

Abstract for International Congress on Academic Medicine

Title:

Using Machine Learning to Explore the Relationship Between Retinal Age Gap and Cardiovascular Risk Factors

Abstract:

The difference between the biological and chronological retinal age is referred to as the retinal age gap (RAG) and has been recognized as a promising biomarker to detect abnormal retinal aging associated with increased mortality risk. Accurate prediction of biological retinal age has the potential to empower the identification of clinical risk factors which contribute to the RAG. The purpose of this work was to develop a machine learning model which can accurately predict biological retinal age and use the computed RAG estimates to identify associated cardiovascular risk factors. A total of 19,994 retinal fundus images were acquired together with measured cardiovascular risk factors from 11,185 healthy UK Biobank participants. An 80/20 split was used to divide the data into training and testing sets respectively. An EfficientNet-B3 architecture was trained for 50 epochs to minimize the mean absolute error (MAE) between the predicted and chronological ages. The RAG was then computed for each retinal fundus image by calculating the difference between the predicted biological age and the corresponding chronological age. An XGBoost decision tree model was trained to predict the RAG using each patient's associated cardiovascular risk factors. Shapley additive explanation (SHAP) values were estimated for each of these factors to compute their associated predictive importance. Experimental results showed that the overall MAE computed on the test set was 2.91 years, demonstrating state-of-the-art performance for RAG prediction. Furthermore, the risk factors with the largest absolute SHAP values were obesity-related factors such as waist-to-hip ratio (0.28) and body mass index (0.28), while the smallest values were associated with alcohol consumption frequency (0.12) and smoking status (0.10). In conclusion, this work provides an important first step towards identifying cardiovascular risk factors associated with the RAG.