Deep learning research and application in diagnostic imaging of certain eye diseases based on fundus photography datasets

Tran Van Canh

Abstract: This study explores the application of deep learning for the diagnostic imaging of ocular diseases using optical coherence tomography (OCT) datasets. OCT imaging provides high-resolution cross-sectional views of the retina, enabling detailed analysis of pathological structures. We propose and evaluate several convolutional neural network (CNN) architectures, including transfer learning models, to automatically classify and detect conditions such as diabetic macular edema, age-related macular degeneration, and drusen. The models were trained and validated on a curated dataset of OCT scans, with preprocessing steps to enhance image quality and reduce noise. Performance metrics including accuracy, sensitivity, specificity, and area under the ROC curve were assessed. Experimental results demonstrate that deep learning models achieve high diagnostic performance, significantly outperforming traditional machine learning approaches. The findings indicate that automated OCT image analysis can serve as a reliable, efficient tool to assist ophthalmologists in early detection and screening, potentially reducing diagnostic workload and improving patient outcomes in clinical settings.

Keywords: deep learning, medical image diagnosis, eye disease detection, fundus OCT images