

Leaf Guard

Table of Contents

1. Background and Necessity for the Application
2. Proposed Solution
3. Purpose of the Document
4. Scope of the Project
5. Constraints

1. Background and Necessity for the Application

Leaf diseases are a major threat to global agricultural productivity, often resulting in significant crop losses and deteriorating food quality. Traditionally, detecting such diseases has been reliant on manual inspection by experts, a time-consuming and inefficient process, especially for large-scale farms.

With the advancement of technology, Big Data processing and Data Science have emerged as practical solutions to this challenge. By analyzing large datasets, including images, weather, and soil conditions, innovative methods for detecting leaf diseases with greater accuracy and speed can be implemented. The demand for increased agricultural productivity combined with limited natural resources necessitates such advancements in agriculture.

2. Proposed Solution

The Leaf Guard application seeks to revolutionize plant health monitoring through the use of Data Science and Big Data. It offers scalable, data-driven disease diagnosis, applicable to small gardens and large industrial farms alike.

Key Features of Leaf Guard:

- **Data Collection:** Leaf images are collected from repositories like Kaggle and stored in distributed systems like HDFS.
- **Data Preprocessing & Feature Extraction:** Data is cleaned, standardized, and key characteristics (e.g., color, texture) are extracted.
- **Model Training:** Machine learning models, such as Convolutional Neural Networks (CNNs), are trained on labeled datasets for leaf disease detection.

- **Disease Detection:** Leaf images are analyzed to classify diseases with high accuracy.
- **User Interface:** An intuitive dashboard enables farmers to upload images and receive diagnostic feedback.

The methodology used ensures scalable, secure, and efficient processing of large datasets, offering reliable diagnostics for early disease detection.

3. Purpose of the Document

This document outlines the technical requirements for Leaf Guard. It aims to provide both stakeholders and developers with a comprehensive overview of the system, its goals, functionalities, and implementation constraints.

4. Scope of the Project

The scope of Leaf Guard includes developing a robust application capable of detecting various leaf diseases. By utilizing Big Data, weather data, and machine learning algorithms, Leaf Guard will identify patterns and offer predictive diagnostics for disease management.

The system will consist of:

- A scalable pipeline for continuous data collection.
- Advanced image preprocessing techniques.
- A user-friendly interface to aid farmers in disease detection and management.

The project will lead to an increase in agricultural productivity and efficiency in disease management.

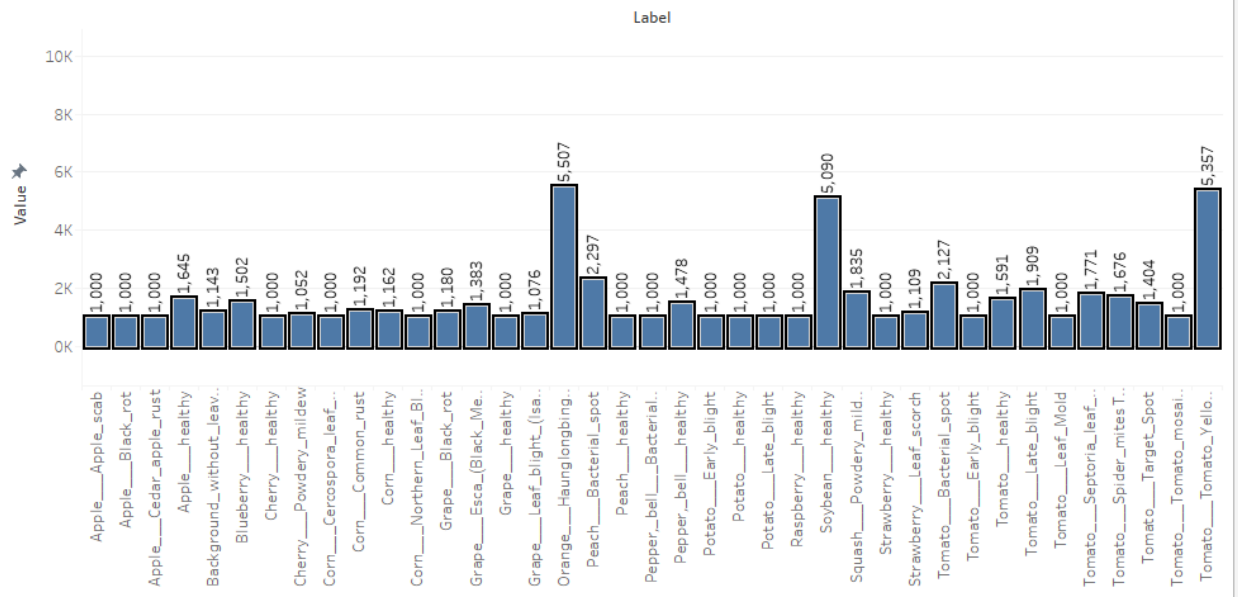
5. Constraints

Several constraints impact the development and deployment of the Leaf Guard system, including:

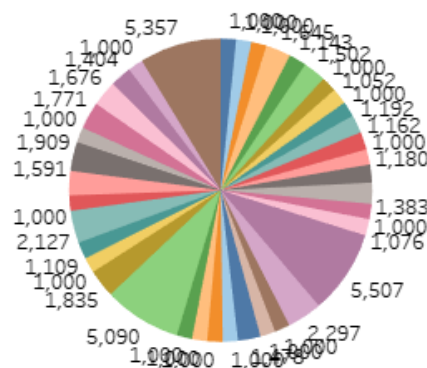
- **Regulatory Compliance:** Ethical considerations regarding data collection, agricultural practices, and environmental factors.
- **Operational Limitations:** Remote agricultural areas may face connectivity issues that could hinder application updates and data transmission.
- **Seasonal Variations:** Leaf appearance and disease patterns can change with seasons, requiring adaptive algorithms.

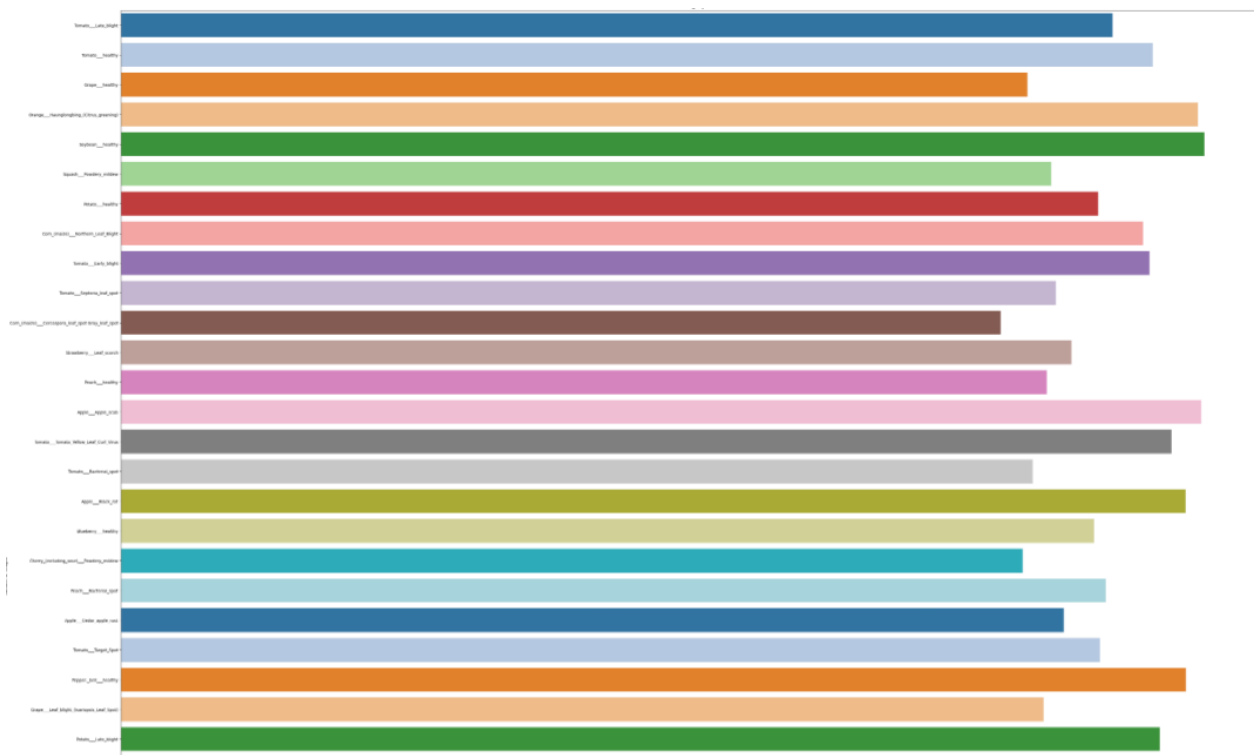
Visualizations:

Column Chart

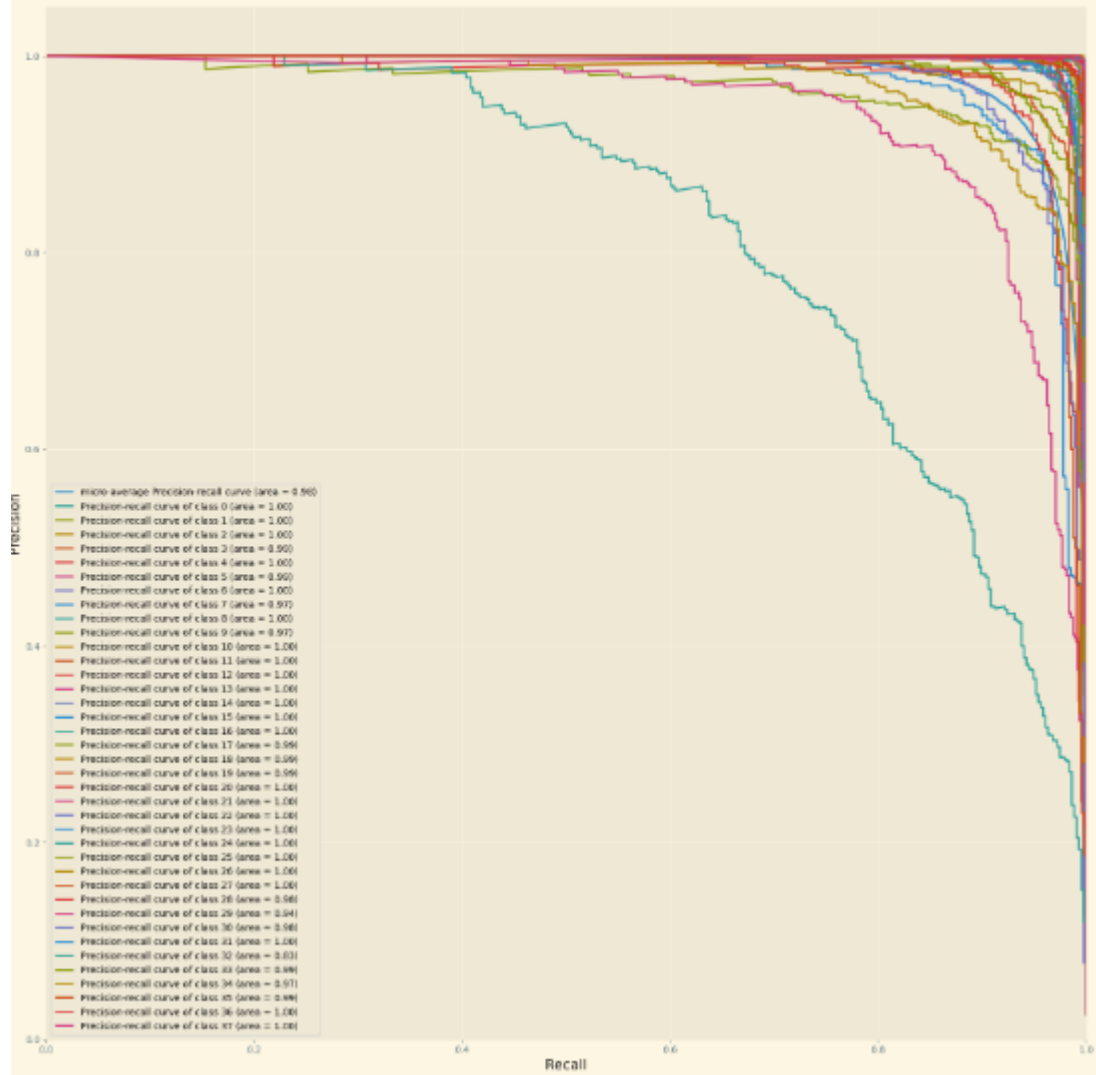


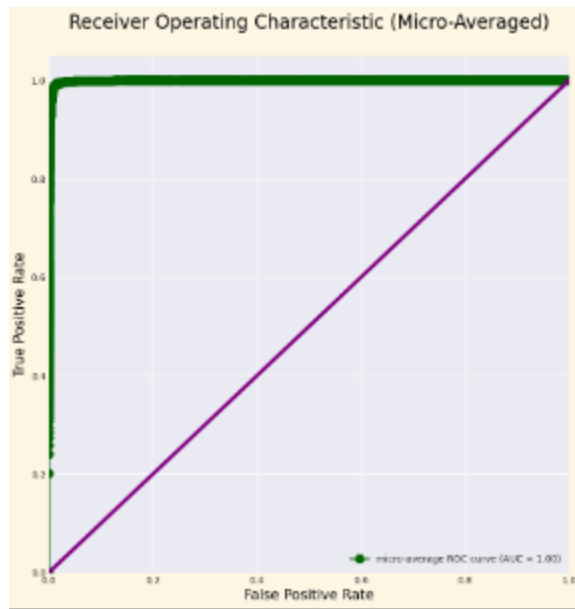
Pie Chart Showing Total Number Of Classes





Precision-Recall curve to Multi-Class





Receiver operating characteristic (macro-averaged)



