Amsterdam UMC
Universitair Medische Centra

Optical fingerprints of tissue

Background – Interaction of light with biological matter can provide valuable insight into the microscopic organization of the probed tissue. For instance, it is known from pathologist's analysis that during development and progression of cancer, the baseline delineation of tissue is lost; that cells grow and obtain irregular shapes; and that their vascular environment can change greatly due to a greater demand of nutrients. All these structural changes are reflected in an optical measurement which typically quantifies absorption and scattering coefficients (for instance using Single Fiber Reflectance Spectroscopy) or directly aims to image these developments (for instance using Optical Coherence Tomography). However, a suitable physics-based model translating these optical measurements into correspondence with the pathologists finding is lacking in many cases.

Goal – The overall goal is to establish a relationship between the microscopic organization of controlled materials (Phantoms) and the measured optical properties based on existing theories. Depending on the student's interest, this can be done using Optical Coherence Tomography, Single Fiber Reflectance spectroscopy or Spatial Frequency Domain Imaging – three state of the art methods currently applied in the clinic. The work will involve making these tissue phantoms, optically characterizing them and - hopefully- provide leads to link optical properties to microscale organization

Requirements – This assignment has a strong experimental component. Some experience with Matlab or LabVIEW for instrumentation and data analysis is beneficial.

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