting farmers and agricultural stakeholders.