Abstract

Glaucoma, particularly primary open-angle glaucoma (POAG), is a leading cause of irreversible blindness worldwide, often remaining undetected until significant vision loss occurs. This research proposes a novel approach for the early detection of POAG by developing a **multimodal fusion-based Transformer model** augmented with **Explainable AI (XAI)** techniques. The study leverages diverse data modalities, including fundus images, optical coherence tomography (OCT) scans, visual field tests, and patient demographics, to build an integrated detection framework. By employing Transformer architectures, the proposed model effectively combines multimodal inputs to capture subtle patterns indicative of glaucoma progression, while XAI techniques provide interpretable insights into the decision-making process. Glaucoma is a leading cause of irreversible blindness worldwide, often undetected until significant vision loss occurs. This research proposes a novel Transformer-based multimodal fusion model integrated with Explainable AI (XAI) techniques for early detection of primary open-angle glaucoma (POAG). The model will combine fundus images, optical coherence tomography (OCT) scans, intraocular pressure (IOP) readings, visual field test results, and patient clinical data to enhance detection accuracy and interpretability. By addressing the "black-box" nature of deep learning models, this research aims to increase trust and adoption among medical professionals. Additionally, the study will analyze POAG prevalence in Bangladesh, offering valuable public health insights. The expected outcomes include an explainable, high-performance detection model, improved clinical adoption, and a framework for ethical AI deployment in ophthalmology.