Available Master Thesis Project at the BBSLAB

Title: Neuroimage quantification of unhealthy ageing biomarkers from advanced MRI protocols.

Introduction

The Barcelona Brain Health Initiative (BBHI, https://bbhi.cat) is an ongoing prospective longitudinal study focused on identifying determinants of brain health in the ageing population. It is conducted in partnership with the Institut Guttmann and the UB. In this large epidemiological study, a cohort of about 1,000 participants, 45-60 years old individuals are currently undergoing repeated detailed in-person evaluations. These evaluations are providing deep phenotyping of brain function, including medical, neurological and psychiatric examinations, assessment of physical fitness, neuropsychological assessments, structural and functional brain magnetic resonance imaging, electroencephalography and perturbation-based non-invasive brain stimulation evaluations of brain activity, as well as collection of biological samples. A crucial aspect of such phenotyping is our extensive MRI-based neuroimage protocol including dedicated MRI sequences to study macro- and micro-structure, vascular performance and lesion, and patterns of brain function among others. Various image quantification techniques are required to exploit such phenomenal image database ranging from many fields in bioinformatics (segmentation algorithms, time series for functional data, track reconstruction, model estimation, etc.)

Objectives

- To work in a multidisciplinary team involving experts from medicine, neuropsychology, engineering and physics.
- To take part in a data management program to extract meaningful brain biomarkers from MRI sequences using standard validated analyses for neurological and psychiatric research on ageing.
- To develop and apply image processing and quantification techniques to quantify relevant ageing biomarkers from MRI data.

Skills Required

- Programming abilities (Linux/Python/Matlab).
- Knowledge of math/algebra, specially matrix manipulation and statistics.
- Team work and Collaboration skills.

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