DIABETIC RETINOPATHY IN FUNDUS IMAGES

AN ENSEMBLE APPROACH

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ABSTRACT

Optical diseases occur due to various reasons like pregnancy, old age, diabetes, macular degeneration etc., Diabetic retinopathy is caused when a person is diabetic for a very long time. Glaucoma causes damage to the optic nerve, thereby leading to blindness. Age-related macular degeneration (ARMD) is the leading cause of severe, permanent vision loss in people over age 60. Studies have found that Diabetic Retinopathy (DR), Age-related macular degeneration (ARMD), and Glaucoma are the leading causes of blindness in India.

Many machine learning algorithms have been used to detect and classify these diseases separately, which consisted of manually designed feature extraction algorithms and traditional classification algorithms to end-to-end deep learning techniques. These techniques require a long time and experience to design and validate.

The project emphasizes the development of an automated system for identification and classification of diabetic retinopathy, glaucoma, age-related macular degeneration in their early stages. The data regarding the three diseases is collected and preprocessed using data augmentation techniques like cropping, flipping, rotation etc., Deep learning techniques like VGG16, DenseNet201, RESNET50 are implemented on the dataset. The models provide the accuracies of 29.5%, 44.5%, 93.9% for 70-30% train, test, and validation data. It is ascertained that RESNET50 out performs than VGG16 and DenseNet201 after performing data augmentation on the data.

An ensemble of all three models is created to classify diabetic retinopathy, glaucoma, age-related macular

degeneration, and the model is subsequently trained on the augmented dataset. It is observed that the ensemble model provides an accuracy of 72.8% in 70-30% the train-test split ratios. The ensemble model and ResNet50 are compared with respect to precision. Ensemble model provides a precision of 0.66 and ResNet50 results in a precision of 0.33. Therefore, it is ascertained that the ensemble model outperforms ResNet50 as the ensemble model is a sequential execution of the implemented three deep learning models.

It is observed that the ensemble model is more robust and stronger than the individual deep learning techniques employed. Gradio is used to build the user interface using the best performing models i.e., ensemble model and ResNet50.

✍ *Author*

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