A Two-Stage Machine Learning Approach for Enhancing ADHD Diagnostic Accuracy: Optic Disc Segmentation and Symptom Severity Classification

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Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by pervasive patterns of inattention, hyperactivity, and impulsivity that are inappropriate for a person's developmental level. Individuals with ADHD may have difficulty sustaining attention, following through on tasks, and organizing activities. The traditional diagnosis of ADHD employs various methods, such as Electro Encephalo Graphy (EEG) scans, self-checklists, and computer-aided assessments. However, these methods are often time-consuming and can sometimes lack scientific rigor. EEG scans, while useful for identifying certain brain activity patterns, do not provide definitive evidence for diagnosing ADHD. Self-checklists rely heavily on subjective reporting, which can be influenced by personal biases and inaccuracies. Computer-aided assessments, although helpful in standardizing evaluations, may not fully capture the complexity of ADHD symptoms and their impact on daily functioning. To address this issue, I propose a two-stage machine learning system to accurately screen ADHD symptom severity in a classification manner. The proposed system takes fundus images as input and isolates the optic disc area, which is highly correlated with the severity of ADHD. This isolated optic disc area, along with the full fundus image, is then inputted into the severity classification network. The system outputs the probabilities of four levels of ADHD severity. The proposed system achieved an accuracy of 85.62% on a public dataset.

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