EyeGen: A Low-Cost Biomarker for the Ophthalmological Assessment of Ophthalmic Diseases Using Deep Learning Models

Gurram, Abhinav (School: Green Hope High School)

An estimated 93 million adults in the United States are at high risk for serious vision loss, but only half visited an eye doctor in the past year. Prices for eye examinations are drastically increasing and due to the COVID-19 pandemic, millions of people around the world aren't able to afford the overly expensive prices for basic eye care. As a solution to this prominent problem, this investigation attempted to develop a risk level self-assessment model using three machine learning methods: decision tree, logistic classification, and support vector machine (SVM). Quantitative and qualitative data were collected from a survey and the attributes were interpreted under specific cultural and socio technical contexts. Data was collected from multiple eye databases, which contain standardized and accessible data entries on thousands of healthy human eyes and those that have diseases. Machine learning models were developed to detect gaze estimation, saccade movement, smooth pursuits, convergence, and any other relevant factors. Multiple models were trained using Decision Tree, Logistic Regression and SVM. The dataset was divided into two groups as the training and testing groups randomly. The training dataset was 70% of the cleaned dataset, and the remaining dataset was assigned as the test dataset. A low-cost, highly accurate, and non-invasive software was developed to accurately detect eye-related diseases using ML-based models. Statistical models with a 95%+ validation and training accuracy were developed to accurately detect eye-related diseases using machine learning and deep learning models.