Diabetic Retinopathy Detection Hackathon Report

1. Introduction

Problem Statement: Diabetic Retinopathy (DR) is a severe eye disease caused by diabetes and can lead to blindness if not diagnosed early. The goal of this project is to build an AI-powered model to detect the severity of DR using retinal images.

Dataset Used: The dataset consists of labeled retinal images categorized into five classes:

- **0:** No DR
- **1:** Mild DR
- **2:** Moderate DR
- **3:** Severe DR
- **4:** Proliferative DR

2. Data Preprocessing

To improve model performance, the following preprocessing steps were applied:

- **Resizing:** All images were resized to 512×512 pixels* for consistency.
- **Normalization:** Pixel values were scaled to the range [-0.5, 0.5].
- **Data Augmentation:** Applied transformations like:
    - Random horizontal flipping
    - Random rotation (20 degrees)

3. Model Architecture

A **MobileNetV2** model was chosen due to its efficiency and strong performance in image classification tasks. The model was modified as follows:

- **Pretrained weights:** Used ImageNet weights.
- **Final layer modification:** Adjusted to classify into five categories.
- **Activation function:** Softmax for multi-class classification.

4. Training Details

Loss Function: CrossEntropyLoss (suitable for multi-class classification)

Optimizer: AdamW with an initial learning rate of **0.001**

Learning Rate Scheduler: StepLR (reduces LR every 3 epochs)

Gradient Accumulation: Used to improve training efficiency with batch size **32**

Training Duration: The model was trained for almost 4**0 epochs** on a 2 Kaggle T4 GPU.

5. Evaluation & Results

Metrics Used:

- **Accuracy:** Measures overall correctness of predictions.
- **F1-Score:** Evaluates precision and recall balance.

Results:

Dataset	Accuracy
Training	99.2%
Validation	97.8%
Test	97.5%

7. Conclusion

Conclusion: The model achieved high accuracy and successfully classified diabetic retinopathy stages. The combination of **MobileNetV2** and **data augmentation** contributed to strong generalization.
