Autism Diagnostics Tool Using Gesture Recognition and Machine Learning

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Autism Spectrum Disorder is the fastest growing developmental disability in America with the CDC labeling 1 in 59 children as Autistic. Currently within the Autism Diagnostics field, due to long wait times, children don't have freedom of choice when/where to participate in diagnosis. Children are unable to expose their full potential skills at unfamiliar medical facilities within the allotted time. After researching the market and patents, I found no available products to aid Autism-Diagnosis on motor skills. To combat the need, I developed a gesture recognition tool to capture/report autistic children's gross motor skills in natural settings, for unlimited time, to reveal their maximum potential skills. My Tool consists of 4 parts: Machine Learning Model(Random Forest), Software Application, Cloud Database Reporting and Wearable Device. I trained my ML model on 52 gestures based on Autism ESDM Diagnosis Standards. I captured real-time gesture data with a depth camera, fed to ML Model, and stored the Model's prediction data in a cloud database using software application APIs. I generated Reports from Cloud data using .php scripts, allowing for therapists from Boston to extend evaluation to children in countries like Peru(1 registered therapist). I added a wristband-device to my App-engine to enable alerts/notifications via Bluetooth (offline reporting option). I tested each element(Model, Application, Reporting, Wristband) individually/collectively in multiple phases. I retrained/retested the Model repetitively(1560 trials) to achieve a minimum accuracy of 80% and statistically analyzed the test results using confusion-matrices. My tool's final Performance Metrics: [Accuracy-0.83032, Precision-0.839, F1-Measure-0.606078, Sensitivity-0.813208, and Specificity-0.815909].

Awards Won:

American Statistical Association: Certificate of Honorable Mention

International Council on Systems Engineering - INCOSE: Certificate of Honorable Mention