Retinal Nerve Fibre Layer Analysis

In The Diagnosis Of Glaucoma

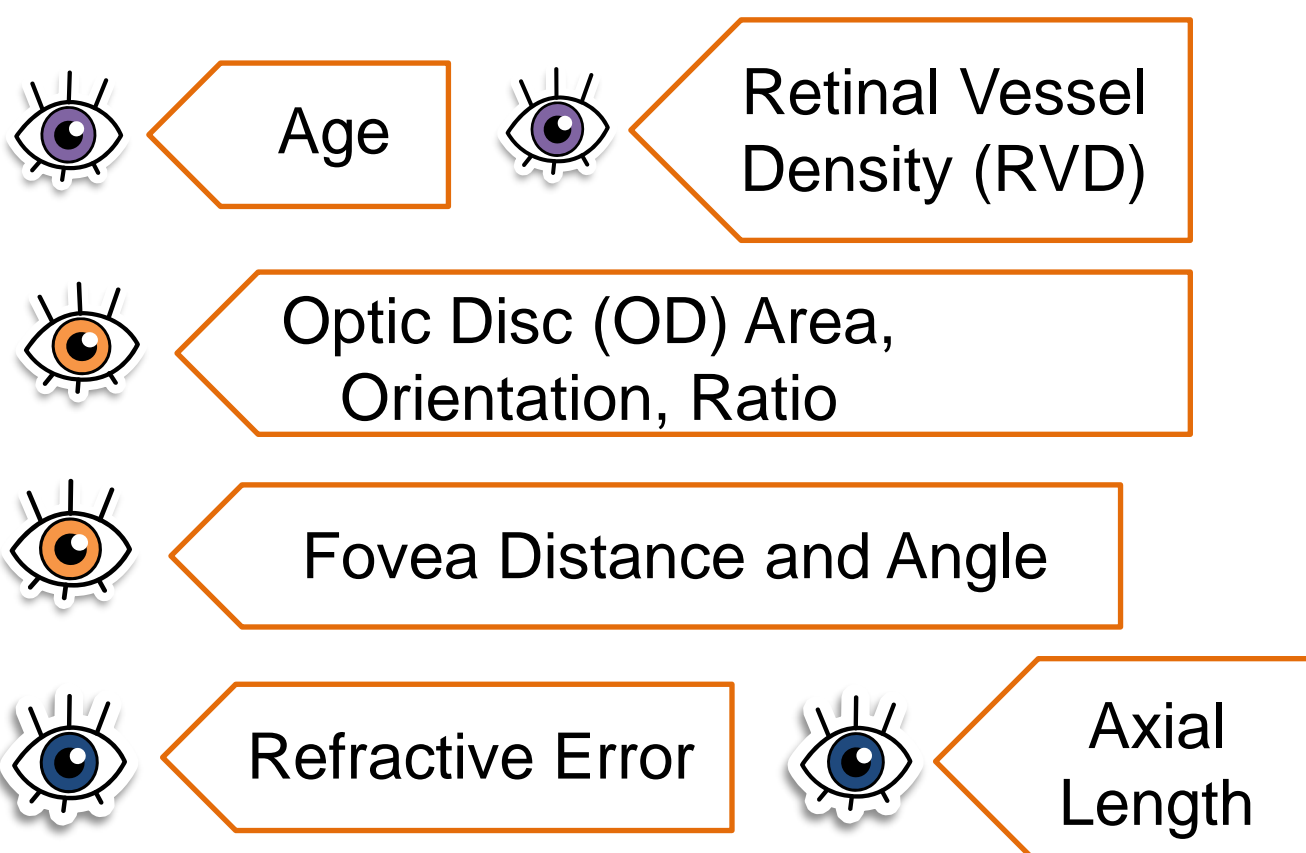Student: Saw William Joseph   Supervisor: Dr Li Fang

1. Project Objectives:

Optical coherence tomography (OCT) is used to generate quantifiable measurements of the retinal nerve fiber layer (RNFL) and these measurements are compared against the normative database. However, most normative databases are populated with data collected from Caucasians and Asians are under-represented. This study aimed to create different RNFL compensation models and measure the reduction in standard deviation (SD) of the compensated RNFL thickness against uncompensated ones in response to the lack of Asian normative databases.

2. Method:

The study involved 2699 healthy Chinese, Indian, and Malay individuals, as well as 523 glaucomatous Chinese patients. We generated six multi-variate regression models that used different combinations of variables as specified below.

We also compared the accuracy of classification of healthy and glaucomatous subjects using compensated and uncompensated RNFL thicknesses.

Age

Retinal Vessel Density (RVD)

Optic Disc (OD) Area, Orientation, Ratio

Fovea Distance and Angle

Refractive Error

Axial Length

3. Results:

➤ The top 3 models that resulted in the greatest SD reduction consist of variables as such:
  1. Age, RVD, OD features, fovea features and axial length
  2. Age, RVD, OD features, fovea features and refractive error
  3. Age, RVD, OD features and fovea features

SD reduction of top 3 models
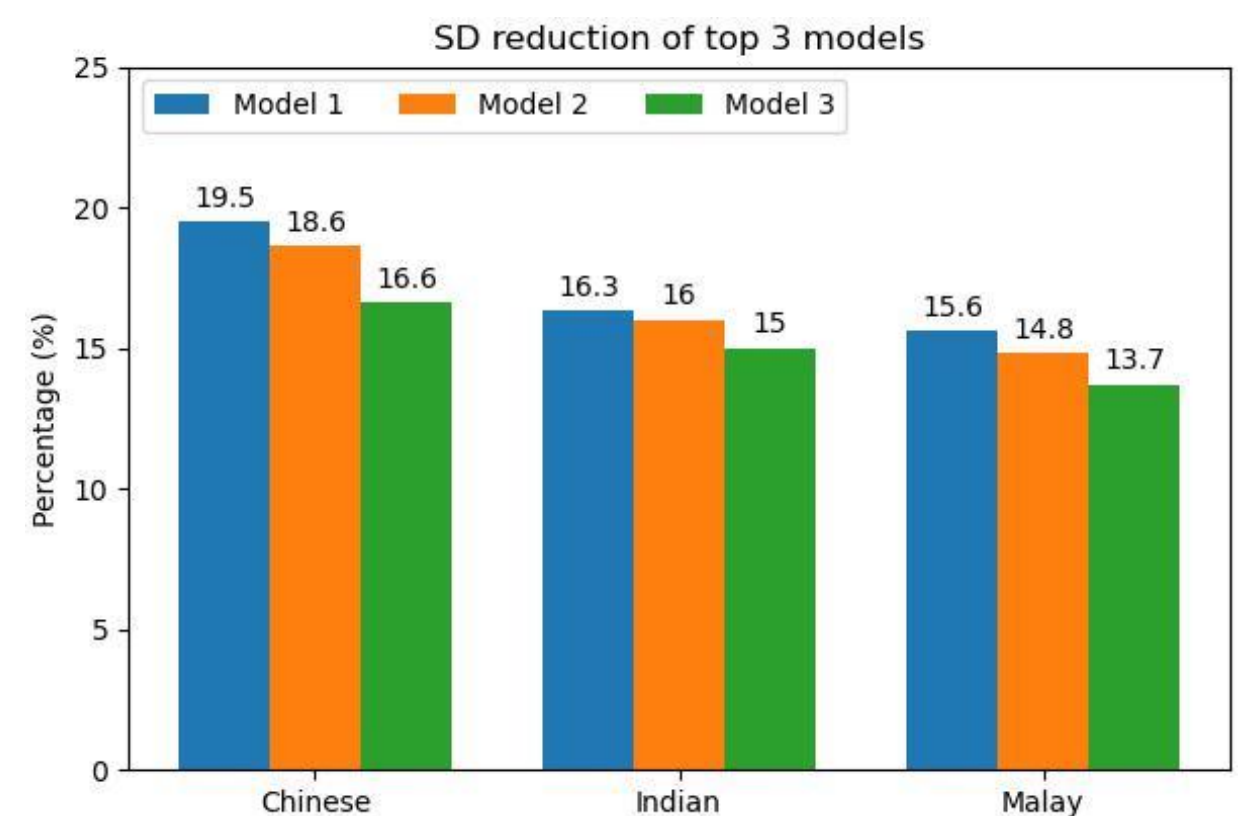
➤ The most significant improvement in classification accuracy was observed when using **compensated** RNFL thickness to classify between healthy Indian subjects and glaucomatous Chinese subjects, relative to using **uncompensated** RNFL thickness

Healthy Chinese vs ERANGA Chinese age 40-90 years old
Raw Approach (AUC= 0.906)
6 variables compensation Approach (AUC= 0.903)

Healthy Malay vs ERANGA Chinese age 40-90 years old
Raw Approach (AUC= 0.907)
6 variables compensation Approach (AUC= 0.907)

Healthy Indian vs ERANGA Chinese age 40-90 years old
Raw Approach (AUC= 0.791)
6 variables compensation Approach (AUC= 0.905)