Theme: Artificial Intelligence

Attending Through Autistic Eyes - An Eye-tracking and Deep-Learning Approach for Autism Diagnosis

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Abstract:
Autism spectrum disorder (ASD) is an early-onset neurodevelopmental disorder marked by impairments in social interaction and communication and restricted interests. However, diagnosing autism is often a complex, time-consuming process, and reliant on subjective analysis of current and past behaviors. Thus, an improved diagnosis could benefit from a deeper understanding of the underlying cognitive and behavioral patterns in individuals with ASD. These can be gained by investigating their visual attention patterns, observed in visual saliency maps, which can be captured through eye-tracking. Visual saliency, particularly when social stimuli are involved, may differ for individuals with ASD. Thus, the differences in visual attention between people with and without ASD pave the way for the use of Deep-Learning tools for the analysis of visual saliency maps to improve ASD diagnosis.
To generate relevant eye-tracking data to address this problem, a new experiment was developed whereby adult participants viewed a sequence of videos created in Unity showing social scenarios. After each video, participants were debriefed about the most interesting aspects. It is expected that autistic individuals focus more on carefully selected non-social stimuli, such as transportation objects, flickering lights, and repetitive movements. Visual saliency maps are then created from the eye-tracking data and will form part of a dataset to train the MSI-Net model, a convolutional neural network designed to predict human visual saliency, which has the potential to assist in diagnosing autism.
While data acquisition is at its beginning, the approach is innovative. The analysis of video saliency maps is crucial in this context since they account for motion, an important driver of human attention. Future studies could explore differences in attention patterns in the context of metacognition in healthy and autistic individuals, while investigating gender differences.

Keywords: Autism Spectrum Disorder, Eye-tracking, Deep-Learning, Video Saliency