Automated User Request Operator and Responsive Application (AURORA): A Novel Approach Implementing a Deep Learning Convolutional Neural Network Framework to Detect Choroidal Neovascularization, Diabetic Macular Edema, and Macular Degeneration

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Over 1.3 billion people worldwide suffer from either vision impairment or blinding retinal diseases, and approximately $139 billion is the estimated economic burden due to these retinal diseases. Machine learning approaches are increasingly helpful in successful image-based diagnosis, disease prognosis, and risk assessment. Retinal optical coherence tomography (OCT) is an imaging technique used to capture high-resolution cross-sections of the retinas of patients. Though it has been demonstrated that an early diagnosis can significantly reduce eyesight difficulties later in life, screenings for retinal diseases are inaccessible to a majority of the world because of their cost ($100-$1000 screening) and the need for specialized scientific equipment. As none of the current models provide a diagnostic accuracy higher than 90%, AURORA was conceptualized. The purpose of this project was to create AURORA, the Automated User Request Operator and Responsive Application, a diagnostic tool based on a deep-learning framework for the screening of patients with common blinding retinal diseases. This framework utilizes transfer learning (in both training and testing programs), which trains a neural network with a fraction of the data of conventional approaches. AURORA was trained on the dataset of greyscale OCT images repository at the open-source dataset platform, Kaggle. AURORA may ultimately aid in accelerating the diagnosis of these retinal diseases, thereby facilitating earlier treatment, resulting in improved clinical outcomes.

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