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Glaucoma Detection in Retinal Tomography Using the Vision Transformer

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Abstract : Glaucoma is a chronic eye condition that causes vision loss that is irreversible. Early detection and treatment are critical to prevent vision loss because it can be asymptomatic. For the identification of glaucoma, multiple deep learning algorithms are used. Transformer-based architectures, which use the self-attention mechanism to encode long-range dependencies and acquire extremely expressive representations, have recently become popular. Convolutional architectures, on the other hand, lack knowledge of long-range dependencies in the image due to their intrinsic inductive biases. The aforementioned statements inspire this thesis to look at transformer-based solutions and investigate the viability of adopting transformer-based network designs for glaucoma detection. Using retinal fundus images of the optic nerve head to develop a viable algorithm to assess the severity of glaucoma necessitates a large number of well-curated images. Initially, data is generated by augmenting ocular pictures. After that, the ocular images are pre-processed to make them ready for further processing. The system is trained using pre-processed images, and it classifies the input images as normal or glaucoma based on the features retrieved during training. The Vision Transformer (ViT) architecture is well suited to this situation, as it allows the self-attention mechanism to utilise structural modeling. Extensive experiments are run on the common dataset, and the results are thoroughly validated and visualized.

Keywords : glaucoma, vision transformer, convolutional architectures, retinal fundus images, self-attention, deep learning
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