Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy

Introduction:

Diabetes has an eye-related consequence called diabetic retinopathy (DB). It often results from damage to blood vessels in the retina's tissue, the rear layer of the eye. Some signs of colour blindness include blurriness, floaters, black or empty patches in the vision, and difficulty recognising it.

The initial signs. It requires ongoing monitoring, and if issues arise, they could reduce life expectancy. It can cause blindness if it is not identified and treated. At this time, the drug cannot be cured. Treatment options exist to halt or delay the progression of diabetic retinopathy. To treat minor cases, diabetes control can be utilised judiciously.

Literature Survey:

[1] The suggested approach, which takes use of an Alex net Convolutional Neural Network, may detect diabetes on a fundus image (CNN). The MESSIDOR database provided the dataset that was used. It contains 1200 photos of the fundus and 580 images each of exudates and normal tissue for the project. For the CNN algorithm, the dataset has been split into two sections: the training dataset and the testing dataset. This approach produces accuracy more than 90% on 50% of the training dataset, while the remaining 50% of the dataset is used for testing. The tests show a reliability of roughly 85%.

Advantages: Diabetic retinopathy has been successfully detected using the CNN, a commonly utilised technique in medical image analysis and classification.

Limitations: Only 580 of the photos were used for both training and testing, despite the fact that the dataset was insufficient to train the neural network, even though the images had good accuracy. It also had problems picking out the tiny exudates in the image.

[2] The suggested method created a CNN architecture to classify diabetic retinopathy in the fundus imaging into five categories: No DR, Mild DR, Moderate DR, Severe DR, and Proliferative DR. They looked at earlier attempts to identify DR using CNN, and they changed the networks in CNN to increase its efficacy and accuracy. They have a 75% accuracy rate.

Benefits: Using a larger dataset to train the CNN has solved the overfitting problem. They used a five-class problem to categorise DR. Correct identification of the healthy eye identified.

Limitations: There are some difficulties in dividing DR into mild, moderate, and severe versions.

[3] A Deep Convolutional Neural Network (DCNN) with No DR, Moderate DR (a combination of mild and moderate Non-Proliferative DR), and Severe DR was utilised to assess the fundus picture and forecast the stage (severe NPDR and Proliferative DR). They have almost used 3468 different Kaggle clinics' fundus photos over the course of time. Over 80% of their predictions were accurate.

Advantages: It has attained accuracy, sensitivity, and specificity that are superior to existing CNN-based approaches.

[4] The architecture used in the proposed model is DenseNet121.This is unique in that each feature map output from a convolution layer is concatenated with the subsequent layers of the same block. Based on the severity of the disease, it divides DR into five categories: PDR, No DR, Slight DR, Medium DR, and Severe DR. Cross-testing two datasets—Messidor and APTOS—has been used in the proposed method to enable the model to acquire complex features. Advantages: The model was created to catch DR early on. Limitations: They used a cross-testing strategy with unbalanced data, so their accuracy is lower than that of current methods. Additionally, the model had trouble categorizing the Slight NDPR class.

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