Doctorate (Ph.D.) or Master (M.Sc.) position

Project title: OCT retinal imaging

We are looking for motivated students with background in physics, biomedical engineering, optometry, or ophthalmology to work on on-going projects on OCT retinal imaging. We develop imaging technologies to assess biomechanical and vascular properties of the human eye. Using video-rate Optical Coherence Tomography (OCT) and image analysis techniques, we are able to follow the movement of different retinal layers with micron precision in real time. We were the first to permit the direct and non-invasive measurement of the ocular rigidity in living human eyes. In addition to the tissue biomechanics, we are able to reconstruct maps of the retina and choroid as well their characterization during the development of diseases. Quantitative assessment of Swept-source OCT Angiography (OCT-A) images using custom algorithms also provide insight unto pathological processes, and help predict disease progression. Using both standard image analysis algorithms as well as Artificial Intelligence (AI), we apply our technologies to provide a deeper understanding of the pathophysiological mechanisms of various ocular diseases, aiming for improved and less invasive methods for an earlier diagnosis. Through prospective cross-sectional and longitudinal studies, we investigate ocular diseases including glaucoma, age-related macular degeneration (AMD), pathologic myopia and Spaceflight Associated Neuro-ocular Syndrome (SANS).

We are looking for a motivated PhD student with background in physic, physic engineering, biomedical sciences or biomedical engineering. Knowledge of IA and image analysis would be an asset. Interested candidates can communicate with the PI, Santiago Costantino santiago.costantino@umontreal.ca

Background literature:

1: Hidalgo-Aguirre M, Costantino S, Lesk MR. Pilot study of the pulsatile neuro-peripapillary retinal deformation in glaucoma and its relationship with glaucoma risk factors. Curr Eye Res. 2017 Dec;42(12):1620-1627.

2: Mazzaferri J, Beaton L, Hounye G, Sayah DN, Costantino S. Open-source algorithm for automatic choroid segmentation of OCT volume reconstructions. Sci Rep. 2017 Feb 9;7

3: Hidalgo-Aguirre M, Gitelman J, Lesk MR, Costantino S. Automatic segmentation of the optic nerve head for deformation measurements in video rate optical coherence tomography. J Biomed Opt. 2015 Nov;20(11)

4: L. Beaton, J. Mazzaferri, F. Lalonde, M. Hidalgo-Aguirre, D. Descovich, M. R. Lesk, and S. Costantino. (2015). Non-invasive measurement of choroidal volume change and ocular rigidity through automated segmentation of high-speed OCT imaging. Biomedical Optics Express. 6(5): 1694-1706