A Scalable and Freely Accessible Machine Learning Based Application for the Early Detection of Dyslexia

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Dyslexia is the world's most common neurological learning disability - it affects 1 in every 10 people worldwide. And though it has been proven that an early diagnosis can significantly reduce learning difficulties later in life, screenings for dyslexia remain inaccessible to a majority of the world because of their prohibitive cost ($1000 - $2000 for a screening) and their need for specialized scientific equipment. Previous studies have shown that dyslexics exhibit significantly longer and more frequent fixations while reading than non-dyslexic readers. The goal of this research was to build a free web-based application that uses a standard computer webcam to screen a child while reading a passage on the screen. By implementing a novel combination of different machine learning algorithms, this research is able to produce a highly accurate eye tracking method with a maximum possible error of only a few pixels. These eye tracking results are then analyzed to determine the duration and frequency of gaze fixations made while reading. Based on this metric, the application is able to predict if a child has a higher risk of dyslexia with an accuracy of 90.18%, as tested on a dataset of real dyslexic patients with 370 samples classified as high or low risk. Because it is completely free and does not require any hefty scientific equipment, this solution provides the first-ever freely available, highly accurate test for risk of dyslexia, and is accessible to millions of families around the world without regard to financial status or physical location.

Awards Won:
Second Award of $2,000
National Security Agency Research Directorate : Honorable Mention Mathematics