NATIONAL UNIVERSITY
of Computer & Emerging Sciences

DLP PROJECT PROPOSAL

AI-Based Plant Disease Detection

SECTION: 6-A

GROUP MEMBERS:

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Introduction

Early detection of plant diseases is crucial for **crop health and agricultural productivity**. Traditional manual inspection methods are slow and inaccurate, leading to potential crop loss. This project aims to develop a **deep learning-based model** that can classify plant diseases from **leaf images** using **EfficientNet and MobileNet** architectures. The model will be optimized for **offline and real-world deployment**, allowing direct use without requiring a web interface.

Objectives

- Develop a **standalone AI model** that classifies plant diseases based on leaf images.
- Use **CNN architectures (EfficientNet, MobileNet)** to achieve high accuracy in classification.
- Train the model using the **PlantVillage dataset** with extensive pre-processing techniques.
- Optimize the model for **low-latency inference**, making it deployable on **local machines or edge devices**.
- Evaluate the model's performance in terms of **accuracy, precision, recall, and F1-score**.

Methodology

Data Collection & Preprocessing

- Use the **PlantVillage dataset**, which contains labeled images of various plant diseases.
- Apply **image augmentation techniques** (rotation, flipping, brightness adjustment) to improve model robustness.
- Normalize and resize images to a fixed dimension suitable for CNN models.

Model Selection & Training

- Implement **EfficientNet and MobileNet** for disease classification.
- Use **transfer learning** to improve model efficiency and reduce training time.
- Optimize the model using **hyperparameter tuning** (learning rate, batch size, dropout rate).

Offline Model Deployment

- Convert the trained model into a **TensorFlow Lite (TFLite) or ONNX** format for optimized local deployment.
- Develop a **Python-based CLI application** that takes image input and provides classification results.

Model Evaluation & Performance Metrics

- Assess model accuracy using **confusion matrix, precision, recall, and F1-score**.
- Compare classification results with **manual expert labeling** for real-world validation.

Expected Outcomes

- A **high-accuracy AI model** capable of detecting plant diseases with **80%+ accuracy**.
- A **lightweight, offline-deployable model** that can run on edge devices or local machines.
- Practical applications for **smart agriculture** and **precision farming**, reducing crop losses.

Tools & Technologies

- **Programming Language:** Python
- **Frameworks:** TensorFlow, PyTorch
- **CNN Models:** EfficientNet, MobileNet
- **Dataset:** PlantVillage
- **Deployment:** TensorFlow Lite (TFLite), ONNX, Raspberry Pi

Conclusion

This project will provide an **AI-driven plant disease detection system** that works efficiently in **offline settings**, ensuring **accessibility for farmers and agricultural researchers**. By using **deep learning-based classification**, the solution will enhance **crop protection and precision farming**.