In silico Analysis for Screening Autism and Assessing Symptom Severity Using Retinal Photographs

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Autism Spectrum Disorder, or ASD, is a neurodevelopmental disorder that can cause significant behavioral and social challenges. The prevalence of ASD has risen over the past two decades, reflecting increased awareness and diagnostic criteria. However, diagnosis protocols for ASD remain reliant on subjective caregiver reports and often inaccessible formal evaluations. Hence, researchers are searching for objective biomarkers to assist in early intervention. One such method of finding biomarkers is utilizing fundus images, as previous research has suggested fundus image geometry correlates with ASD. In this study, a machine-learning model was designed that utilizes convolutional neural networks through segmentation and self-supervised learning to improve geometric understanding and predict ASD symptom severity. The proposed model achieved an accuracy of 91.53% and F1 score of 89.66%, outperforming baseline models. An ablation study conducted further supports the effectiveness of both vessel segmentation and self-supervised learning in increasing overall accuracy. These findings support the potential of retinal imaging and machine learning to assist existing ASD diagnostic protocols for early intervention.

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