Cheng-Yi Li

National Yang Ming Chiao Tung University
Taiwan

Age-related Macular Degeneration (AMD) neovascular activity prediction using OCT-Angiography based on entropy and machine learning

Abstract:

Purpose: The study aims to explore the potential of incorporating the information science concept of entropy in the classification of eyes with active and inactive age-related macular degeneration (AMD).

Methods: A total of 35 reactive events and 59 treatment events from 97 follow-ups with AMD were analyzed using OCTA vascular density maps, centerline maps, and foveal avascular zone (FAZ) masks at the superficial capillary plexus (SCP) level. We assessed OCTA metrics, including entropy, vessel density, vessel caliber, vessel tortuosity, FAZ area, and FAZ circularity. Additionally, a supervised machine learning algorithm called the eXtreme Gradient Boost (XGBoost) classifier was developed to categorize images into inactive and active AMD groups. All code used for experiments in this study can be found in a GitHub repository (https://github.com/charlierabea/Entropy)

Results: Our analysis revealed that the entropy and vessel density of central vessels increased significantly in reactive events. In treatment events, entropy, vessel density, vessel caliber, and vessel tortuosity primarily showed high significance increases. FAZ area and circularity, however, did not reach statistical significance in either event type. The XGBoost classifier demonstrated excellent performance, achieving an accuracy of 0.967, AUROC of 0.967, sensitivity of 0.93, and specificity of 1.00. When the model was constructed without entropy inputs, its performance declined, with an accuracy of 0.867, AUROC of 0.837, sensitivity of 0.95, and specificity of 0.72.

Conclusions: Our study indicates that incorporating entropy into the evaluation of OCTA metrics may enhance the classification of active and inactive AMD. This improvement could contribute to more accurate diagnoses and better management of the condition.

Biography

Cheng-Yi Li is an incoming BME MSE student at the Johns Hopkins University, as part of the MD-MSc program at National Yang Ming Chiao Tung University (NYCU). He is the multimodal medical large language model (LLM) researcher at UCLA Natural Language Processing Lab and the undergraduate research fellow at Big Data Center, Taipei Veterans General Hospital (TPEVGH). He has published 3 papers in reputed journals (Journal of Advanced Research/ IEEE Computational Magazine) and has two arXiv preprints under review at the Nature Portifolio and the ACL conference. s