Final Project Proposal

Project Title: - DIABETIC RETINOPATHY DETECTION USING ARTIFICIAL INTELLIGENCE

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Problem Statement:

Diabetic Retinopathy is an eye disease associated with long-standing diabetes. This happens when high blood sugar levels cause damage to blood vessels in the retina. These blood vessels can swell and leak. Or they can close, stopping blood from passing through. Sometimes abnormal new blood vessels grow on the retina. All these changes can steal your vision.

Currently, detecting Diabetic Retinopathy (DR) is a time-consuming and manual process that requires a trained clinician to examine and evaluate digital color fundus photographs of the retina. Expertise and equipment required to diagnose the disease often lacks in the areas where rate of diabetes in local populations is high and DR detection is most needed. As the number of individuals with diabetes continues to grow, the infrastructure needed to prevent blindness due to DR will become even more insufficient.

The problem to be investigated is the detection of Diabetic Retinopathy (DR) using Artificial Intelligence (AI). Diabetic Retinopathy is a prevalent and severe complication of diabetes mellitus that causes damage to the retina, leading to vision impairment and, if left undetected and untreated, potential blindness. It manifests in two main stages: Non-Proliferative Diabetic Retinopathy (NPDR), an early stage marked by blurry vision, and Proliferative Diabetic Retinopathy (PDR), an advanced stage with symptoms like dark floaters.

The project aims to address these challenges by developing an AI-based solution for the early detection of DR. Leveraging machine learning and computer vision techniques, the project will create an automated system that can efficiently and accurately detect the presence and severity of DR from retinal images. Such a system has the potential to extend the reach of DR detection, particularly in underserved regions, and facilitate timely intervention to prevent vision loss.

Challenges:

The challenges of this project “Diabetic Retinopathy (DR) using Artificial Intelligence (AI)” includes:

Data Collection: - Here, firstly we need to search for the right dataset which should have various stages of DR.

Algorithm Selection & Data Preprocessing: - Here we need to identify the best deep learning techniques which is suitable for DR detection. And we need to check the data and ensure that there should not be any noise, insufficient data by using cleaning and standardizing the data.

Model Training: Here, we need to select the right deep learning model, which requires computational resources and expertise & which gives the better accuracy for testing input data.

Real-time Application: Implementing the model in real-time clinical scenarios can pose technical hurdles.

Data Set:

Here, For the data set collection we are going to use the Kaggle platform.

https://www.kaggle.com/competitions/aptos2019-blindness-detection/data

In the above link, we can find the data set across 13,000 images (approximately).

Methods:

In this project, we are going to use the deep learning algorithms, which is particularly Convolutional Neural Networks (CNNs), to address the DR detection problem. CNN has very crucial success especially in medical image analysis. In this project we mainly want to explore the different deep learning models and architectures to optimize DR detection. Here, we would like to focus more on ResNet-18 model as ResNet-18 is a convolutional neural network that is 18 layers deep. By this, we can load a pretrained version of the network trained on more than a million images from the ImageNet database. The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. These methods will be compared, and improvements may be made to enhance accuracy and efficiency.

Evaluation:

The project's results will be evaluated using Testing accuracy metric, which is an estimation that demonstrates the precision and accuracy of any of the proposed models. Additionally, the confusion matrix is an accurate measurement that provides more insight regarding the achieved testing accuracy. And we will do Performance metrics for the different CNN models. We will do the evaluation of this project by achieving results for both overall testing accuracy and the performance metrics.