Detection of Diabetic Retinopathy With a Deep Learning Algorithm

Shen, Selena (School: Pine View School)

Approximately 537 million adults (of 20-79 years) around the world are living with diabetes. It is estimated that 30% of diabetes patients end up developing some type of diabetic retinopathy (DR), which is currently the leading cause of preventable vision loss and blindness in the working-age population. All diabetes patients have the potential to develop DR, and, therefore, regular screening and early diagnosis are essential to a better response to treatment and more positive prognosis. In addition, deep learning algorithms (DLA) are cost-effective and efficient when compared to manual grading, which is the current standard. In this project, the aim was to create a deep learning model for the detection of diabetic retinopathy. Through changing the health system with AI and sparking clinician-AI collaboration, the goal is to increase the number of early DR detections at a cheaper price. Data was gathered from the MESSIDOR database, which houses 1200 clinically labeled retinal images. Using trial and error, the final convolutional neural network used was the VGG-16 model with one top layer. Adjusted tolerant level to achieve optimal results. The model achieved 90% accuracy, 100% specificity, 100% sensitivity, and 90% precision, averaging 0.28 seconds per image. This study's objective of creating an efficient and reliable diagnostic tool for diabetic retinopathy with a deep learning algorithm was met. Creating an automated system like this one for DR screening would increase screening accessibility, increase the number of early DR detections, lower screening costs, and encourage early treatment (as well as lowering overall treatment costs).

Awards Won: