Automated Diagnosis of Diabetic Retinopathy Severity levels using Deep learning

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Diabetic retinopathy is a condition where high blood sugar damages the retina's blood vessels, potentially leading to vision loss or blindness. However, manual classification of diabetic retinopathy severity levels has challenges due to subjectivity and time constraints and this leads to a more efficient approach. This study, notably the first initiative, aims to address the classification challenges by using CNNs, as well as a prototype of a custom-designed CNN along with deep learning and image processing techniques to classify five severity levels such as Normal, Mild, Moderate, Severe, and Proliferative Diabetic Retinopathy. This study utilized APTOS 2019 grayscale images tailored for diabetic retinopathy severity assessment, ensuring a robust evaluation of each model's performance. Preprocessing techniques include image normalization, resizing, and augmentation for increasing the robustness and generalization of the models, followed by data pre-processing to ensure dataset quality and consistency. The dataset was divided into 80 %, 10%, and 10 % for the training, testing, and validation, respectively. On the DR dataset, we fine-tune these models based on CNNs using architecture VGG16. The trained model achieved a test accuracy of 90 % in classifying the five-severity level of the diabetic retinopathy. The automated classification system presents significant advancements by contributing to the sustainable management of diabetic retinopathy, helping to reduce the risk of blindness in diabetic patients.

***Key words**: CNN, Diabetic retinopathy, Deep learning, Image processing.*