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# Deep Neural Network-Based Diagnosis of Macular Degeneration Using OCT Images

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**ABSTRACT**

**Introduction:** Age-related macular degeneration (AMD) is among the diseases significantly impacting an individual's quality of life. With advancements in optical coherence tomography (OCT) imaging technology and the development of convolutional neural networks (CNNs), utilizing these complex image data for early and accurate diagnosis of this condition has become feasible. This study aimed to diagnose macular degeneration using OCT images and CNN networks. The study seeks to present an effective and efficient diagnostic method for AMD, enhance diagnostic capabilities in medical imaging, and contribute to improving the management of this condition.

**Methods and Materials**: The data utilized in this study were extracted from the amalgamation of datasets from five previous studies, comprising approximately 6,000 OCT images of both AMD-afflicted and healthy eyes. Following the importation and preprocessing of these images using the cv2 Python library, they were partitioned into training and testing sets. Subsequently, the TensorFlow and Keras libraries were employed to develop and train a custom CNN model. This model was trained using the training dataset, and its performance was evaluated using binary classification metrics such as accuracy and F1 score on the testing dataset.

**Results:** After training, this constructed neural network had approximately three million parameters, and the results demonstrated that significantly, this model can distinguish AMD from the healthy state and performs this task without error. These results surpassed expectations, indicating that this neural network possesses high power and accuracy in accurately and promptly diagnosing AMD from other states. Additionally, evaluation metrics on the test data, consisting of 1,500 images, showed accuracy and an F1 score of 100%, indicating that the model performed exceptionally well and had no errors distinguishing between AMD and the healthy state. This observation indicates the power of this neural network in diagnosing this disease based on OCT images.

**Conclusion and Discussion:** Based on this study, using deep neural networks with OCT images for diagnosing macular degeneration is of great significance. These advancements indicate that these advanced methods can effectively improve early detection and intervention in eye diseases, especially macular degeneration.

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