Universitat Pompeu Fabra Barcelona

Master in Bioinformatics for Health Sciences

Master project 2021-2022

Personal Information

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Project

Computational systems biology

Project Title:

Neuroimaging of vascular disease in sporadic and genetic Alzheimer's disease

Keywords:

Alzheimer's disease, Vascular lesions, Brain, Neuroimaging, Segmentation

Summary:

Cerebral small vessel disease (SVD) is now recognized to be the most important vascular contributor to dementia. Substantial evidence shows that SVD and Alzheimer's disease share risk factors and have additive, if not synergetic, effects on cognitive impairment and neurodegeneration. Yet, the intersection between SVD and AD pathophysiological processes remains unclear. Consequently, a proper understanding of how SVD exerts its action on the aging brain, interacts with Alzheimer's disease, and leads to clinical symptoms is urgently needed. In the present project, we will focus on one specific radiological markers of SVD: the white matter hyperintensities (WMH). The term of WMH refers to abnormal clusters of hyperintense signal in white matter tissue on T2-weighted or fluid attenuated inversion recovery (FLAIR) MRI. WMH are frequently found in patients with Alzheimer's disease but their specific relationship with the disease processes remains debated. The aim of the current project is therefore to better characterize the emergence of WMH in the context of Alzheimer's disease, and delineate their effect on the neuronal loss. For this, the candidate will use and manipulate the MRI data (T1, T2, FLAIR) of >100 patients with sporadic Alzheimer's disease or Down Syndrome (i.e., genetic Alzheimer's disease). Specifically, the master student will: • Familiarize with Alzheimer's disease pathophysiology in a highly interdisciplinary environment. • Learn about brain image processing tools • Implement different methods to segment WMH and compare their application in the context of Down syndrome • Familiarize with statistical approaches to assess the relationships between WMH and different biomarkers of Alzheimer's disease

Expected skills::

Interest for neuroimaging and/or neurodegenerative disease, curiosity, ability to work independently but also in group, programming skills (R or matlab) are not mandatory but will be valorized, basic statistical knowledge, ability to interact in english

Possibility of funding::

No

Possible continuity with PhD: :

Yes

Comments:

We have several other neuroimaging projects. Don't hesitate to contact me if you are interested in learning about neuroimaging in neurodegenerative diseases.