Name of the project:
Classification of patients with Parkinson's disease based on retina imaging

Brief description:
One of the main limitations to be able to identify adequate therapeutic targets in Parkinson's disease is the great physiopathological and clinical heterogeneity of the disease. Therefore, it is necessary to identify biomarkers and develop tools that allow us to classify patients better and earlier. In vivo studies in Parkinson's disease, Alzheimer's disease or multiple sclerosis have shown that in such diseases damage to the retina is early and associated with a worse prognosis. Moreover, post-mortem studies support that the retina reproduces a large part of the definitory pathophysiological phenomena observed within the brain in such diseases. Now, it is possible to quantify in vivo and non-invasively the structural integrity of the retina by means of optical coherence tomography (OCT), a widely available high-resolution imaging technique that provides near-histological tomographic images of the retina. Dr. Iñigo Gabilondo specialized in the use of retinal OCT in multiple sclerosis at the Hospital Clinic de Barcelona, a subject to which he devoted his doctoral thesis. Since he joined the Biocruces Bizkaia HRI in 2014, Dr. Gabilondo has been leading a line of research on the visual system in Parkinson's disease whose objective is to identify diagnostic and prognostic biomarkers based on retinal OCT and brain magnetic resonance imaging. A recent publication by the group in the journal Movement Disorders (link) shows that in patients with Parkinson's there is a pattern of retinal atrophy as measured by OCT (specific morphological changes of the macula) that is associated with a more aggressive disease. The cohort of patients and controls of the project already includes images and clinical data of 110 patients and 330 controls. The group also has access to the UK Biobank repository with retinal OCT images of more than 3000 subjects and repositories of collaborating research groups with more than 300 OCT images of Parkinson's patients. In line with our last findings that support the existence of morphological abnormalities in the macula of patients with aggressive Parkinson's disease, in this PFM we aim to perform unsupervised clustering of retina OCT images of 400 patients with Parkinson's disease and 400 controls using together with demographical and clinical features a wide collection of automatically computed morphological parameters of the macula from OCT images. During the PFM, the student will be integrated with neurologists and optometrists of the Neurodegenerative Diseases group and with Engineers from the Computational Neuroimaging Lab in Biocruces Bikaia HRI.

What the student needs:
Experience in classification techniques.
Python preferably, but not necessary.
Interest in neuroimaging

Supervisor:
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