DIABETES DETECTION THROUGH RETINOPATHY

Infyma Hackathon
Fatima Imran
fatimaimran.dev@gmail.com

I. INTRODUCTION

Diabetic Retinopathy (DR) is a serious complication of diabetes that affects the eyes. Early detection through deep learning models can significantly improve diagnosis and treatment. In this study, we employed a deep convolutional neural network (CNN) based on ResNet-152 to classify retinal images into five categories representing different severity levels of DR. The model was trained and evaluated using a dataset of retinal fundus images.

II. Approach

A. Dataset

The dataset used for training and evaluation was obtained from Kaggle's "Diabetic Retinopathy Balanced" dataset [1]. The dataset was structured into three categories:

- The dataset consists of retinal fundus images categorized into five classes (0-4), indicating different stages of DR severity.
- The data was preprocessed by resizing images and applying normalization techniques to enhance model performance.
- Data augmentation techniques, such as rotation, flipping, and contrast adjustments, were applied to improve generalization.

III. METHODOLOGY

A. Model Architecture

A **ResNet152** model pre-trained on ImageNet was employed, with modifications to accommodate the DR classification task. The final layers were replaced with:

1. **GlobalAveragePooling2D**: Reduces spatial dimensions.
2. **Fully Connected Layer (512 neurons, ReLU activation)**
3. **Dropout (50%)**: Prevents overfitting.
4. **Fully Connected Layer (256 neurons, ReLU activation)**
5. **Dropout (50%)**
6. **Output Layer (Softmax activation)**: Produces class probabilities.

The last 30 layers of ResNet152 were unfrozen to enable fine-tuning.

B. Model Compilation and Training

1. **Model Compilation:**
    - The model was compiled using a learning rate of **1.0e-05**, which was kept constant throughout training.
    - The loss function used was **categorical cross-entropy**, suitable for multi-class classification.
    - The optimizer was **Adam**, known for adaptive learning rate adjustments.
    - The model was evaluated using **accuracy** as the primary metric.

IV. RESULTS

- Final test accuracy: 55.8%
- Loss: 0.9936

	precision	recall	f1-score	support
0	0.44	0.69	0.54	100
1	0.51	0.57	0.54	100
2	0.47	0.27	0.34	100
3	0.69	0.66	0.67	100
4	0.78	0.60	0.68	100
accuracy			0.56	500
macro avg	0.58	0.56	0.55	500
weighted avg	0.58	0.56	0.55	500