

An Expert System For Disease Prediction And Fertilizer Recommendation Using Deep Learning

K.Geethika, G.Krishna Prathibha, G.Sneha

Under the esteemed guidance of
Mr. A. Rajashekhar Reddy
Assistant Professor



Bachelor of Technology
Department of Information Technology
BVRIT HYDERABAD college of engineering for Women

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Overview

- 1 Problem Statement
- 2 Graphical Representation
- 3 Methodology
- 4 Progress and Result
- 5 Justification
- 6 References

Problem Statement

- Delayed disease detection and imprecise fertilizer application pose significant challenges in tomato crop management, leading to yield losses and compromised quality. This project integrates advanced technologies, such as image recognition and data-driven analytics, to provide early disease detection and personalized fertilizer recommendations, aiming to revolutionize and optimize tomato cultivation practices.

Graphical Representation

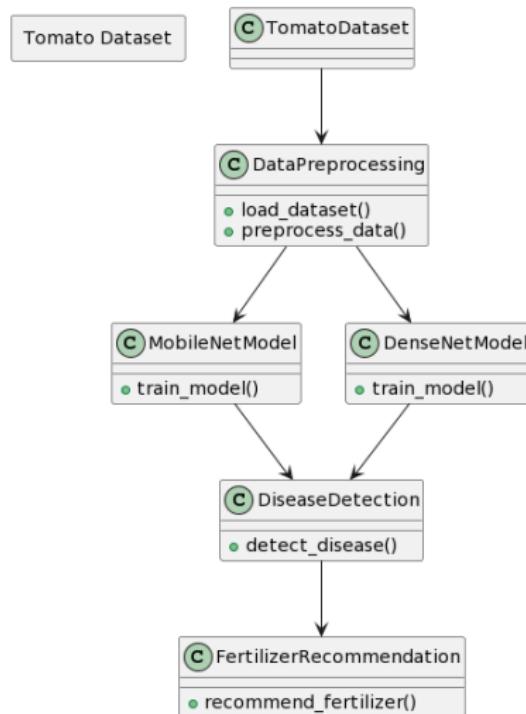


Figure: Proposed Architecture for Tomato Crop

Steps

- **Data Collection and Preprocessing :**

- Collection of a large dataset of images of healthy and diseased crop leaves and ensure that the images are high-quality and well-lit.
- Label the images with the corresponding disease class (e.g., healthy, early blight, late blight).
- Preprocess the images to normalize the size, format, and intensity.
- Augment the dataset by applying techniques such as flipping, rotating, and cropping.
- Split the data into training and testing sets.

Steps

• Feature Extraction

- Extract features from the pre-trained model's, remaining layers pre-process the Tomato leaf images.
- These features serve as a rich representation of the input images and are crucial for the subsequent disease classification

Steps

- **Train the model**

- The data is trained with a defined model (using DenseNet201 as feature Extractor) and pre-trained MobileNetV2.

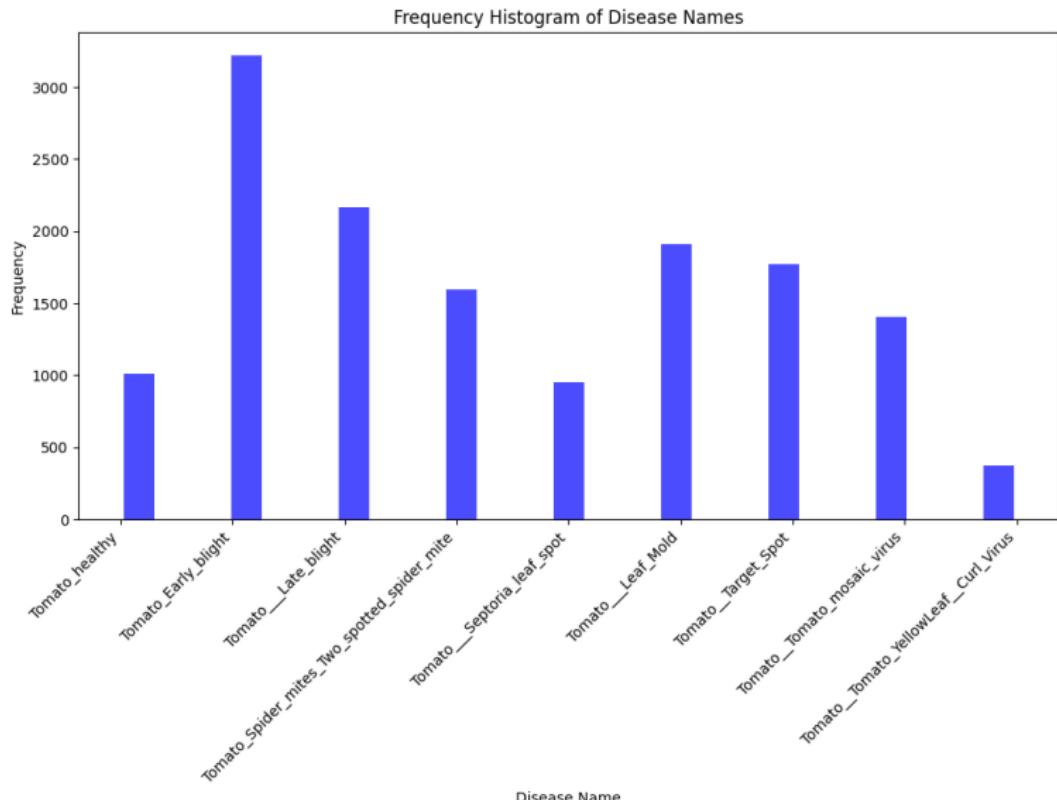
- **Disease Detection**

- Disease Detection is done by the trained model

- **Fertilizer Recommendation**

- using rule based instructions, fertilizer recommendation is given for respective disease detected.

Frequency of Each class



Real Image data Representation



Generated Dataset Representation



Accuracy

Model	Accuracy
DenseNet201	99.1
MobileNetV2	88.4

Comparison of Accuracy of Different ReLU Types in Neural Networks

S.No.	ReLU type	Accuracy
1.	ReLU	99.1
2.	Leaky ReLU	98.6
3.	Quantum ReLU	98

Accuracy

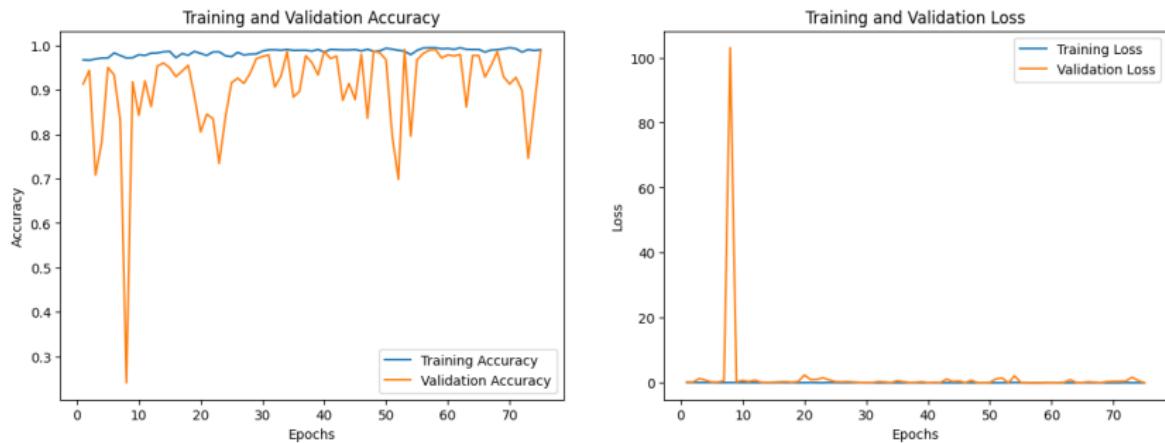
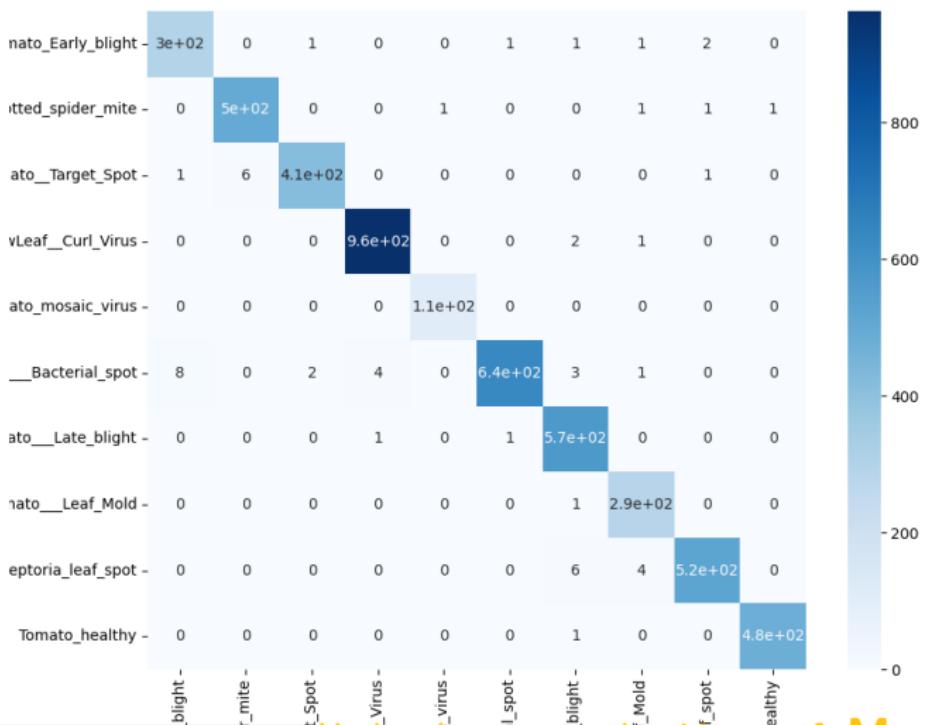


Figure: Accuracies vs Loss for 75 epochs

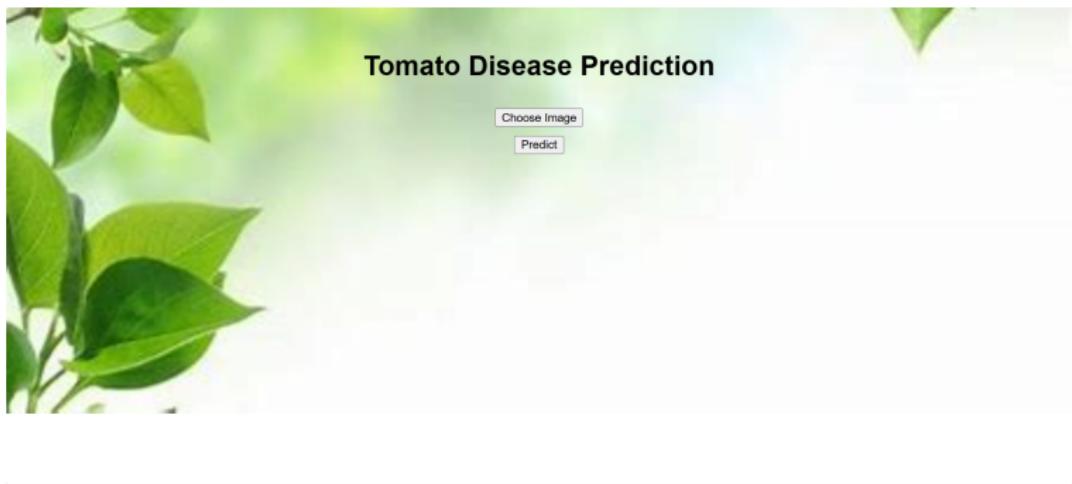
Confusion Matrix



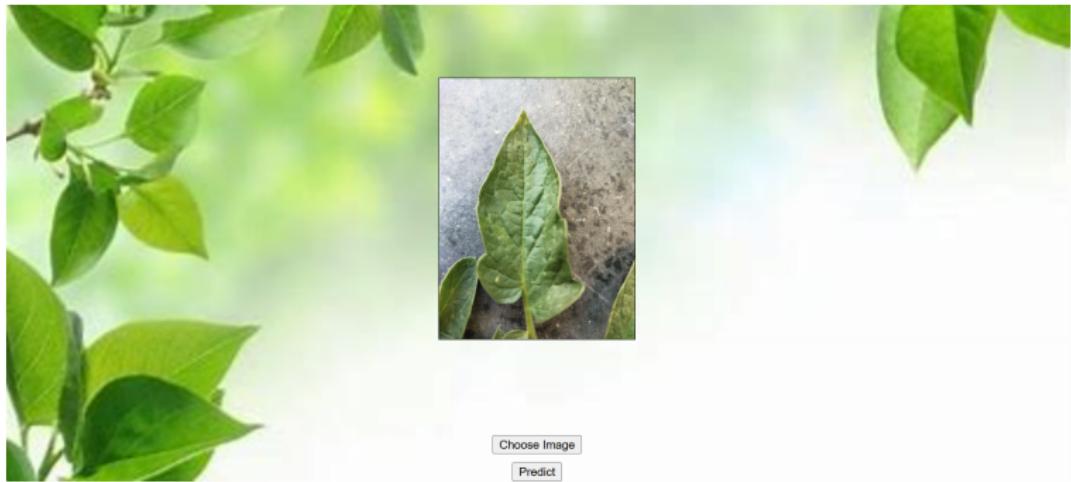
Result

- Our model surpasses earlier systems by offering a holistic solution for tomato crop management.
- Integration of real-world data and improved accuracy.

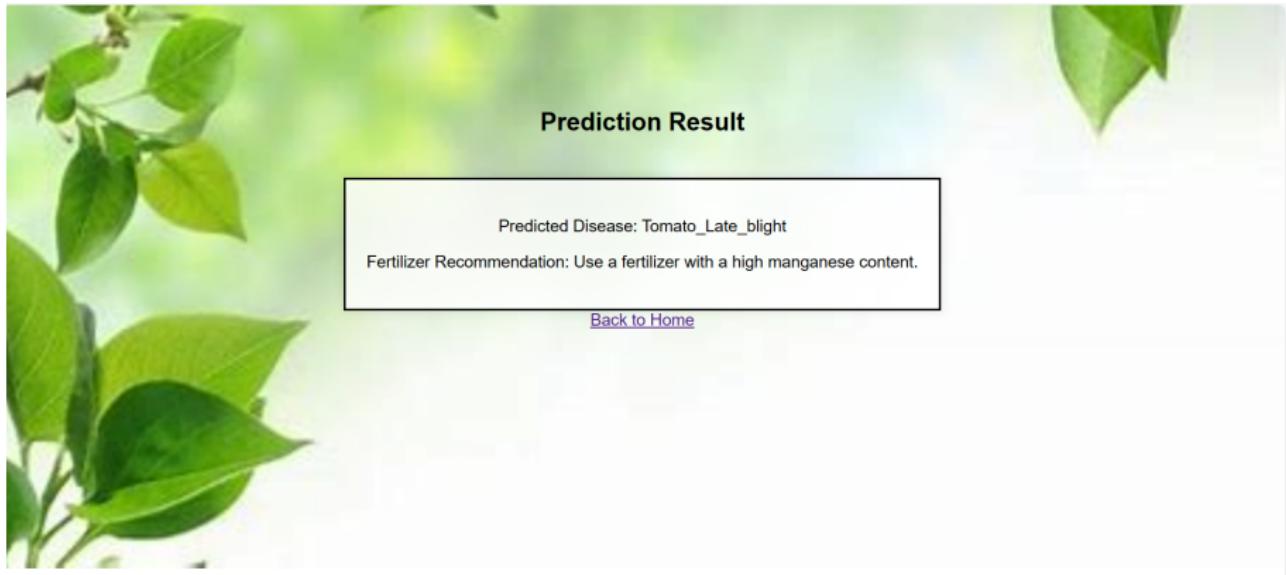
GUI Representation



GUI Representation



GUI Representation



Key Findings

- **Comprehensive Solution:**

- Previous systems addressed only disease detection.
- Our model incorporates GUI for user-friendly interaction and recommends appropriate fertilizers, enhancing crop management efficiency.

- **Enhanced Accuracy:**

- Earlier dense models achieved 96% accuracy.
- Our model boasts an accuracy of 99.1%, signifying significant improvement in performance.

Overview of Report Structure

- **Introduction** - Tomato leaf Disease Detection
- **Literature Survey** - related works are read and reviewed
- **System Design** - Proposed a system to overcome failures of existing system
- **Methodology** - Data is augmented and then train the data with models
- **Implementation** - Data is trained with models(like DenseNet201) fetching fertilizer recommendation and integrated with GUI
- **Results and Discussions** - The proposed model have fetched 99.1% accuracy.
- **Conclusions and Future works** - various other models and multiple crops.

Upcoming tasks and Milestones

S.No	Module Implementation
1	Improvements to be done in GUI
2	Extending to Modified ReLU Activation Function

References

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- DCNet: DenseNet-77-based CornerNet model for the tomato plant leaf disease detection and classification Saleh Albahli1 and Marriam Nawaz,2022
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Any Questions ?

Thank you