ARAMIS LAB
Brain and Spine Institute (ICM)
CNRS UMR 7225 – Inserm U1127
Sorbonne Université
Inria – Paris Research Center
www.aramislab.fr

JOB OFFER

PhD fellowship

Multimodal analysis of neuroimaging and transcriptomic data in genetic fronto-temporal dementia

Keywords: medical imaging, genomics, neurodegenerative diseases, statistical learning

The topic: discovering biomarkers using multimodal neuroimaging and transcriptomic data

Fronto-temporal dementia (FTD) is a neurodegenerative disease with devastating personal, familial and social consequences. A large proportion of FTD cases are due to genetic mutations. The ICM has assembled one of the largest cohorts worldwide on these genetic forms of FTD. Such cohort comprises multimodal data including neuroimaging (MRI, PET), cognition and transcriptomic (RNA-seq). Participants are followed up over time with the different types of data being collected at each visit. A major aim is to use these multimodal data to characterize and discover biomarkers of the presymptomatic phase of the disease, in order to design upcoming therapeutic trials. Analysis of baseline neuroimaging data has led to the discovery of biomarkers with publications in high-impact medical journals [1,2].

The PhD project

The present PhD project aims at designing and applying new approaches for analyzing and integrating multimodal transcriptomic and neuroimaging data. More specifically, the objectives are: i) to analyze the evolution of neuroimaging measures over time; ii) to analyze transcriptomic data both cross-sectionally and longitudinally; iii) to design new approaches for the joint analysis of multimodal transcriptomic and neuroimaging data. We will assess the ability of these approaches to distinguish between presymptomatic carriers of genetic mutations causing FTD (c9orf72 and GRN mutations) and non-carriers, to track the evolution of alterations over time and to predict disease onset. We will also study the relationships between these markers to better understand the presymptomatic phase of the disease.

A vibrant scientific, technological and clinical environment:

You will work within the ARAMIS lab (www.aramislab.fr) at the Brain and Spine Institute (http://www.icm-institute.org), one of the world top research institutes for neurosciences. The institute is ideally located at the heart of the Pitié-Salpêtrière hospital, downtown Paris.

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The ARAMIS lab, which is also part of Inria (the national French research institution for computer science), is dedicated to the development of new computational approaches for analysis of large multimodal data sets and their application to neurodegenerative diseases.

This position is offered within a large-scale collaborative project, IPL Neuromarkers, which aims at discovering new biomarkers of neurodegenerative diseases. The present PhD project will be conducted in collaboration between the ARAMIS Lab, the DYLISS Lab (Inria), the FTD research team (ICM) and the iCONICS bioinformatics platform (ICM). These different teams provide complementary expertise in neuroimaging, genomics, statistical learning and physiological and clinical aspects of FTD. You will thus work in a truly multidisciplinary environment at the interface of computer science and biomedical research.

Bibliography

[1] Bertrand A, Wen J, Rinaldi D, Houot M, Sayah S, Camuzat A, et al. Early Cognitive, Structural, and Microstructural Changes in Presymptomatic C9orf72 Carriers Younger Than 40 Years. JAMA Neurol 2018;75:236–45. doi:10.1001/jamaneurol.2017.4266.

[2] Wen J, Zhang H, Alexander DC, Durrleman S, Routier A, Rinaldi D, et al. Neurite density is reduced in the presymptomatic phase of C9orf72 disease. J Neurol Neurosurg Psychiatry 2018. doi:10.1136/jnnp-2018-318994.

Your profile

- Knowledge of statistical learning methods
- Knowledge in image analysis would be a plus
- Strong interest for pluridisciplinary work at the interface of medicine and computer science
- Good programming skills, preferably in Python
- Excellent relational and communication skills to interact with professionals from various backgrounds.

Salary: 1982€ (gross monthly salary)
Type of contract: 3 year fixed-term contract
Starting date: Between september and november 2019

Ready to take up the challenge?

Send your CV to Olivier.Colliot@upmc.fr.