



JOB OFFER Postdoctoral fellow

USA-France collaborative project Computational anatomy of the hippocampus from high resolution multi-contrast 7 Tesla MRI

Keywords: medical image computing, morphometry, registration, segmentation, brain diseases

The topic:

7 Tesla MRI provides unprecedented means to study anatomical structures in vivo. This is of particular interest for the hippocampus which has a complex internal structure composed of intricate layers with different cellular composition. 7 Tesla MRI with very high spatial resolution and multi-contrast imaging (T1, T2, R2*, QSM...) has the potential to precisely map the internal architecture of the hippocampus, resulting in new biomarkers of pathologies such as epilepsy and Alzheimer's disease. However, these advances in image acquisition require corresponding advances in image analysis to be fully exploited. To that purpose, we propose a new approach to move computational anatomy beyond morphometry by integrating both multi-contrast MRI and shape into a single framework. These mathematical and computational approaches are expected to significantly advance the field of computational anatomy of the human brain, breaking down the millimeter barrier of conventional brain morphometry and providing a coherent analysis framework for anatomical data at ultra-high spatial resolution.

Your mission:

You will be in charge of developing a coherent framework for computational anatomy of the internal structures of the hippocampus based on cutting edge MRI acquisition techniques at 7 Tesla. Specifically, you will be in charge of developing approaches for inter-subject registration, template estimation at the group level, segmentation of anatomical structures, mapping of multi-parametric maps onto anatomical surfaces and statistical analysis. You will implement the developed approaches within the software platforms developed by the ARAMIS Lab and its collaborators. Finally, you will evaluate the proposed approaches in selected datasets of healthy controls and patients with epilepsy acquired within the project.

A vibrant scientific, technological and clinical environment:

The position is offered within a 3-year USA-France collaborative project involving the ARAMIS Lab (Paris, France), Ecole Normale Sup rieure (Cachan, France), Neurospin (Saclay, France) and the Center for Magnetic Resonance Research at University of Minnesota (Minneapolis,

ARAMIS Laboratory

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USA). Please find further information about the project below. This project is fundamentally envisioned as a multi-disciplinary active collaboration, and the recruited post-doc will be strongly encouraged to exploit this opportunity to interact with experts of different background: neuroscience, computational neuroanatomy, image analysis algorithms, epileptology, high field MRI. This project will thus be of very high educational value for the post-docs involved as they will be exposed to rich and diverse academic inputs.

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. The ARAMIS lab, which is also part of INRIA (the national French research institution for computer science), is dedicated to the development of new paradigms for the analysis of neuroimaging and clinical data sets.

You will be in close collaboration with the partners of the project through regular meetings, videoconferences and visits to the US partner in Minneapolis

The HIPLAY7 project: joining forces across the Atlantic

Project: HIPLAY7 - Hippocampal layers: advanced computational anatomy using very high resolution MRI at 7 Tesla in humans

Partners:

- ARAMIS Lab (brain image analysis, computational anatomy): Olivier Colliot, Marie Chupin, Stanley Durrleman, Anne Bertrand
- University of Minnesota (7 Tesla MRI, MR physics, epilepsy): Pierre-François Van de Moortele, Thomas Henry
- Ecole Normale Supérieure de Cachan (mathematical modeling, computational anatomy): Alain Trouvé
- Neurospin (7 Tesla MRI, MR physics, epilepsy): Lucie Hertz-Pannier, Alexandre Vignaud

Funding: NSF (USA), NIH (USA), ANR (France)

Your profile

- PhD in the field of medical image computing
- Previous research work on at least one of the following topics: registration, geometrical modeling, segmentation, shape analysis
- Good relational and communication skills to interact with professionals from various backgrounds.

Starting date: from January 2017

Duration: 2 to 3 years

Salary: to be negotiated depending on experience

Ready to take up the challenge?

send your CV to Olivier.Colliot@upmc.fr

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