2018-00576 - Phd : Representation of Cortical Structure and Function through Probabilistic Semantic Modelling

Contract type : Public service fixed-term contract
Level of qualifications required : Graduate degree or equivalent
Function : PhD Position

About the research centre or Inria department
Located at the heart of the main national research and higher education cluster, member of the Université Paris Saclay, a major actor in the French Investments for the Future Programme (Idex, LabEx, IRT, Equipex) and partner of the main establishments present on the plateau, the centre is particularly active in three major areas: data and knowledge; safety, security and reliability; modelling, simulation and optimisation (with priority given to energy).

The 450 researchers and engineers from Inria and its partners who work in the research centre's 31 teams, the 100 research support staff members, the high-level equipment at their disposal (image walls, high-performance computing clusters, sensor networks), and the privileged relationships with prestigious industrial partners, all make Inria Saclay Île-de-France a key research centre in the local landscape and one that is oriented towards Europe and the world.

Assignment
A fundamental challenge in computational neuroanatomy and the understanding of the human brain is the representation of neuroanatomy and function beyond spatial matching. Formalising the neuroanatomical concepts that define brain regions in terms of anatomy, tissue structure and function across subjects is currently limited to quashing individual variability into a common template space. However, there is ample evidence that individual variability escapes such template space transforms.

Specifically, recent studies have shown that shape- or anatomy-based alignment, even when carried out through sophisticated diffeomorphic deformations procedures, does not solve the issue.

Main activities
We will develop a probabilistic domain-specific language to represent neuroanatomical structures and functions. This will allow us to perform data-driven inference on the relationship between brain anatomy and function leveraging large scale datasets.

We expect that our approach to brain function and anatomy will enable us to capture population as well as individual variability. Furthermore, we will be able to define an explicit formalization of brain areas that will generate an anatomo-functional correspondence across subjects.

Skills
The successful candidate will be interested in applications of theoretical computer science, machine learning and in the understanding of human neuroanatomy. Knowledge of scientific computing in Python (Numpy, Scipy) is encouraged. All the work will be done in Python based on the Nilearn (http://nilearn.github.io) and tract-querier (http://tract-querier.readthedocs.io) libraries.

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration
Monthly gross salary : 1.982 euros (1st 2 years), 2.085 euros (3rd year)