

Fruit Disease Detection System

Abstract :

Agriculture is a vital sector in the global economy, with fruit production being significantly affected by various diseases, primarily of fungal and bacterial origin. Early detection and accurate classification of these diseases are crucial for minimizing losses and improving crop yield. This study presents a hybrid approach that integrates Machine Learning (ML) and Deep Learning (DL) techniques for the detection and classification of fruit diseases. The system involves key stages including image acquisition, preprocessing, segmentation, feature extraction, and classification. Various ML algorithms and DL models such as SVM, ANN, CNN, and VGG16 were evaluated, with the proposed hybrid Convolutional Neural Network (HCNN) combined with YOLOv8 achieving the highest accuracy of 97.10% on a heterogeneous fruit dataset. The model outperforms traditional classifiers in terms of precision, recall, and F1- score, demonstrating its effectiveness in real-world agricultural applications. This research highlights the potential of automated disease detection systems in supporting smart farming practices and reducing manual inspection costs.

1. Programming Languages:

Python – For Machine Learning model and backend logic

Streamlit– For frontend (web interface)

2. Frameworks & Libraries:

TensorFlow / Keras – Deep learning framework

OpenCV – Image processing

NumPy, Pandas, Matplotlib – Data processing and visualization

Deep Learning Model (CNN) Predicts Disease Frontend:

Technology: Streamlit

Backend:

Language: Python, Keras + TensorFlow

Dataset:

Can use publicly available datasets like:

PlantVillage Dataset (Kaggle) – which includes various fruit diseases

Custom dataset with labeled images (Healthy, Diseased)

Final Output:

A complete web application where users can:

1. Upload a fruit image
2. Get real-time disease prediction and prevention tips