**ABSTRACT**

**Automated Diabetic Retinopathy Detection System**

Diabetic Retinopathy (DR) is a common complication of diabetes and one of the leading causes of vision loss globally. Early detection is critical for preventing severe visual impairment, yet traditional diagnostic methods, which rely on manual examination of retinal images, are often slow and prone to human error. This study explores the use of machine learning (ML) techniques to automate and improve the accuracy of DR detection. By applying algorithms such as Convolutional Neural Networks (CNNs) and other classification models, the system identifies key features associated with DR, including microaneurysms, hemorrhages, and abnormal blood vessels. Key steps in the process include data pre-processing, feature extraction, and model training. These steps ensure that the system can effectively recognize and classify the retinal images based on the presence and severity of DR. Performance metrics such as accuracy, precision, recall, and area under the curve (AUC) will be used to assess the effectiveness of the developed models. The ultimate goal of this research is to provide a scalable, automated solution for early DR detection, improving patient outcomes and reducing the burden on healthcare professionals by providing automated reports and visualization to understand the risk progression.

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