

A Quantifiable Method to Detect and Monitor ADHD: The Use of Facial and Motion-Based Behavioral Cues Analysis Using Deep Neural Network and RGBD Data

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At present, there are no well-validated biomarkers for attention-deficit/hyperactivity disorder (ADHD). Currently, the diagnosis of such disorders is done by experts who employ standard questionnaires and look for certain behavioral markers through manual observation. Such methods for their diagnosis are not only subjective, difficult to repeat, and costly but also extremely time consuming. Often, individuals are left unsure about what to do when they are diagnosed with ADHD, which is characterized by: 1) hyperactivity (can't sit still), 2) inattention (can't focus), and 3) impulsivity (acts without thinking). With the ultimate goal to make the diagnostic procedures easier and more efficient, I have developed an objective-based framework that can be used to diagnose patients using simple ready to use XBOX Kinect RGBD (Color+Depth) sensor. I used the following analysis and behavior cues based feature descriptors: 1) Facial expression analysis for assessing visual attention and emotional states based on dynamic deep machine learning to detect shape, appearance, and dynamic of individual facial action units, 2) Real-time facial expression analysis using Kinect Animation Units for tracking visual expression changes, 3) Head Pose Tracking to study rotation movement of the head to obtain valuable cues about person's attention state, 4) Velocity of Head Movement and Cumulative Distance Tracking to study dynamics of the head motion, and 5) 3D Skeletal model tracking of body movements to study body gestures. I have also utilized advanced statistical based classifiers and developed scoring approach to differentiate between control versus ADHD groups and determine from the intensity levels the degree of hyperactivity, impulsivity and inattention.

Awards Won:

National Institute on Drug Abuse, National Institutes of Health & the Friends of NIDA: Honorable Mention

American Psychological Association: Certificate of Honorable Mention