

Drusen content estimation from staining in microscopy images

Background Drusen are an integral characteristic for identifying, categorising and evaluating numerous retinal diseases, including Age-Related Macula Degeneration (AMD) which affects for over 200 million people worldwide and is a leading cause of blindness in the developed world. In this sense, quantifying biomarkers such as drusen play an enormous role in the search for novel treatment strategies and potential cures.

Microscopy based staining is one of the oldest methods in biology to analyse ex-vivo tissue samples at micrometre resolution (see figures below). It allows one to see various tissue types and the intricate retinal layers. In particular, depending on the types of molecular staining and bleaching techniques used, drusen and other biomarkers may appear more readily to the visible eye.

Aim The individual will produce a semi-automatic tool for quantifying drusen prevalence in microscopy images that have been stained and bleached. This quantification will then be used to discriminate retina samples from healthy and sick subjects.

Materials and Methods The student will develop a simple interface for an expert to delineate a key retinal structure (ie. Bruch's membrane), from which a specific region needs to be analysed with a priori knowledge on the staining effect on drusen so that quantification of this structure can then be automated. Data will be provided and a useful solution will be emphasised. The project will be conducted in collaboration with the Inselspital.

Nature of the Thesis:

Method exploration: 20%

Implementation: 50%

Experimentation: 30%

Requirements:

Knowledge in Computer Vision, Machine Learning,
Matlab / Python

Supervisor:

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