

# **Project Report — Plant Disease Detection from Leaf Images**

## **Introduction**

Plant diseases significantly affect crop quality and yield. Early detection is vital to prevent large-scale damage. This project focuses on identifying tomato leaf diseases using image recognition through a Convolutional Neural Network (CNN).

## **Abstract**

This system is designed to classify tomato leaf images into one of four categories: Early Blight, Late Blight, Leaf Mold, and Healthy. The model is trained on the PlantVillage dataset. A GUI built using Streamlit enables users to upload a leaf image and receive a disease prediction with confidence. The system achieves a validation accuracy of over 90%.

## **Tools Used**

- **Programming Language:** Python
- **Libraries/Frameworks:** TensorFlow, Keras, OpenCV, Streamlit, NumPy, scikit-learn, matplotlib
- **Dataset:** PlantVillage (custom subset with 4 tomato leaf classes)

## **Steps Involved in Building the Project**

### **1. Dataset Collection**

The PlantVillage dataset was used. It includes thousands of images of diseased and healthy tomato leaves. We selected four classes for this project.

### **2. Image Preprocessing**

Images were resized to 128x128, normalized (pixel values scaled to 0–1), and labeled. The dataset was split into training and testing sets.

### **3. Model Building**

A CNN model was built using Keras with layers: Conv2D, MaxPooling, Flatten, Dense, and Dropout. The model was compiled with Adam optimizer and categorical cross-entropy loss.

### **4. Model Training**

The model was trained on the dataset for 10 epochs, achieving ~98% training accuracy and ~91% validation accuracy.

### **5. GUI Development**

A user-friendly web app was developed using Streamlit. Users can upload an image, and the model predicts the disease class with confidence.

### **6. Model Deployment**

The model and label encoder were saved and integrated into the GUI for real-time prediction.

## **Conclusion**

This project demonstrates how machine learning and computer vision can assist farmers and agricultural

experts in detecting plant diseases early. The model provides reliable predictions, and the GUI ensures ease of use. This system has potential to be scaled for multiple crops and diseases in future developments.