TOMATO DISEASE PREDICTION USING DEEP LEARNING.

Moringa School

Group 3 Capstone Project.

Introduction.

Tomatoes are a crucial crop in Kenya, providing both economic benefits and nutritional value.

They are highly susceptible to various diseases, caused by fungi, bacteria, viruses and pests.

The consequences of unchecked tomato diseases are severe, leading to significant yield losses and economic challenges for farmers.

Business Problem

Tomato diseases cause substantial yield losses and economic difficulties for Kenyan farmers.

Traditional disease detection methods are often slow and inaccurate, necessitating a more efficient solution.

Project Goals

Create a web-based application that automatically detects a tomato disease using leaf images.

Stakeholders.

- **Farmers**

  To use the model for early and accurate disease detection.

- **Agricultural Extension Officers**

  To provide support and training to farmers.

- **Researchers & Scientists.**

  To further develop and improve the model.

- **Policy Makers**

  To support agricultural policies and initiatives based on model findings.

Metric of Success.

Model Accuracy:

Achieve a classification accuracy of over 90%.

Accuracy is best, as it measures the overall correctness of disease detection in all image classifications.

Methodology.

Data Collection:
Downloaded the dataset from Kaggle.

Data Preprocessing:
Images were correctly labelled, resized and batched.

Model Development.
Utilized various deep learning architectures like ResNet50, CNN, VGG19, EfficientNetB0 and MobileNetV2.

Model Evaluation & Selection:
Performance assessed using accuracy metrics.

Model Deployment:
Deployed the model using a web-based application.

Data Overview.

Source:

PlantVillage , a research initiative by Penn State University.

Content:

It contains 16,011 images of tomato leaves.

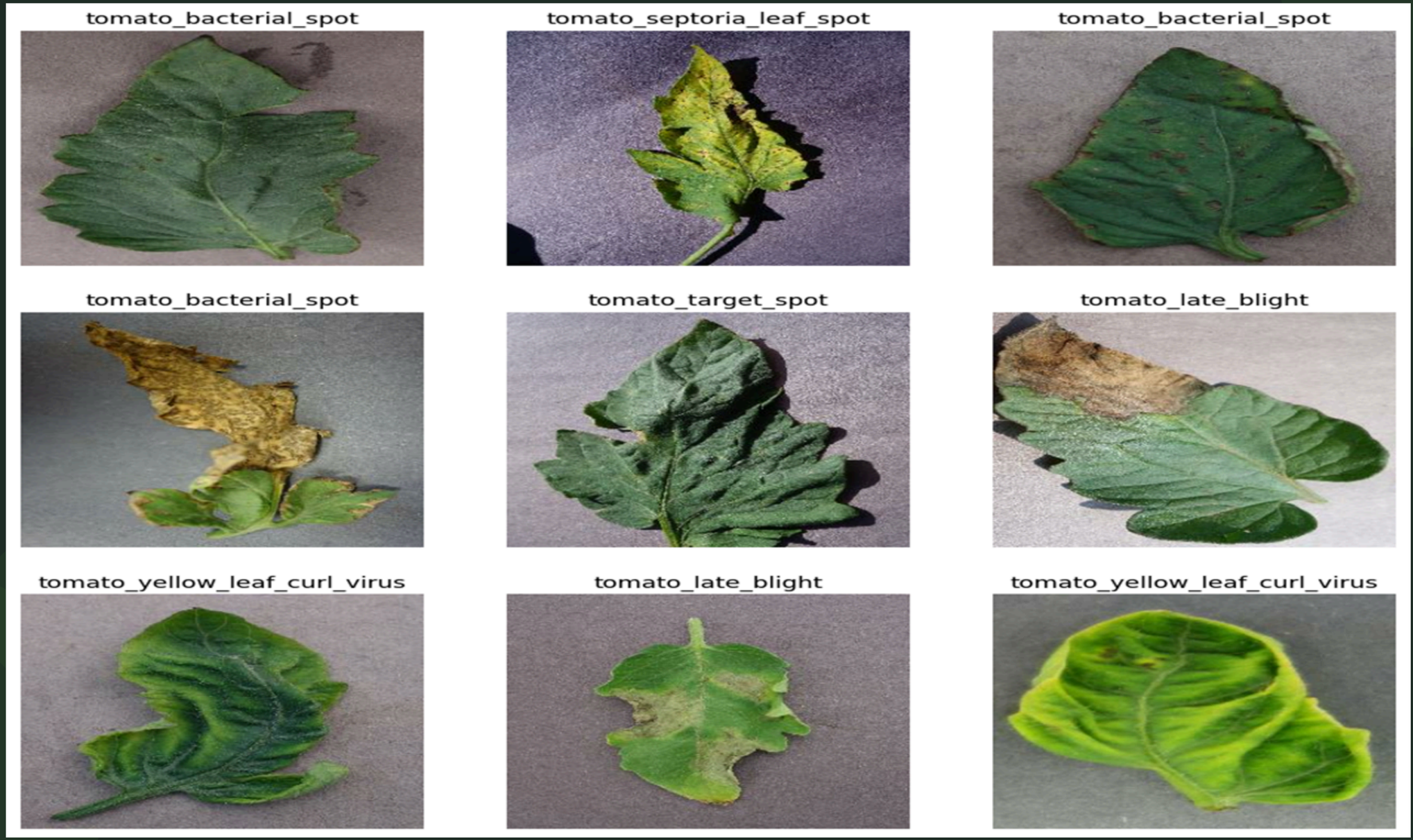
Classes:

It had 10 different categories of tomato leaves, 9 diseases and 1 healthy.

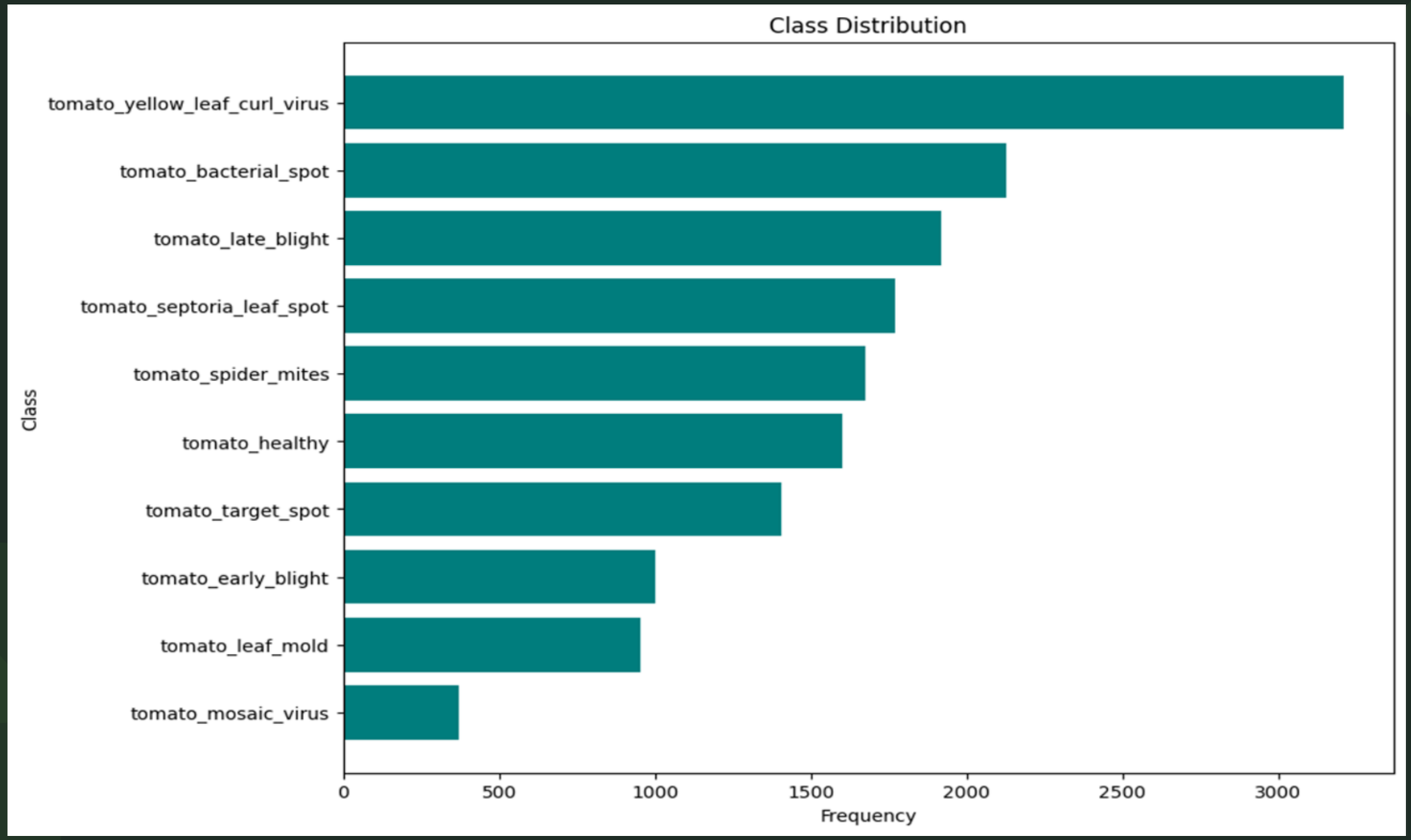
Disease Names:

Bacterial spot, early blight, late blight, leaf mould, septoria leaf spot, two-spotted spider mites, target spot, yellow leaf curl virus and mosaic virus

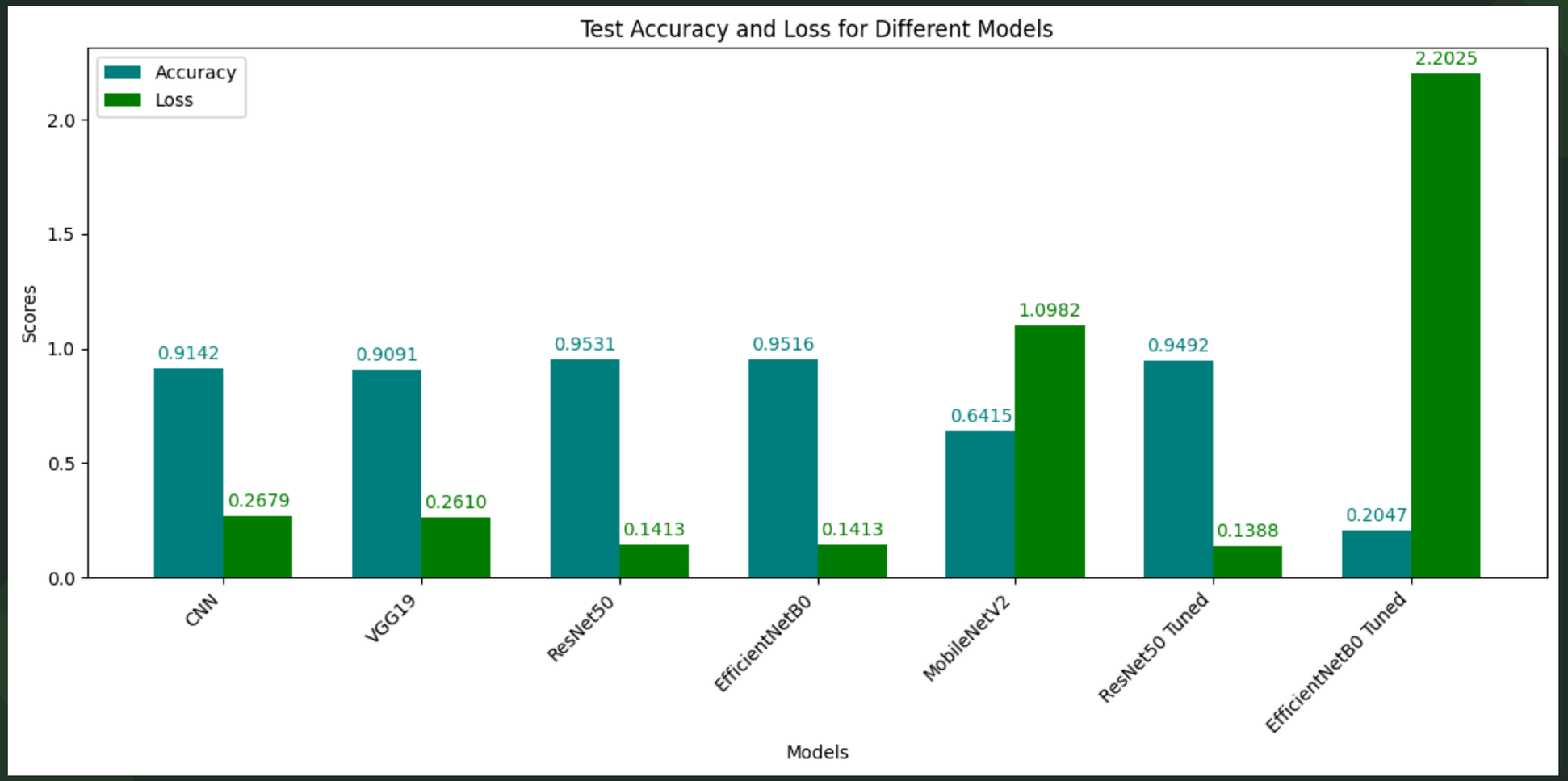
Image Samples.



Class Distribution.



Model Perfomance.



Model Selection.

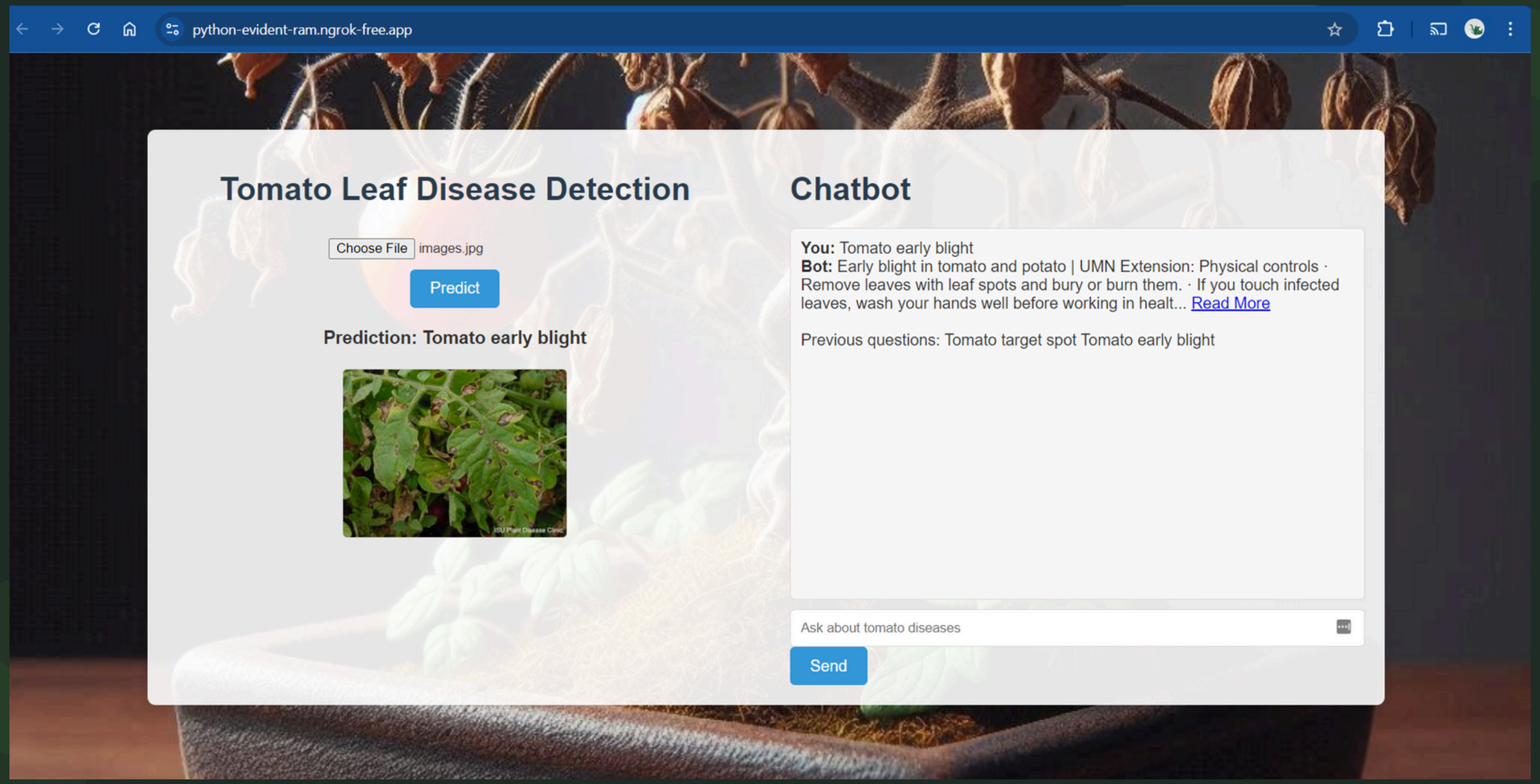
The bar chart shows that ResNet50 performed best, with 94.9% accuracy and 13% loss. EfficientNetB0 had 95.3% accuracy and 14% loss but was inconsistent. Thus, ResNet50 was chosen for predicting tomato diseases.

Predicting using Resnet50

```
1/1 [==============================] - 0s 82ms/step
Predicted: tomato_late_blight.
 Confidence: 99.95%
```

The Resnet50 model was able to accurately predict that the random image that was loaded was of a leaf that had been affected by late blight with a high confidence level of 99.95%

Deployment.



Deployment Link

Recommendations

For Farmers:

Regularly use the disease detection tool for early identification and management of tomato diseases

Extension Officers:

Provide training and support to farmers on using the tool

Researchers:

Continue refining and improving the model-based field data and feedback

Challenges

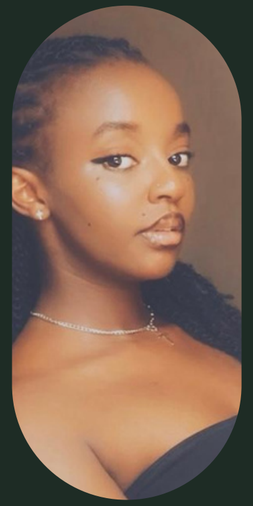
- Obtaining high-quality labelled images for training.
- Computational limitations in training our model.

Future Work.

- Develop a mobile app (iOS and Android) to capture leaf images and predict plant diseases.
- Expand the dataset with diverse plant images and integrate weather data for better predictions.
- Improve model accuracy with transfer learning.
- Enhance the model to classify the severity of infections (mild, moderate, severe).
- Integrate the model into a mobile app for instant disease detection and treatment recommendations.
- Use IoT devices for continuous crop monitoring and early disease detection. Create training materials to educate farmers on using the tools effectively, including tutorials and best practices for image capturing and result interpretation.

Meet the Project Team

Kimani J. Irungu



Lisa Mwikali

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Purity Kibaki

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Thank You
welalin
Spasibo
obrigado
Terma Kasih
Grazie
Nirringrazzjak
Multumesc
Kia ora
Matondo
Salamat
Vinaka
Mochchakkeram
Terma Kasih
Raibh Maith Agat
Mochchakkeram
Kiitos
Raibh Maith Agat
Chokrane
Asante
Kiitos
Grazie
Maake
Mamana
Merci
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Kiitos
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Matur Nuwun
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