

Rice Disease Detection on Mobile Application

CAPSTONE PROJECT I

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Agenda

- I. Project Overview
- II. Literature Review
- III. Methodology
- IV. Model Development
- V. Results
- VI. Mobile Application Development
- VII. Conclusion
- VIII. Demo

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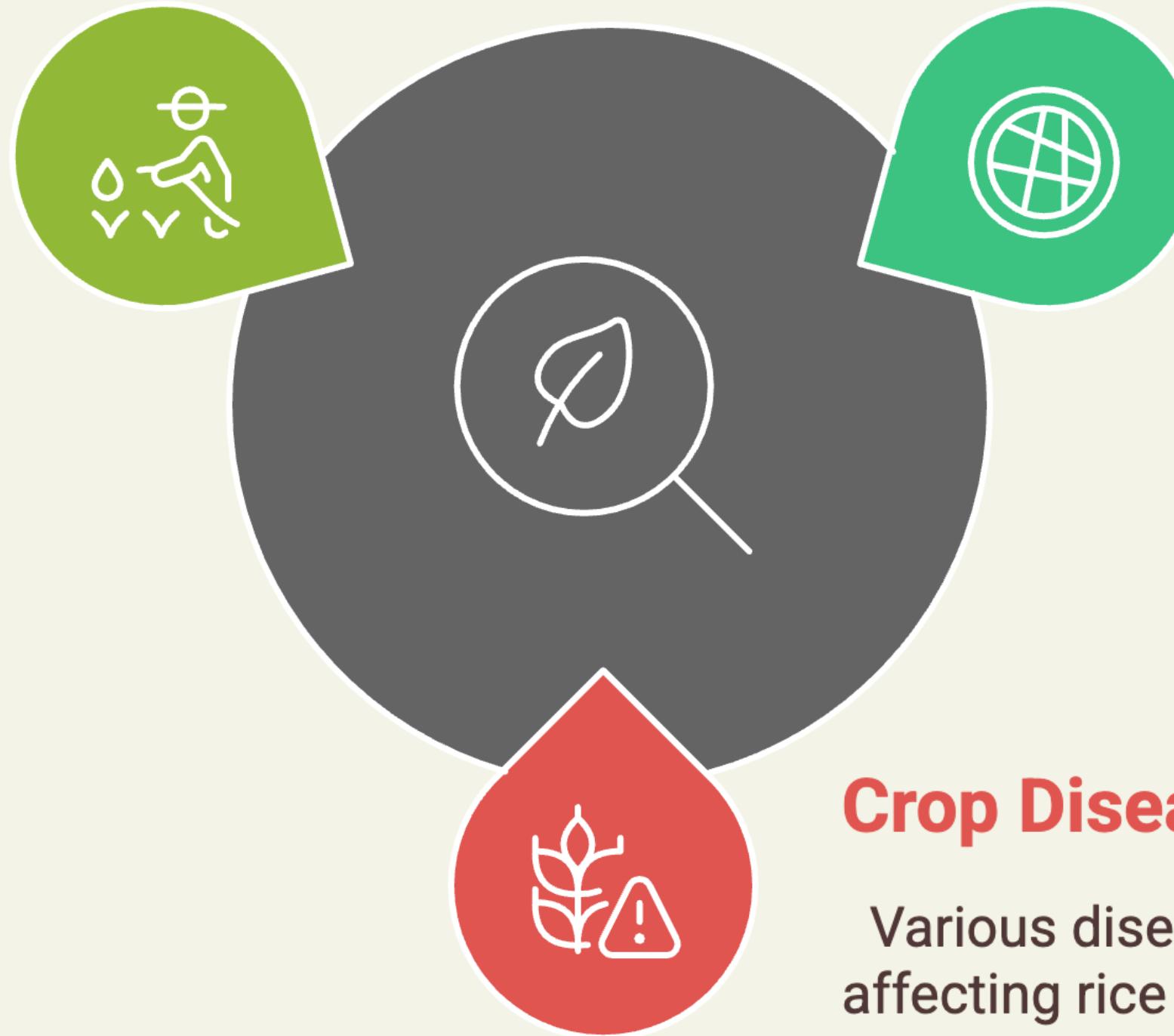
PROJECT OVERVIEW

PROJECT OVERVIEW

Background

Traditional Identification Methods

Manual disease identification by experienced farmers



Rice's Global Importance

Rice's role as a primary food source worldwide

Crop Diseases

Various diseases affecting rice crops

PROJECT OVERVIEW

Problem Statement

1

Lack of System

Farmers lack access to licensed systems for disease management.

2

Limited Expert Access

Farmers have limited access to agricultural experts for guidance.

3

Inefficient Management

Disease management becomes inefficient due to the lack of resources.

4

Need for Solutions

There is a pressing need for effective disease management solutions.



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PROJECT OVERVIEW

Objective

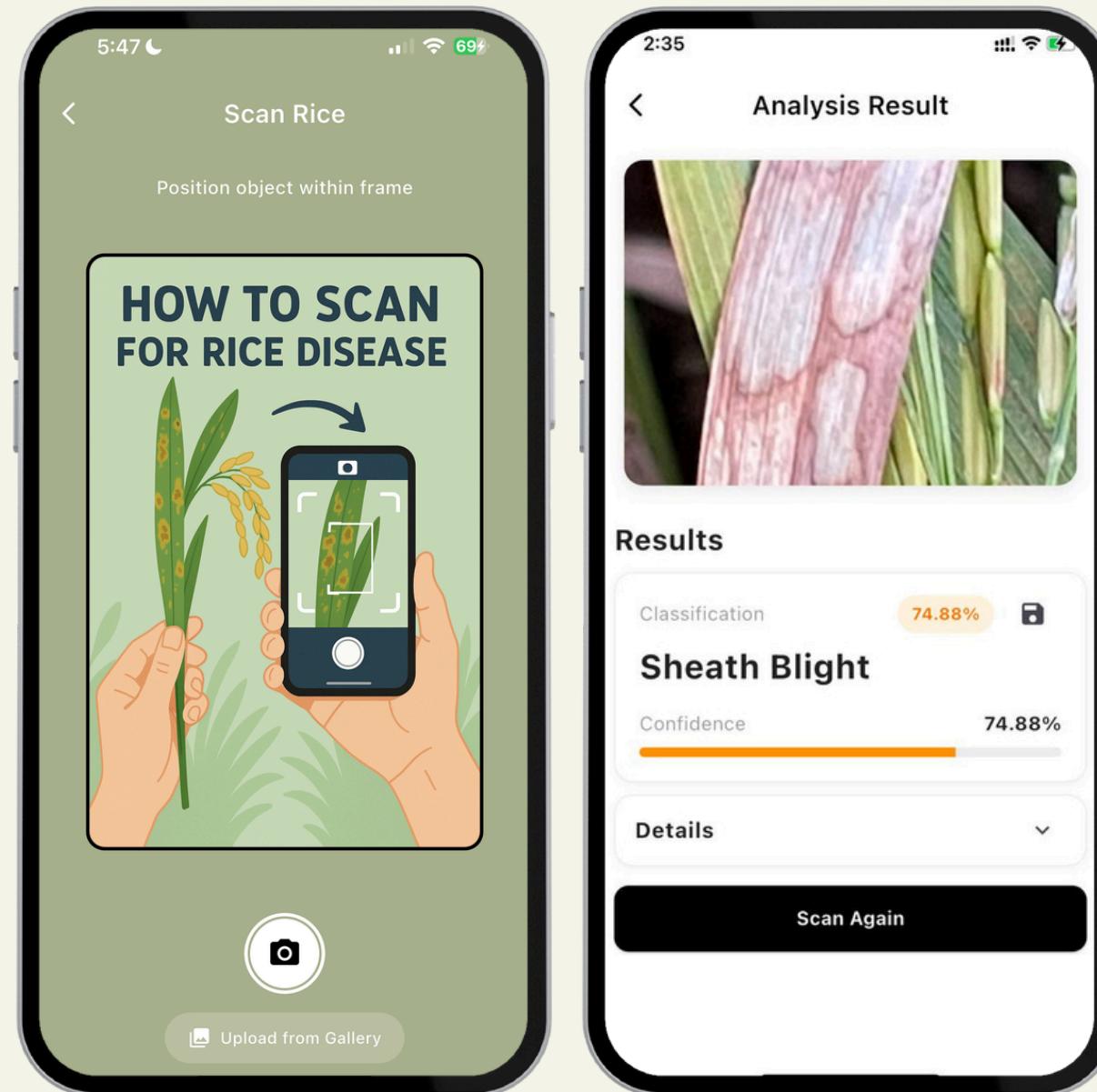


Image Analysis

Deep Learning algorithms analyze the image



Disease Identification

System identifies the condition of the rice



Early Detection

Detects diseases early to prevent spread

||

LITERATURE REVIEW

LITERATURE REVIEW

Related Work

R. Deng et al., 2021 🌾

ResNet-50

DenseNet-121

SE-ResNet-50

Ensemble Model

99% Accuracy

T. Selvi et al. 2024 🧑

ResNet-50

Few-shot Learning

97% Accuracy

Rice Leaf
Disease
Classification

S.R. Shah et al., 2023 🌾

Inception V3

VGG16, VGG19

Modified ResNet-50

99.75% Accuracy

CNN P.A.S Rani and N.S. Singh, 2022

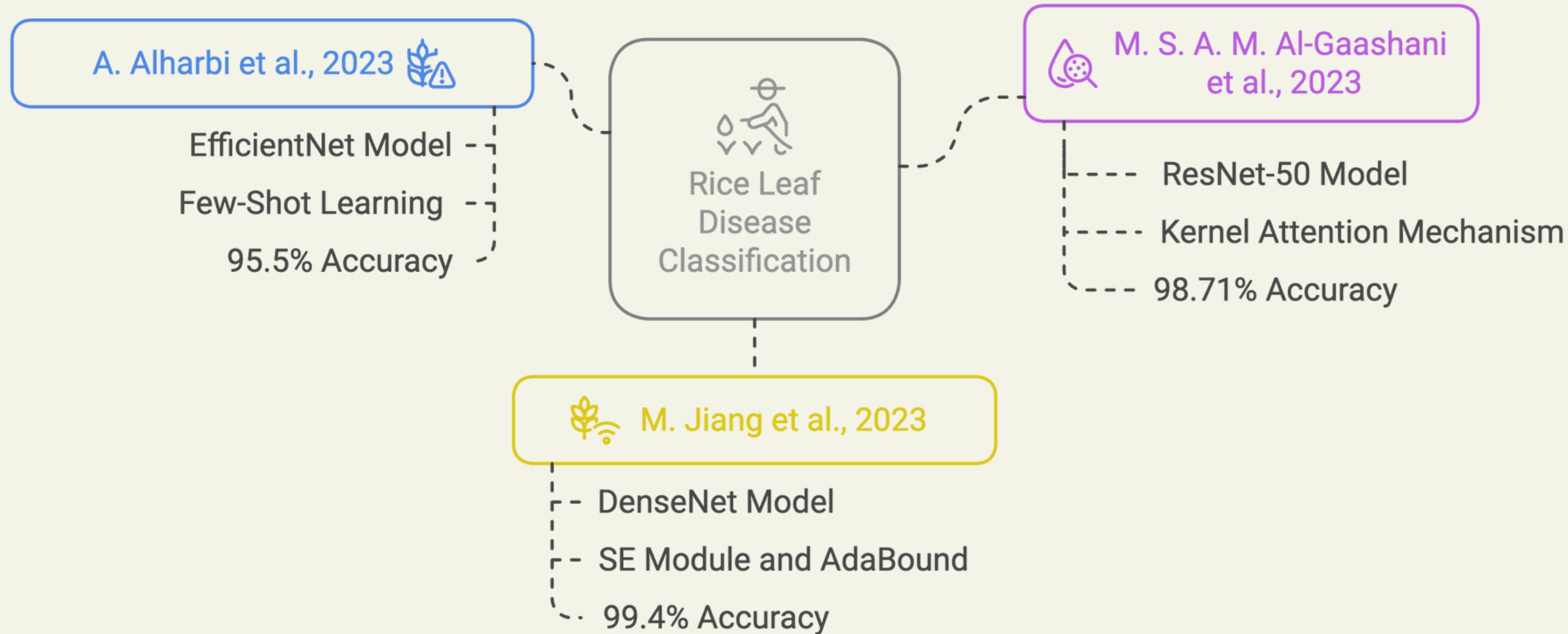
Deep CNN

ResNet-50

97.3% Accuracy

LITERATURE REVIEW

Related Work



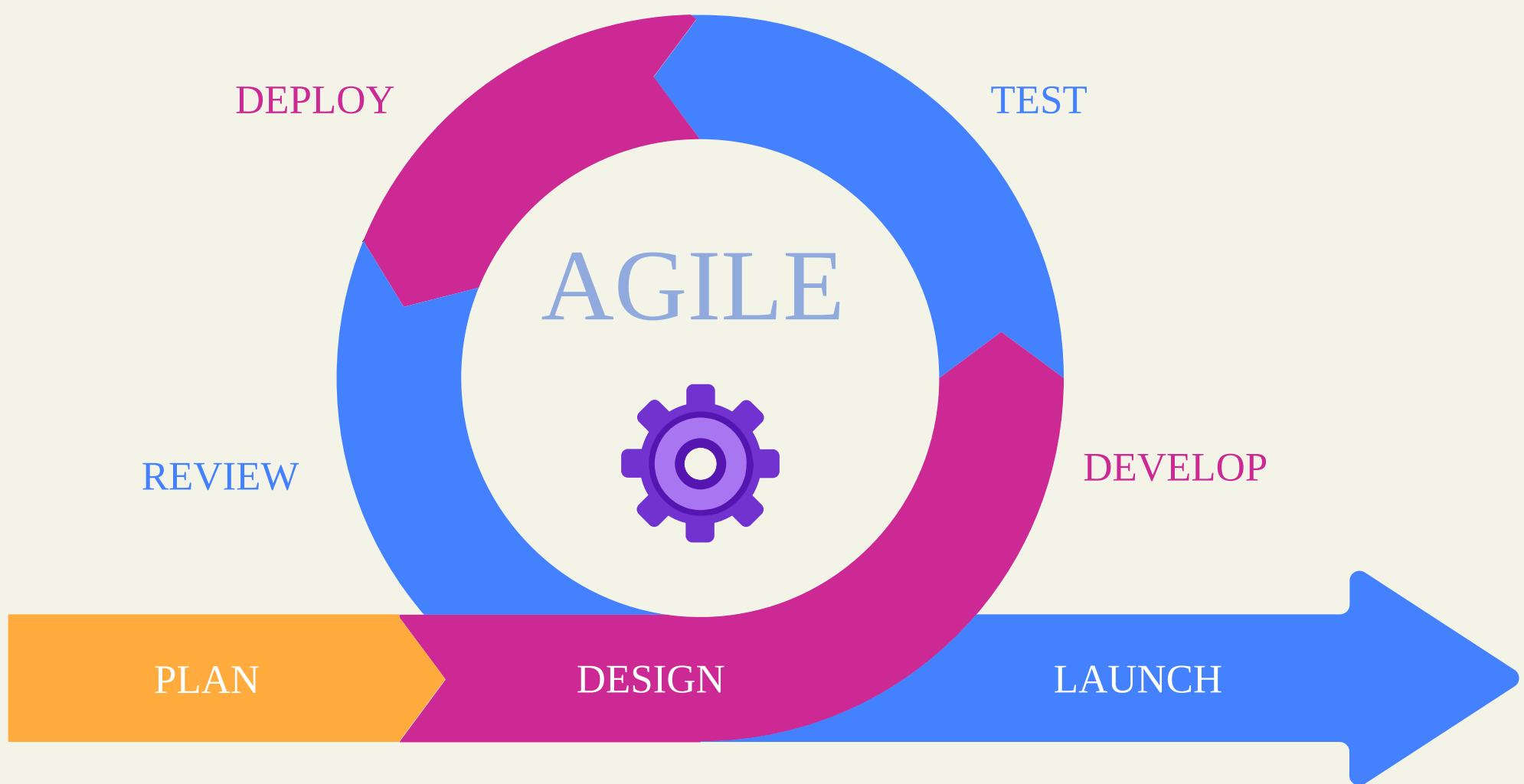


METHODOLOGY

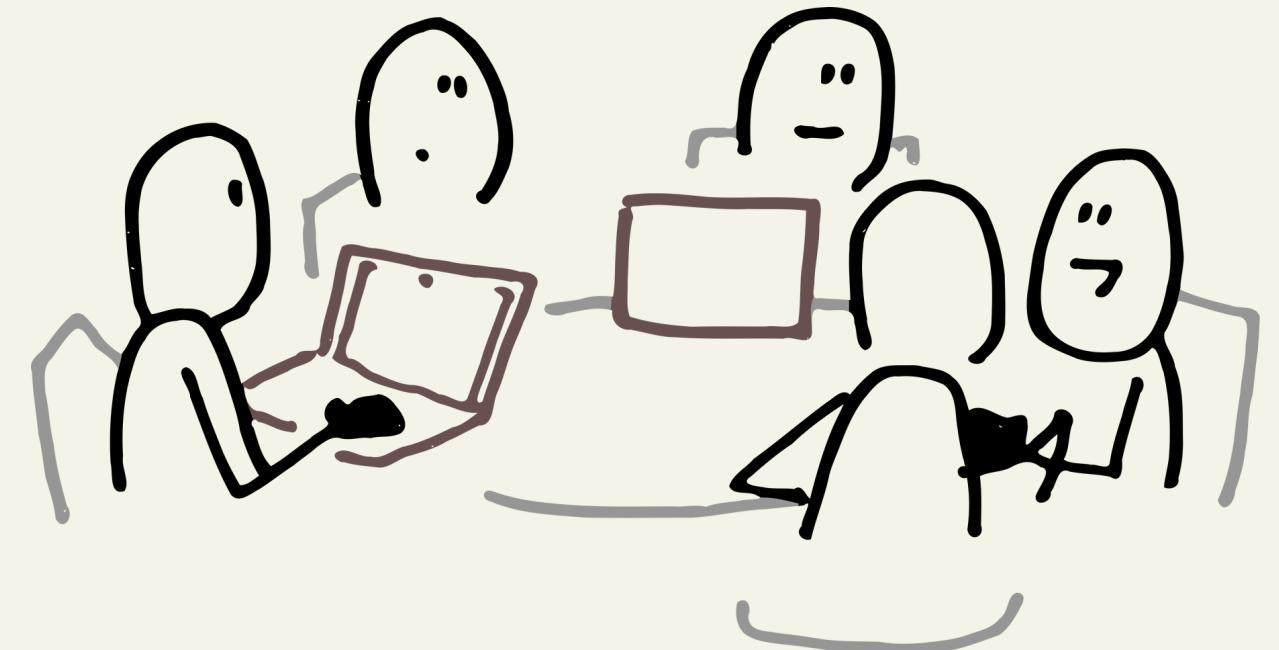
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METHODOLOGY

Agile Framework



Scrum Framework (Weekly Standup Meetings)



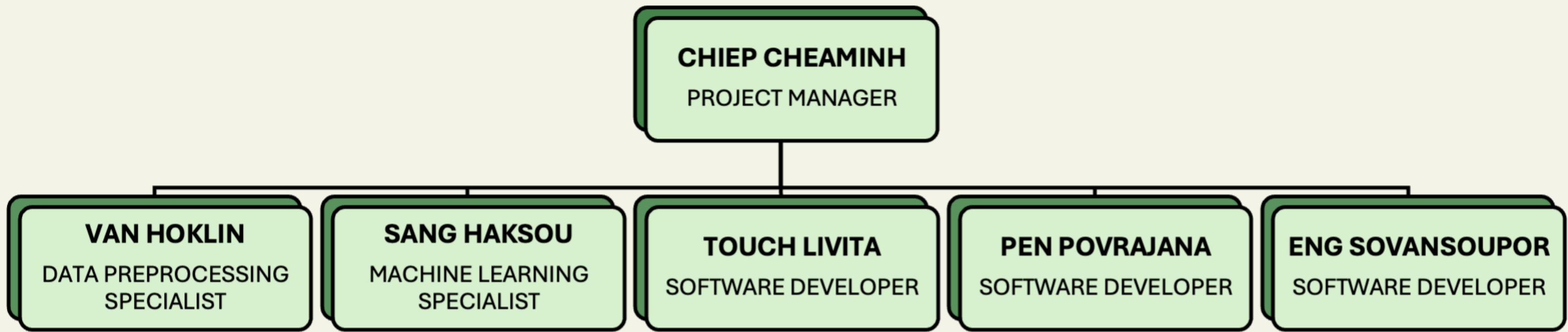
Three main questions:

- What did I do this week?
- What will I do today?
- Are there any blockers?



METHODOLOGY

Team Roles & Responsibilities



METHODOLOGY

Technical Stack

Frontend



Flutter



Dart

Dart

Backend



Python



Postman



Flask



Firebase

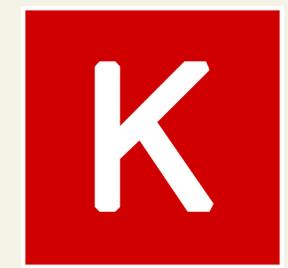
Deep Learning



TensorFlow



Jupyter Notebook



Keras



Nvidia CUDA

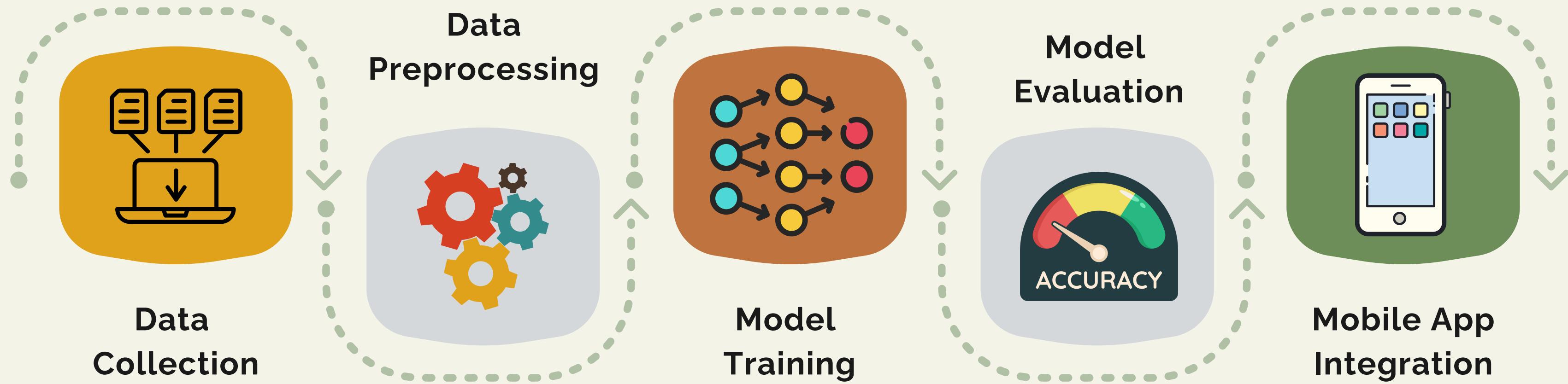
IV

MODEL DEVELOPMENT

1

MODEL DEVELOPMENT

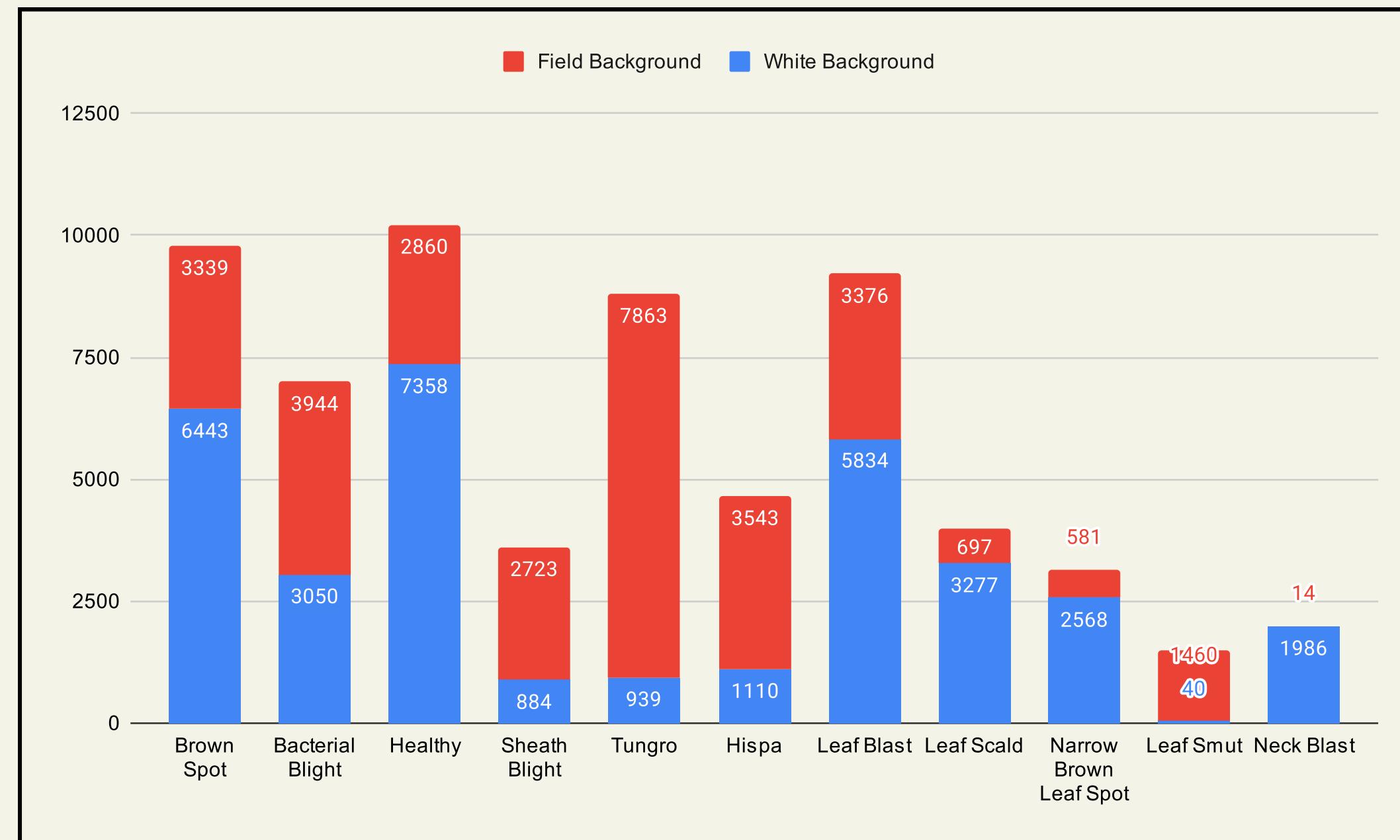
Deep Learning Pipeline



MODEL DEVELOPMENT

Data Collection

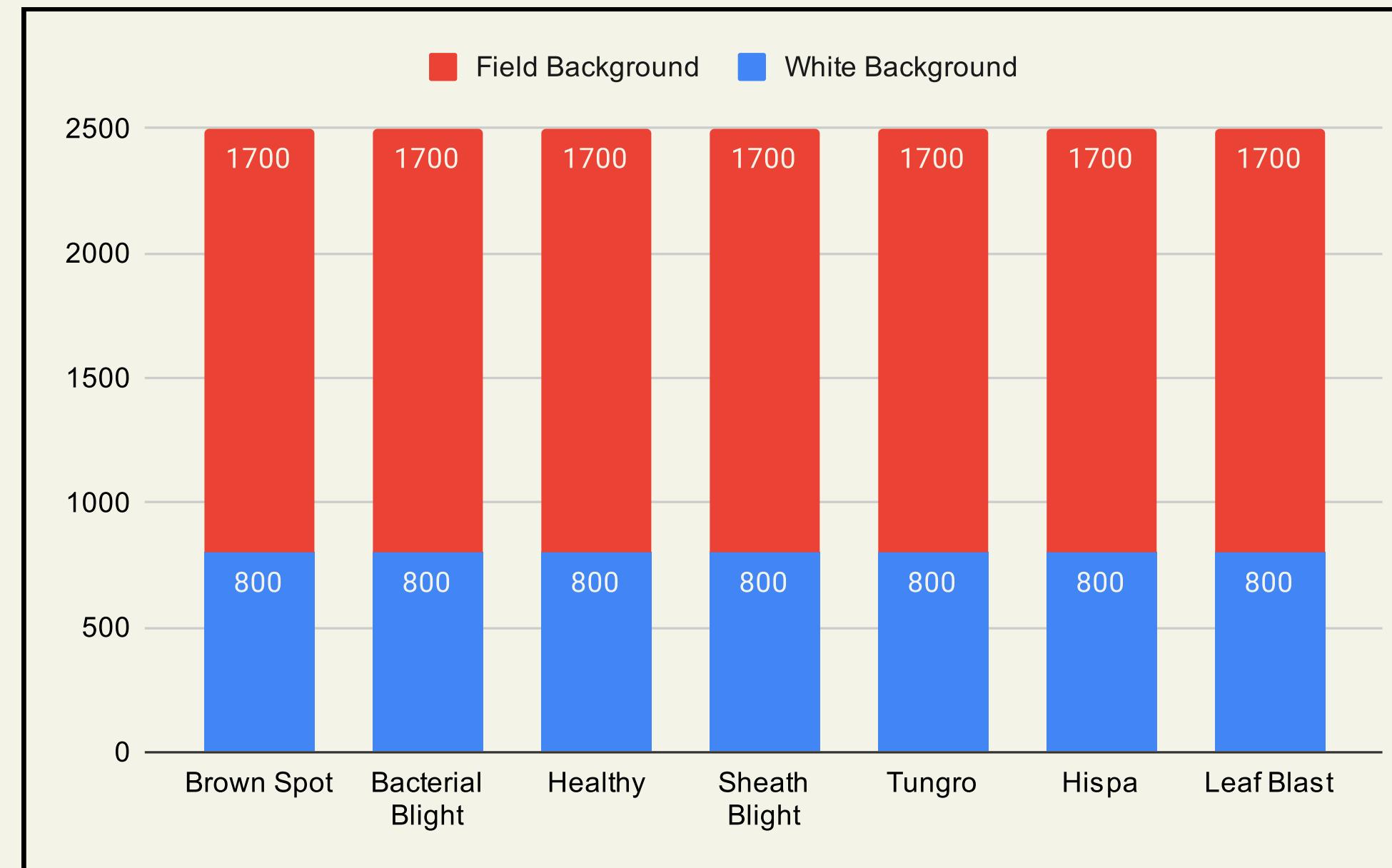
- Collected secondary dataset from **Kaggle**, **Mendeley**, and **Universe.roboflow**.
- 11 classes** with images in **white** background (lab) and **field** background (real-world)
- Overall Dataset: **63,889 images** across **11 classes**.



MODEL DEVELOPMENT

Data Collection

- After cleaning the dataset, we selected **7 classes**.
- For each class, we chose **800 images** with a white background and **1,700 images** with a field background.
- The overall dataset now consists of **17,500 images** across **7 classes**.



5

MODEL DEVELOPMENT

Rice Disease Types

Disease	Healthy	Bacterial Blight	Leaf Blast	Brown Spot	Sheath Blight	Hispa	Tungro
Image							

MODEL DEVELOPMENT

Rice Disease Types

Disease Name	Cause	Description
Healthy	None	Normal green leaves with no disease symptoms.
Bacterial Blight	Bacterial	Yellowish-brown streaks on leaves, leading to wilting and drying.
Leaf Blast	Fungal	Gray-centered lesions with brown borders, affecting plant growth.
Brown spots		Oval, water-soaked lesions on leaf sheaths, leading to plant lodging.
Sheath Blight		Small brown spots with yellow halos, reducing grain quality.
Hispa	Parasite	Small brown spots with yellow halos, reducing grain quality.
Tungro	Virus	Stunted growth and yellow-orange discoloration.

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MODEL DEVELOPMENT

Data Augmentation



MODEL DEVELOPMENT

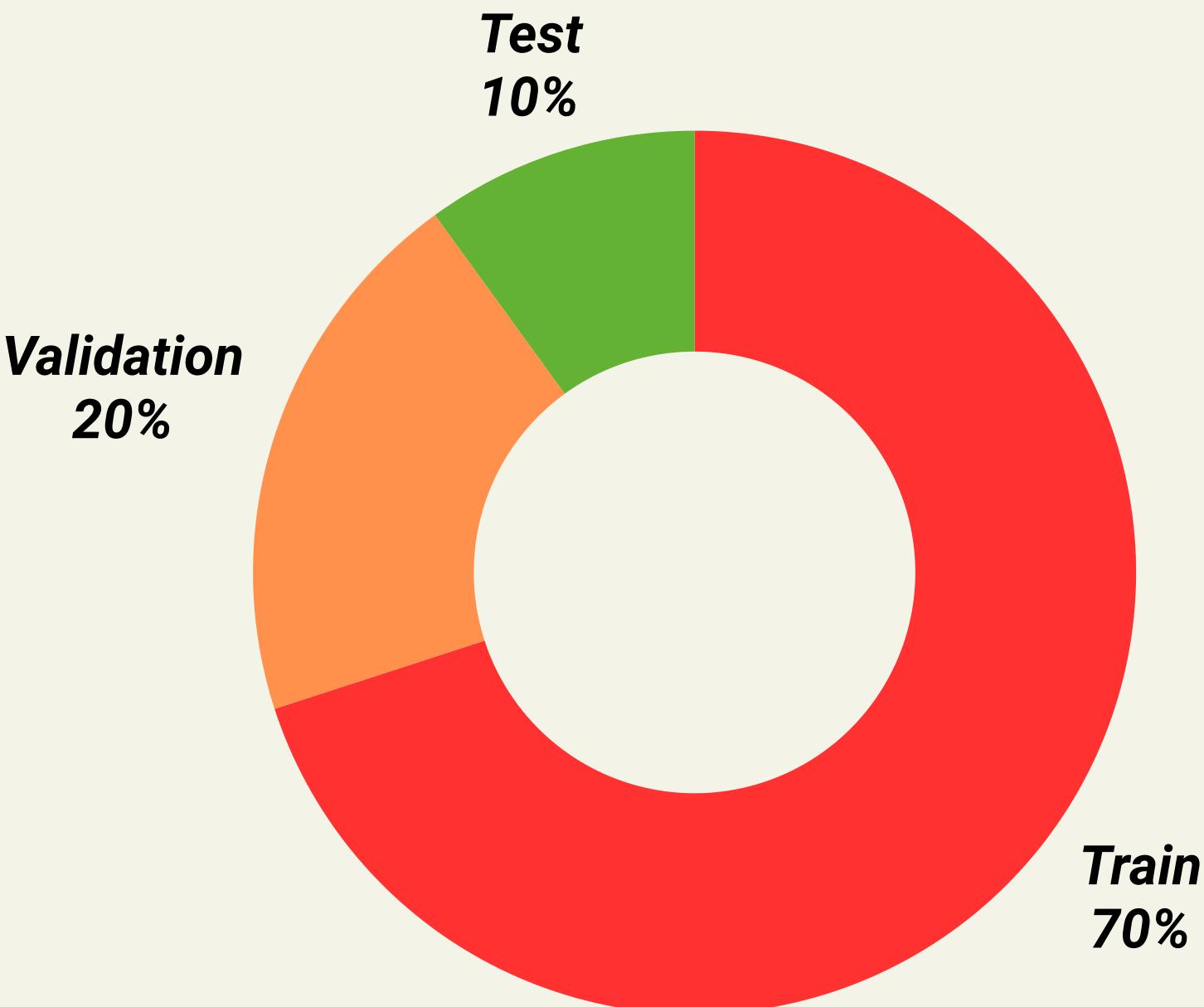
Data Splitting

Data Splitting:

12,500 images for training

3,500 images for validation

1,750 images for testing



MODEL DEVELOPMENT

Model Selection



EffiecientNetB0

5.3M parameters, 0.39B FLOPs, 224x224 input size

DenseNet-121

8.0M parameters, 2.8B FLOPs, 224x224 input size

MobileNet-V2

3.5M parameters, 0.3B FLOPs, 224x224 input size

MODEL DEVELOPMENT

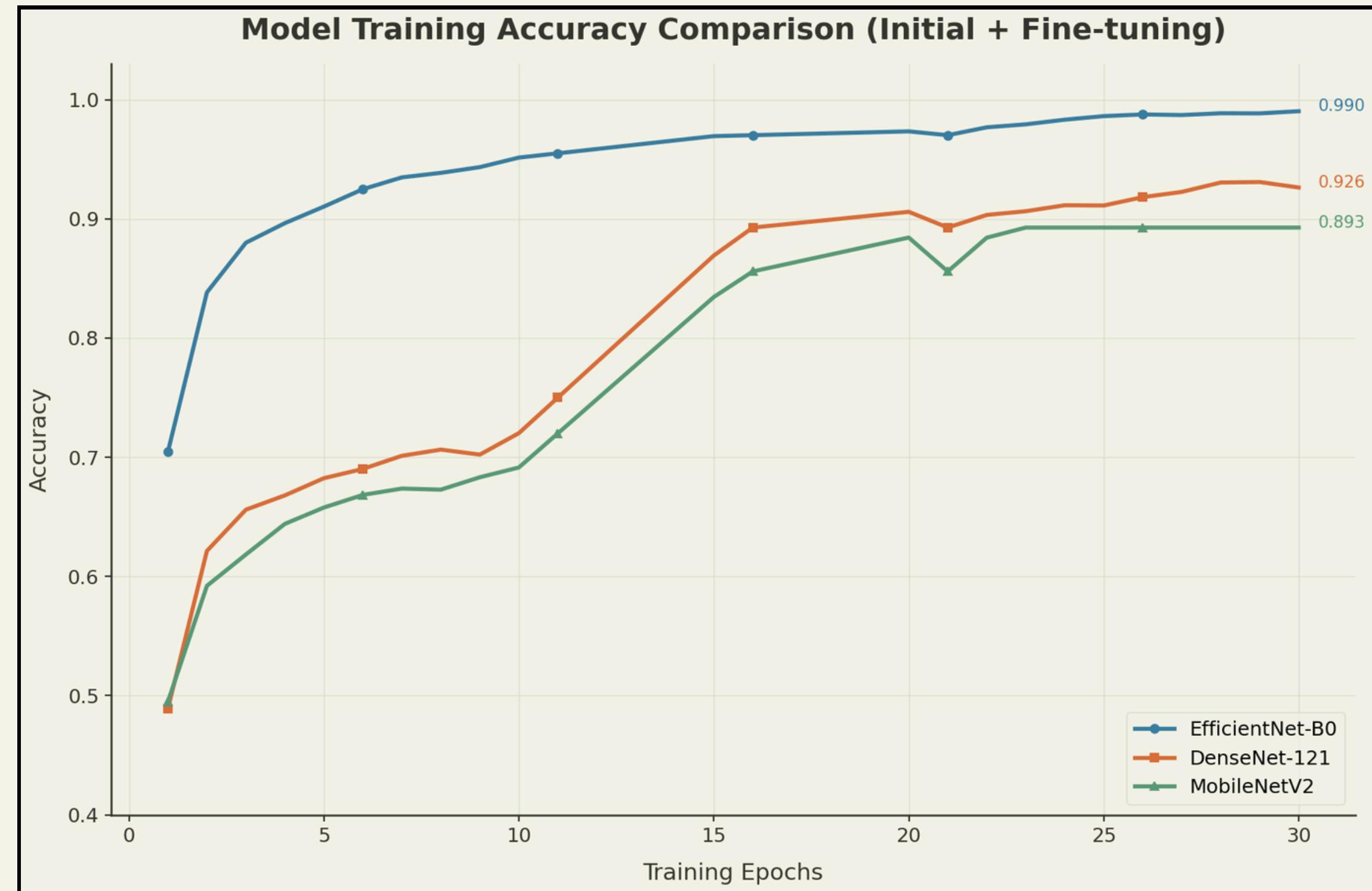
Model Training

Epochs: 30 (10 + 20)

Optimizer: Adam

Batch Size: 32

Duration: 2h-3h



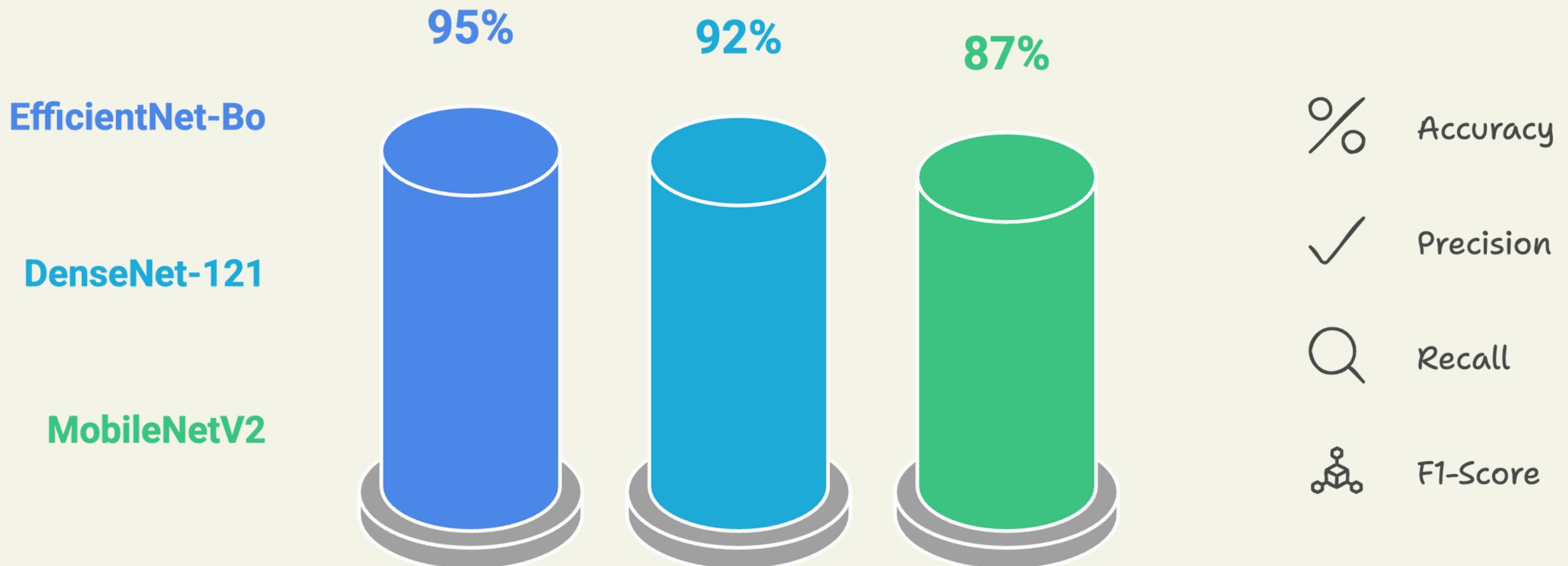
V

MODEL RESULT

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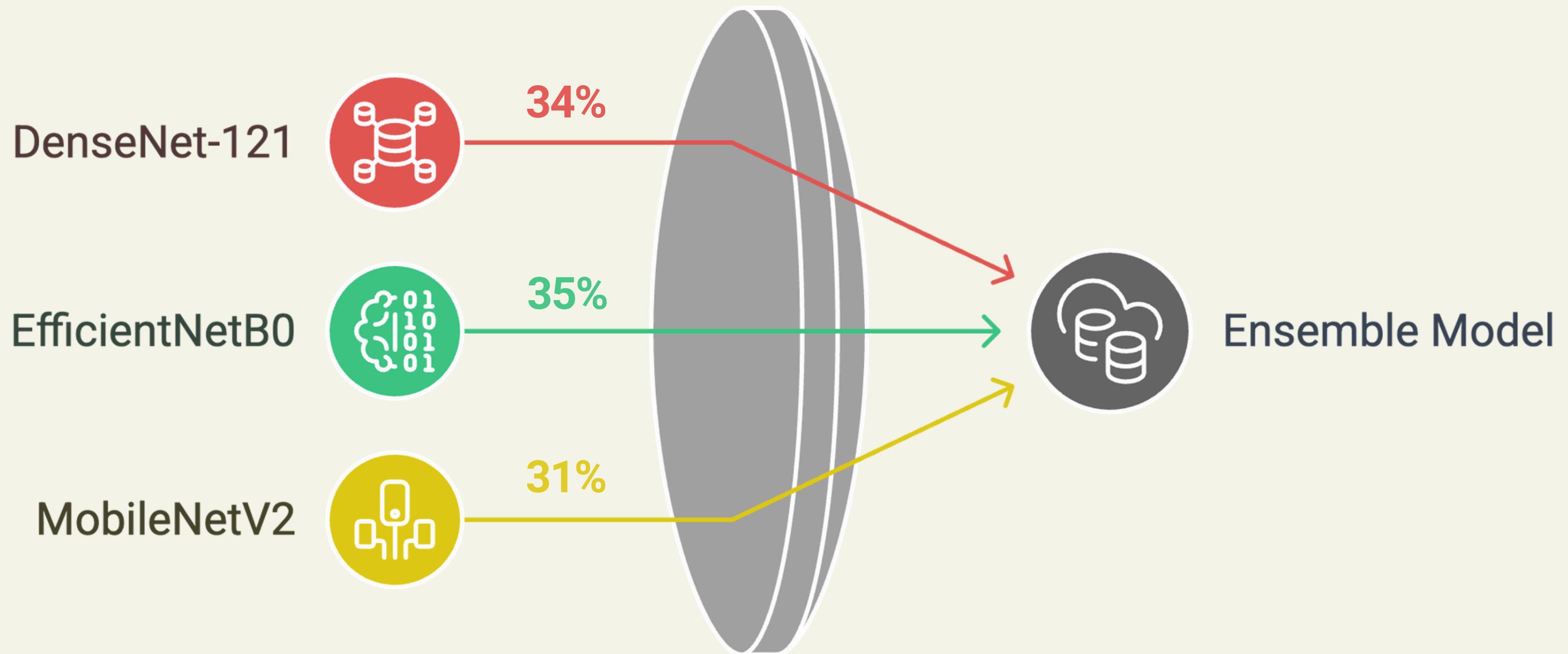
MODEL RESULT

Model Comparison – Accuracy



MODEL RESULT

Ensemble Model

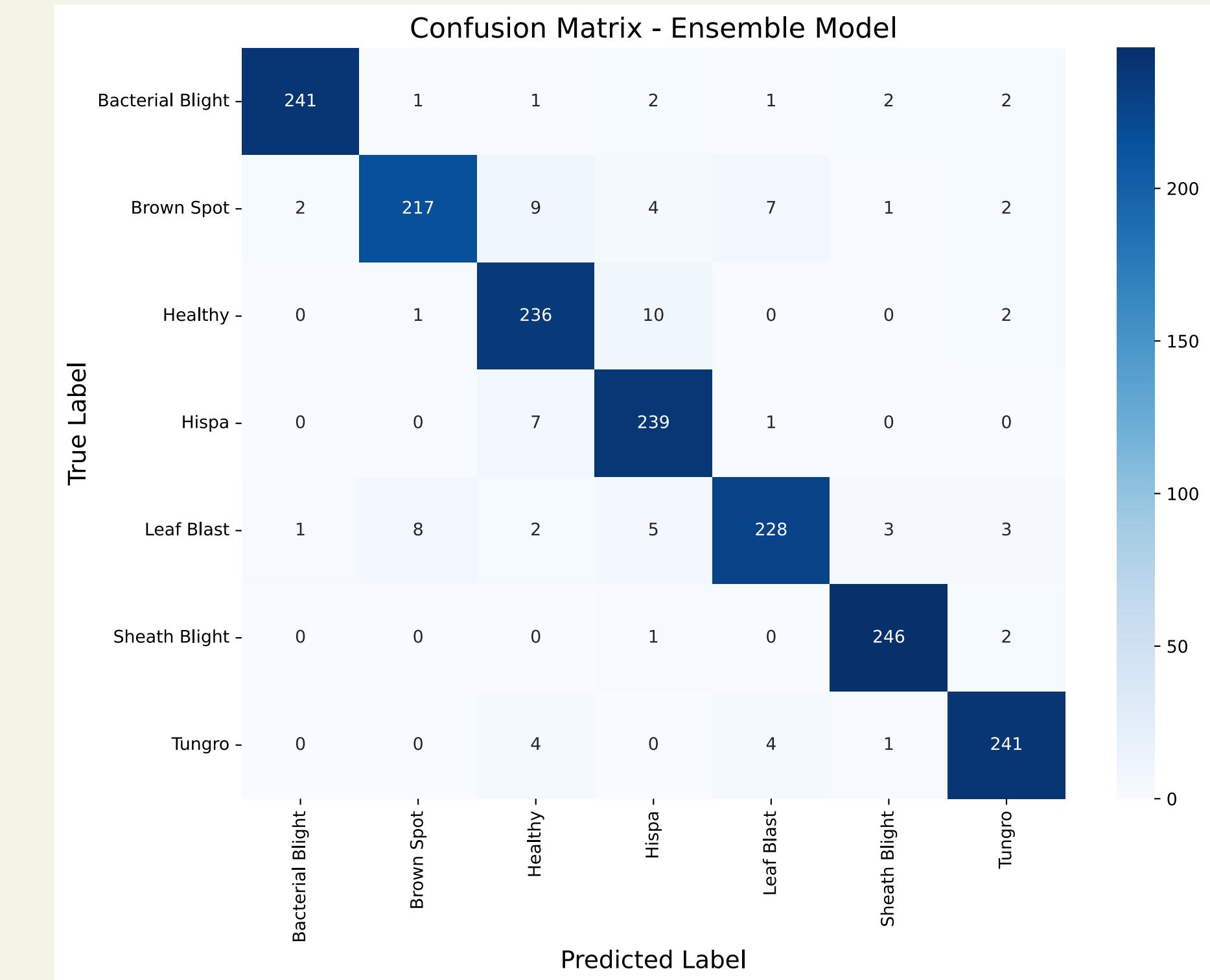


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MODEL RESULT

Ensemble Model

The **ensemble** approach **improved performance, achieving higher accuracy** individual models, with a notable increase in accuracy to **95%**

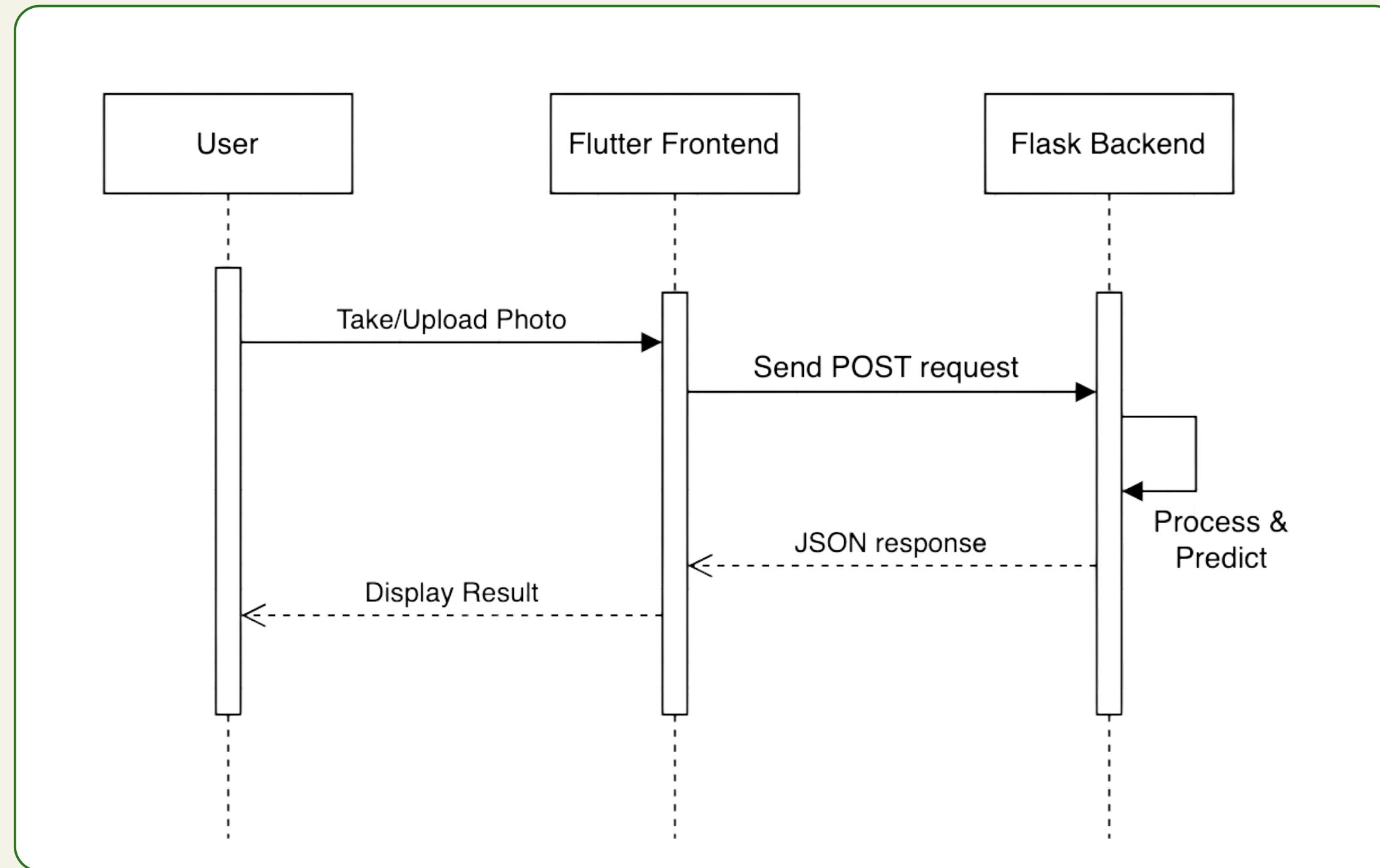


VI

MOBILE APP DEVELOPMENT

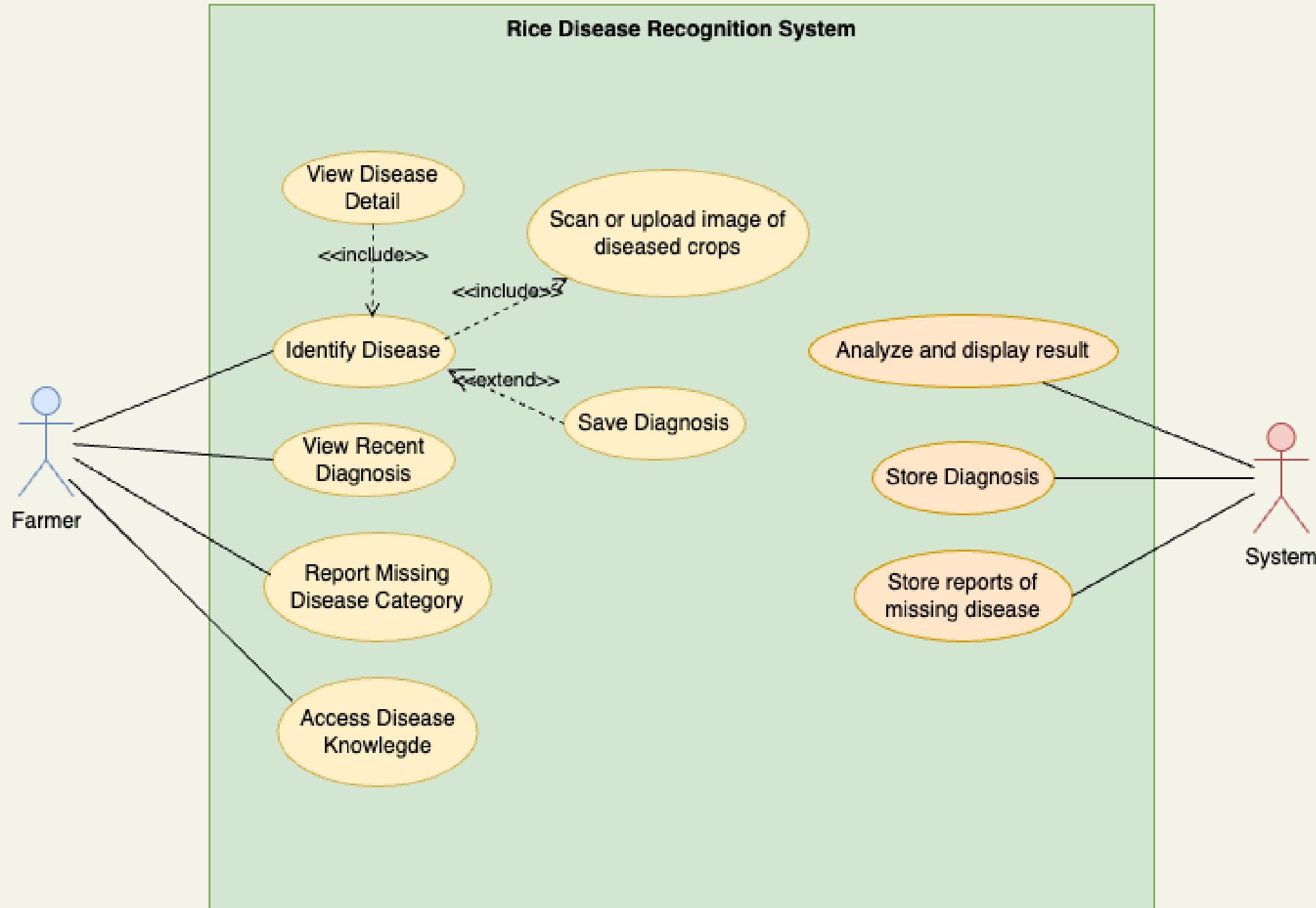
MOBILE APP DEVELOPMENT

API Integration



MOBILE APP DEVELOPMENT

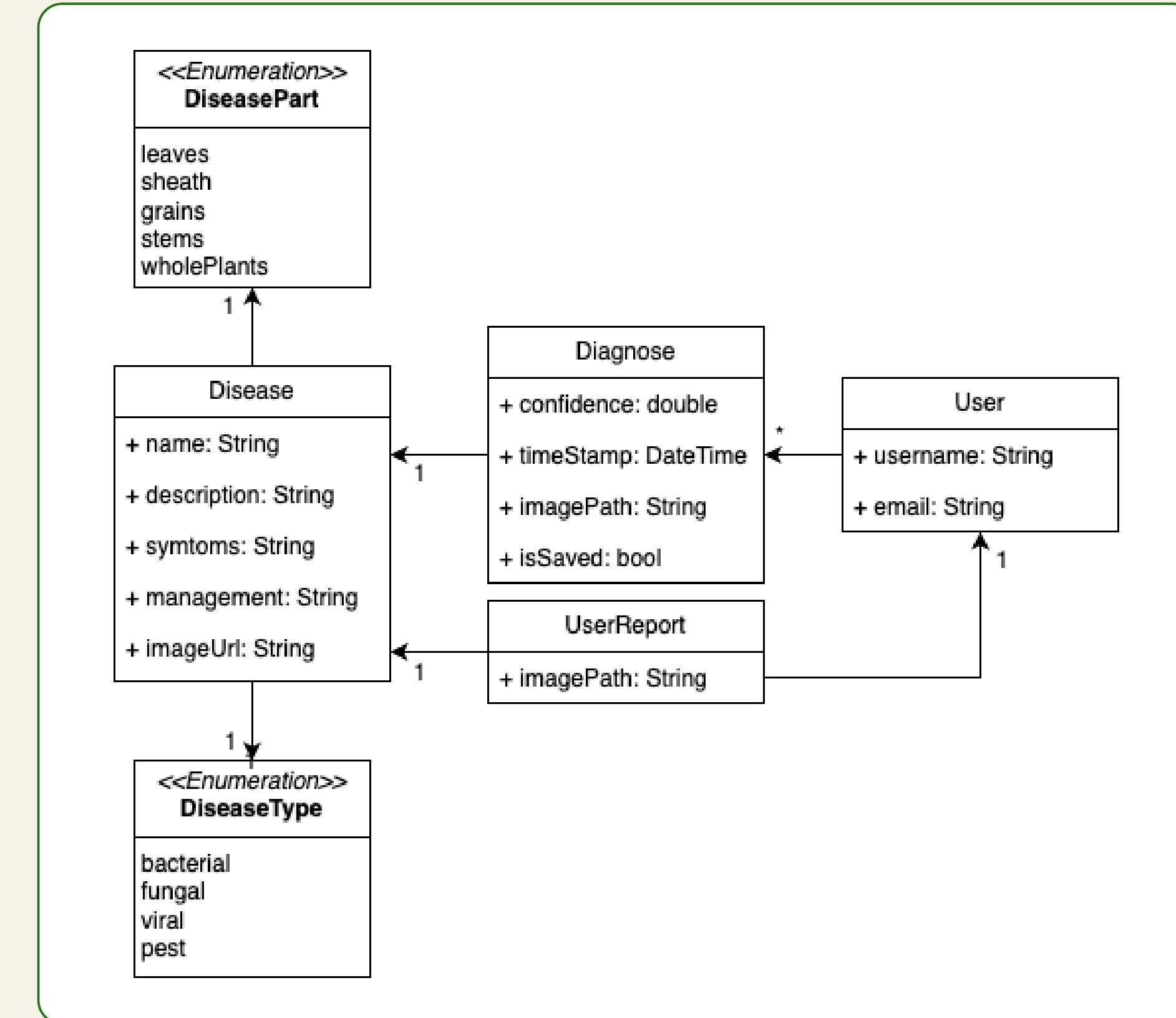
Use Case Diagram



MOBILE APP DEVELOPMENT

Class Diagram

Disease
Diagnose
User
UserReport



MOBILE APP DEVELOPMENT

Functional Requirements

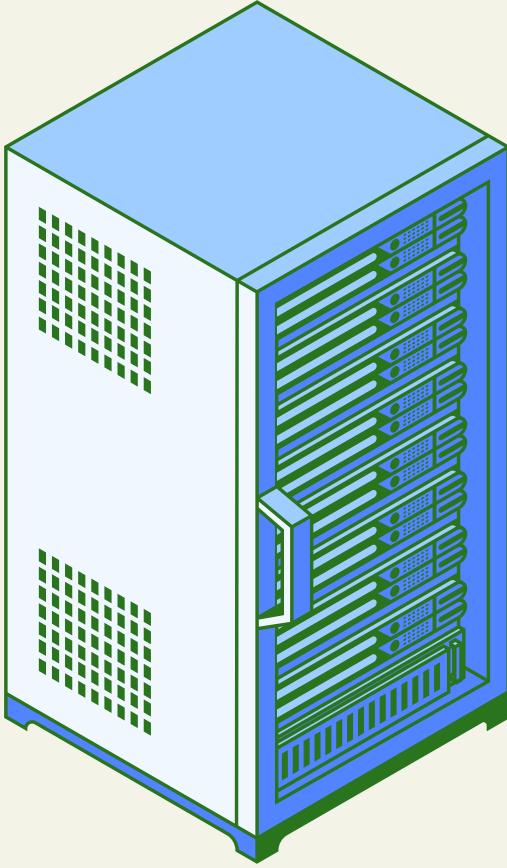
Functionalities	Duration
<ul style="list-style-type: none">1. Authentication Login2. Edit User Profile3. One-click Scanning / Upload Image4. Analyze diagnosis5. Save/Remove diagnoses6. Display Common diagnoses7. Report a missing disease8. Multi-language support (Khmer & English)9. Voice Assistance10. Call directly to expert	Implemented 3 Months

VII

CONCLUSION

CONCLUSION

Challenges



**Limited Computational
Resources**



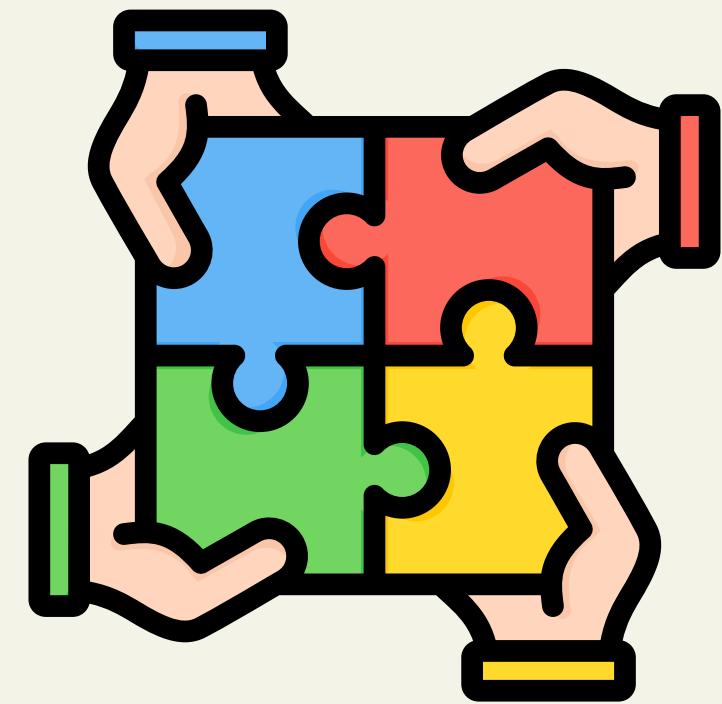
**Lack of Domain
Expertise**

CONCLUSION

Lesson Learnt



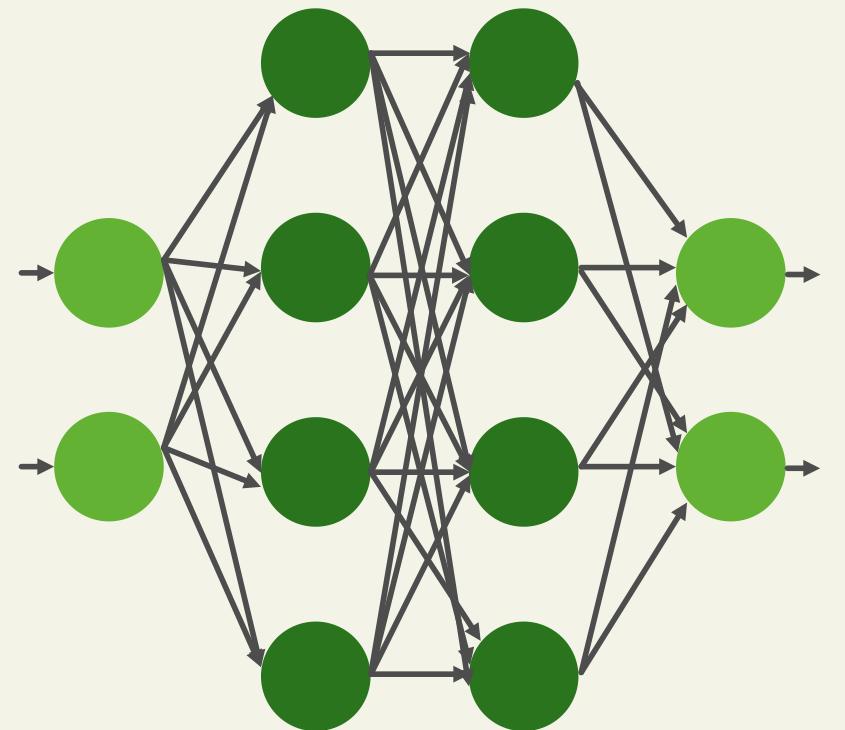
Team Collaboration



Cross-Specialization

CONCLUSION

Future Work



**Improve the
Model**



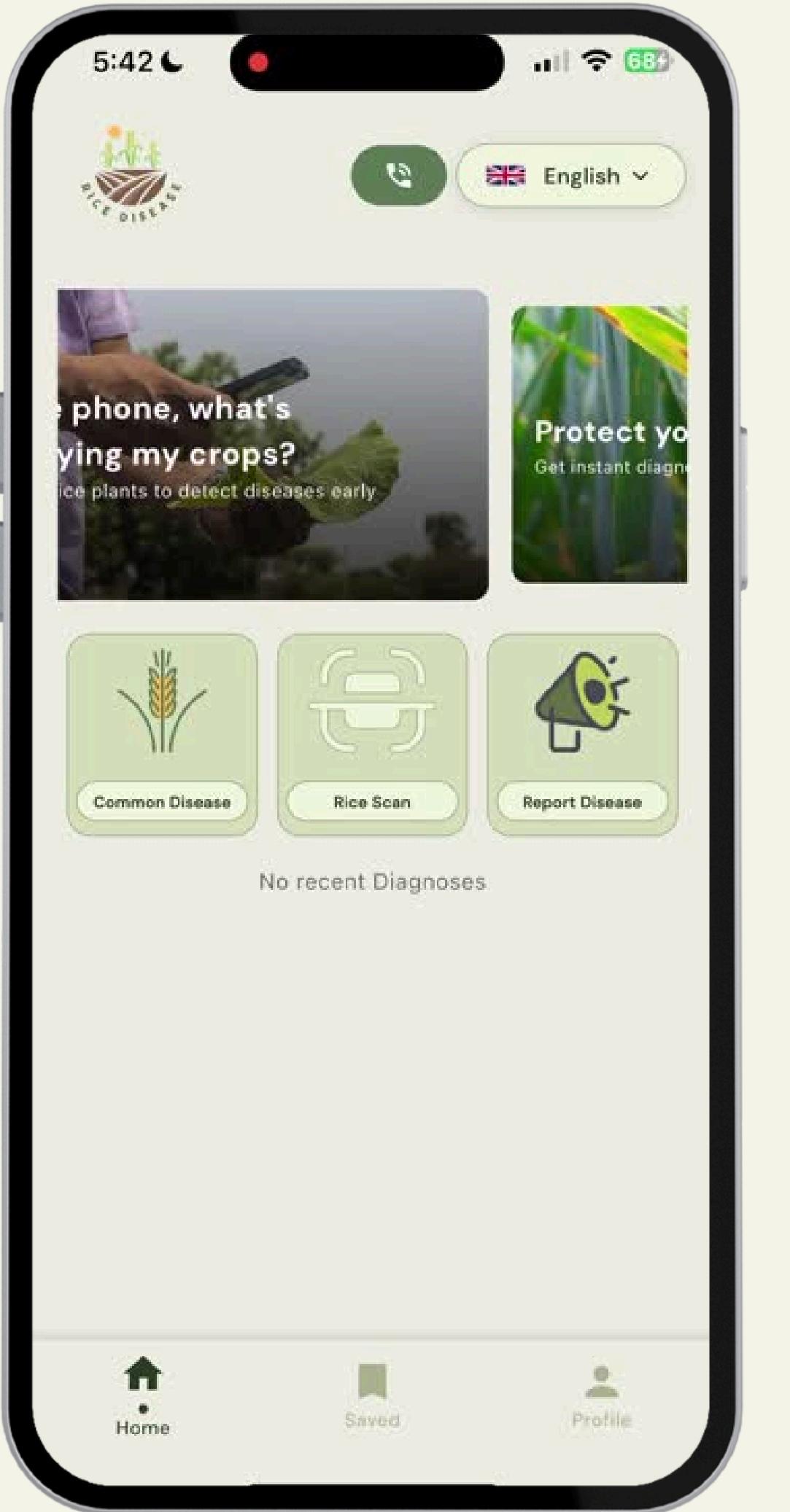
**Add more
Classes**



**Offline
Functionality**

VIII

APPLICATION DEMO



REFERENCES

- [1] S. Phadikar, J. Sil and A. K. Das, "Rice diseases classification using feature selection and rule generation techniques," *Computers and Electronics in Agriculture*, 2013.
- [2] P. k. Sethy, N. K. Barpanda, A. Rath and S. K. Behera, "Deep feature based rice leaf disease identification using support vector machine," *Computers and Electronics in Agriculture*, 2020.
- [3] F. Jiang, Y. Lu and Y. Chen, "Recognition of rice leaf diseases based on deep learning and SVM," *Comput. Electron. Agric.*, 2020.
- [4] C. Zhou, Y. Zhong, S. Zhou, J. Song and W. Xiang, "Rice leaf disease identification by residual-distilled transformer," *Eng. Appl. Artif. Intell.*, 2023.
- [5] J. Zhang, Y. Li and X. Wang, "Hyperspectral imaging combined with deep learning for rice seed vigor classification," *J. Food Eng.*, 2020.
- [6] G. Latif, S. E. Abdelhamid and R. E. Mallouhy, "Deep learning utilization in agriculture: Detection of rice plant diseases using an improved CNN model," *Plants*, 2022.
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- [9] Mendeley, "Rice Leaf Spot Disease Dataset," Mendeley Data, 2021. [Online]. Available: <https://data.mendeley.com/datasets/hx6f852hw4/2>.
- [10] Dede Ikhsan and Wisaputra, "Rice Leaf's Disease Dataset," Kaggle, 2021. [Online]. Available: <https://www.kaggle.com/datasets/dedeikhsandwisaputra/rice-leafs-disease-dataset>.

Thank you!

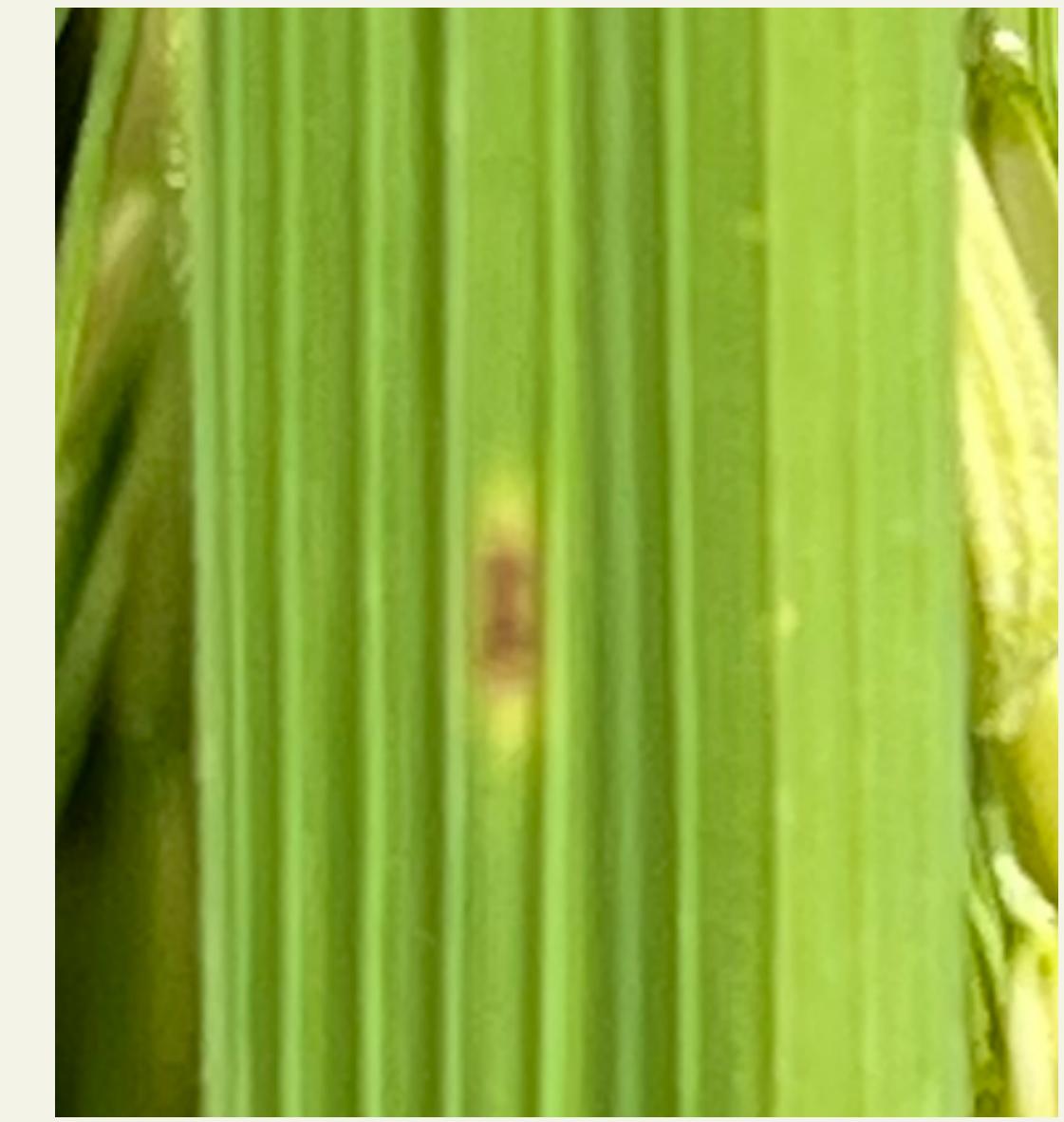
Do you have any questions?

APPENDICES

TEST IMAGES - HEALTHY



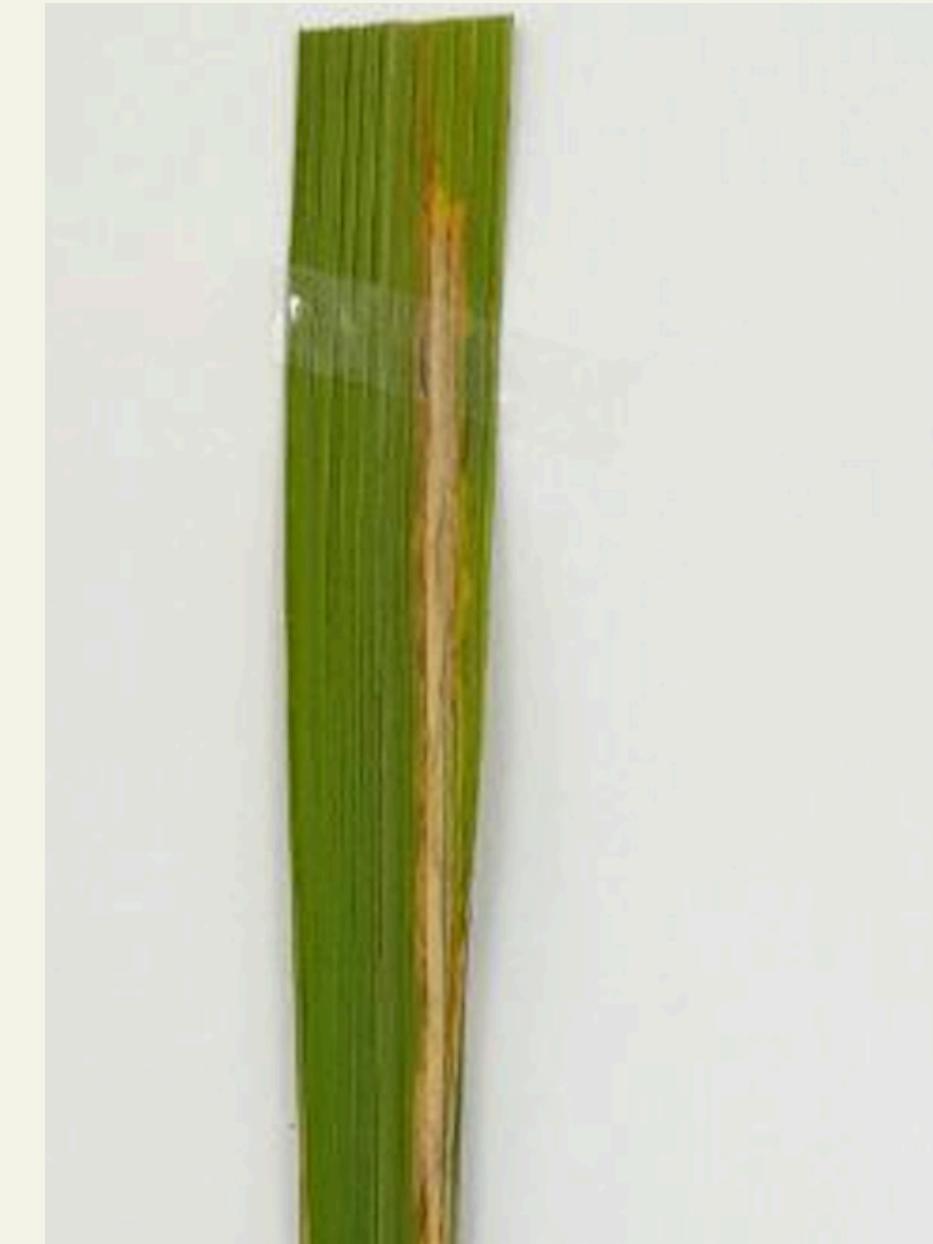
TEST IMAGES – BROWN SPOT



TEST IMAGES – SHEATH BLIGHT



TEST IMAGES – BACTERIAL BLIGHT



TEST IMAGES - LEAF BLAST



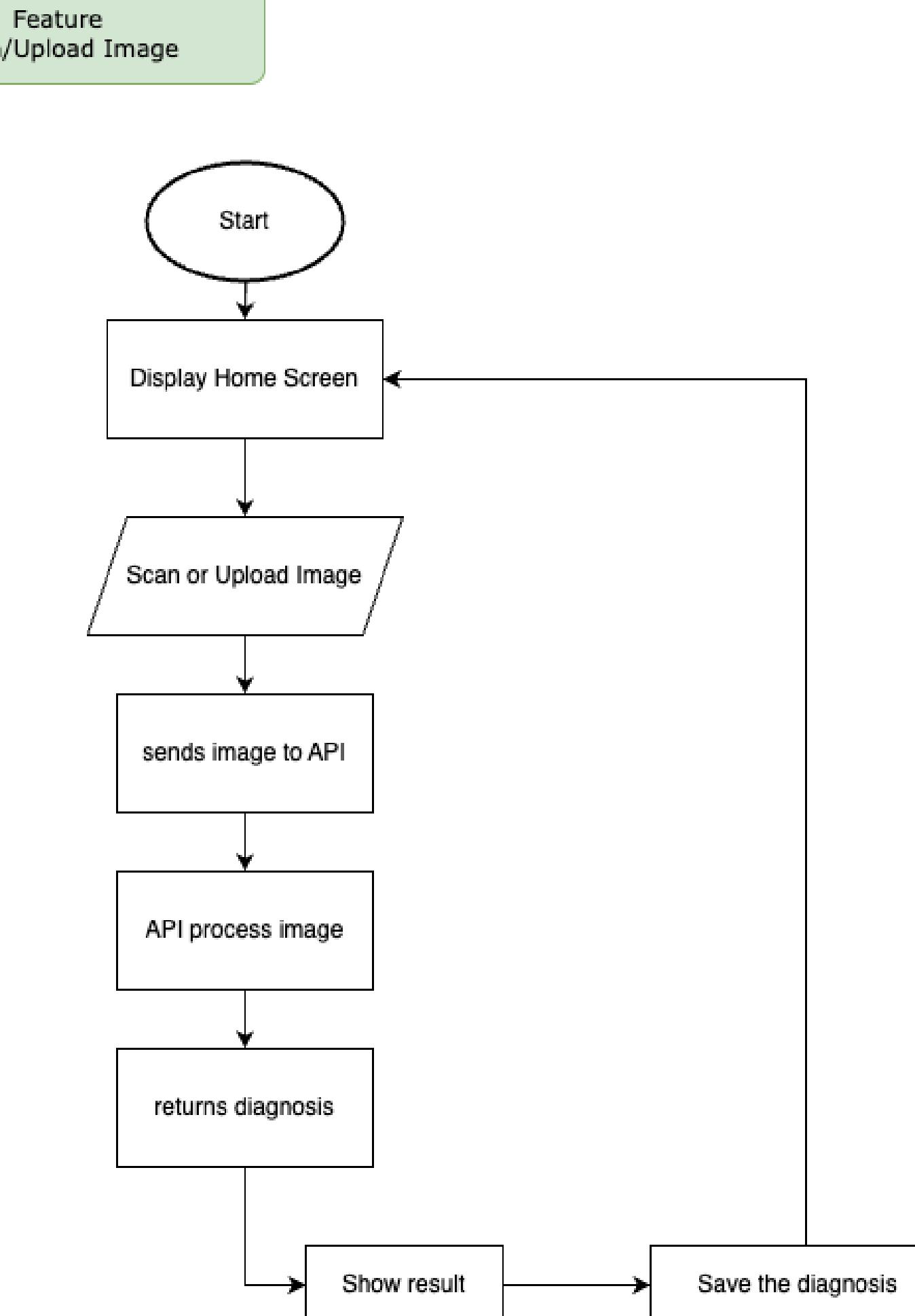
TEST IMAGES - TUNGRO



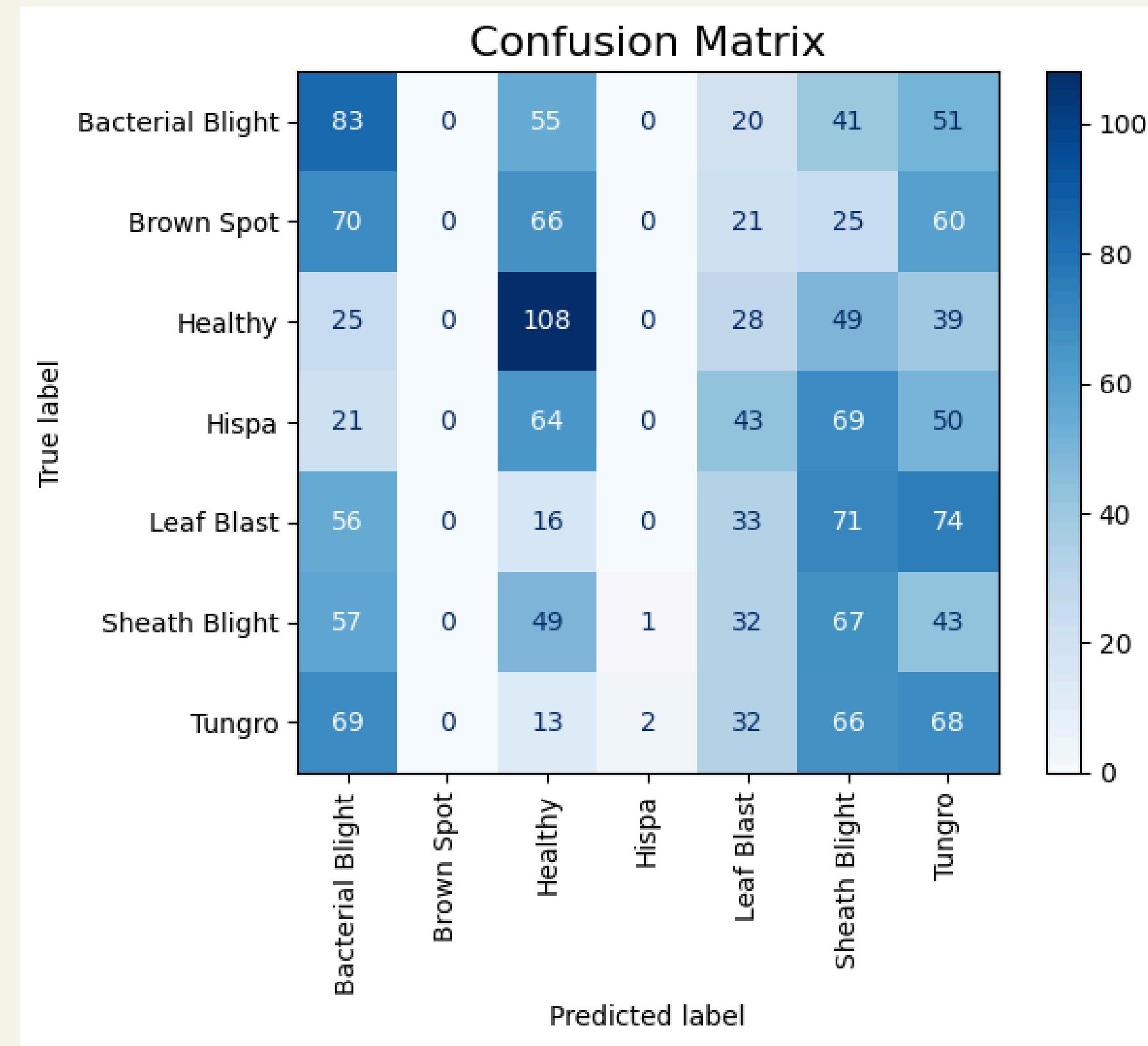
TEST IMAGES – HISPA



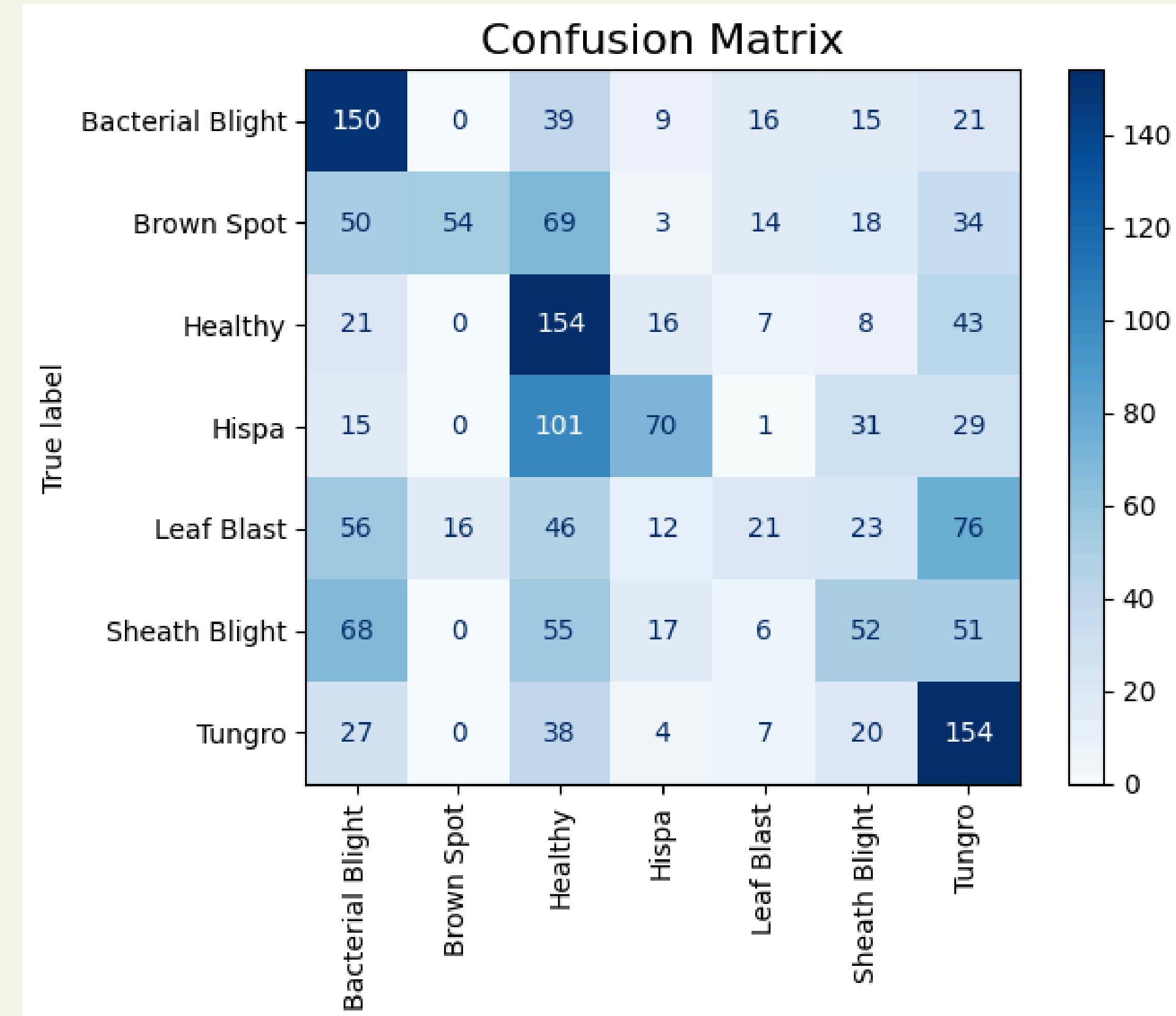
Feature: **Scan/Upload Image**



EfficientNetB3



Resnet-50



MobileNetV3

