

SEL-Pet: An Innovative Eye-Tracking and Audio Hybrid System for ASD Early Detection

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1 in 44 children in the USA are impacted by autism spectrum disorder (ASD), but only <50% of children received effective early intervention due to delayed diagnosis. This represents a huge missed opportunity during a critical window in the child's neurodevelopment. Our project aims to develop an accessible and accurate system analyzing both eye-gaze and audio for ASD early detection. This hybrid system is implemented in a website called SEL-Pet to collect data through 4 categories of experiments/stimulus. 108 participants were recruited (ASD n=30; General Population (GP) n=78) and 1014 experiment datasets were collected with embedded AI-driven web-gazers and microphones. For efficiency during model training, the eye-gaze data are converted into visual scanpath representations, and mel frequency cepstral coefficients (MFCC) are extracted from the audio data. A convolutional neural network (CNN) model was then trained to examine the scanpaths/velocity map, and a long short-term memory (LSTM) network model was coded to analyze the acoustic features. We achieved validation accuracies of 63% for only eye gaze, 69% for only audio, and 82% for hybrid, demonstrating the reduction of false positives in a 2-dimensional system. Our novel project may be implemented into at-home settings and into educational institutions to screen for ASD in a non-invasive and child-friendly way while encouraging children to develop their social-emotional learning (SEL) skills, minimizing financial and time commitment for families and the necessity of professional availability and providing peace-of-mind in parenting.

Awards Won:

Fourth Award of \$500