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Course: SAT 5114 – AI in Healthcare

PROJECT

AI-Based Early Detection of Diabetic Retinopathy Using Retinal Fundus Images

ABSTRACT

Diabetic Retinopathy is a serious complication of diabetes and is a leading cause of preventable blindness worldwide. Early diagnosis is critical to slowing disease progression, yet many healthcare systems face challenges in scaling timely screenings, due to limited resources or expertise, particularly in underserved regions. This project addresses this gap by designing a deep learning-based system that analyzes retinal fundus images to detect and classify the severity of Diabetic Retinopathy. It is built using convolutional neural networks (CNNs), the model is trained on large, diverse publicly available datasets such as APTOS 2019 and EyePACS, which include thousands of annotated images representing varying stages of the disease. To enhance robustness, images undergo contrast enhancement, noise reduction, and augmentation, improving feature extraction and reducing overfitting. The framework aims to achieve high diagnostic precision across all stages—from mild cases to advanced retinopathy cases—enabling clinicians to prioritize urgent interventions. By automating screenings, this solution reduces dependency on manual analysis, which can be time-consuming and prone to human error. This AI model can streamline early detection in clinics, expand telemedicine access for remote populations, and help prevent blindness. This project underscores the potential of AI to enhance early diagnosis, improve patient outcomes, and address gaps in diabetic eye care globally.