Master Thesis Proposal

Segmentation of retinal layers in time-resolved OCT images

Background

Optical Coherence Tomography (OCT) is a non invasive imaging technique for performing high resolution cross-sectional imaging of biological tissues in vivo. OCT uses near-infrared light to capture information above and below the surface of objects. This way, structures with different optical properties and boundaries between structures can be identified. The resolution of an OCT image can range between 1 and 15μm, and the imaging depth is commonly in the order of 2-3mm. This, along with its non invasive nature, makes OCT suitable for ophthalmology and in particular imaging of the retinal layers of the eye. This is of particular interest, since the deeper retinal layers are not easily depicted with other imaging modalities.

Aim

The proposed project will explore ways of differentiating the distinct retinal layers in OCT images acquired through time.

Materials and Method

By operating on already collected data, the student will need to put forth image processing and machine learning techniques to segment the different retinal layers in a 2D time-resolved OCT image. Different OCT modalities may be used to ensure he robustness of the method. Different classification methods will be explored in order to design a robust and accurate strategy. Thorough evaluation of the composed algorithmic solution will be conducted, both quantitative and qualitative. Additional data collection may occur if proven necessary.

Nature of the Thesis

Theory 15%
Literature review 10%
Data analysis 10%
Data collection 5%
Implementation 50%
Thesis Writing 10%

Requirements

Familiarity with Machine Learning
Familiarity with Computer Vision
Programming skills: C/C++ and/or Matlab and/or Python

Supervisor

Prof. Dr. Raphael Sznitman