Postdoctoral position in MR-Elastography
BPALP - Brain PALPation by using MR passive elastography
IR4M - CNRS UMR 8081 UPsud CEA SHFJ

Location: IR4M - CEA SHFJ 4 Place du Gal Leclerc 91401 Orsay and Neurospin CEA Saclay 91191 Gif/Yvette
Opening: December 3rd 2018 for a period of 2 years

For more informations, please contact Jean-Luc Gennisson (jean-luc.gennisson@u-psud.fr)

Summary of the project:

Elastography is a recent imaging technique (with MRI or ultrasound (US)) that allow to recover biomechanical properties (BMP) of soft tissues. Brain elastography has been studied extensively recently and has allowed, mainly *ex vivo*, to better understand tumor or degeneration pathologies. But this technique suffers from drawbacks for daily clinical practice. In US, due to skull bone it is not possible to non-invasively investigate brain BMP without neurosurgery. In MRI it is necessary to vibrate the head from an external actuator which makes difficult daily clinical diagnosis. Thus BMP of brain are unwell known *in vivo* and are poorly used as a biomarker for cancer diagnosis or treatment monitoring compared to other organs.

We propose to develop an original MRI method without external vibrator for brain cancer tumor diagnosis with an innovative technique coming from US imaging, passive elastography. We will develop MR sequences: on clinical magnets 7T and 3T for BMP understanding and daily clinical practice, respectively; on preclinical magnet 7T for fundamental understanding and monitoring of chemotherapy treatment. We will validate our passive elastography BMP reconstruction with "gold standard" US elastography in small animals with craniotomy and in humans during neurosurgery. Full 3D reconstruction of the BMP of the brain will be also compared to diffusion tensor imaging to understand the link between brain architecture and its elastic tensor.

The main result of this consortium will be to develop a breakthrough technology, which would represent a major advance compared to the state-of-the-art. The main result of the project will be to propose a new MR imaging sequence in order to optimize the specificity and sensitivity of the MR systems as a diagnosis tool for brain tumors. Once validated, it will be applied to specific brain cancer diagnosis on mice and humans, for chemotherapy treatments monitoring and neurosurgery strategy definition, respectively.

Skills needed and information:

The candidate will be mostly in charge to build and implement new MR sequence on 7T Siemens system and 3T Siemens system. These new MR sequences should be implemented to speed-up the acquisition rate and to optimize the setup sensibility and efficiency, as well as the shear wave frequency selectivity (between 100 Hz and 2000 Hz). This project requires a good knowledge of the physics of MRI and in MR programming. Skills in biomechanics are also welcome, especially in elastography methods. Comparison will be done with ultrasound elastography, so an experience in ultrasound could be interesting. This work will be realized in collaboration with Alexandre Vignaud and Benoît Larrat at Neurospin.

Financial conditions are based on the Paris-Saclay University postdoctoral grants, and depend on the years of experience of the candidate.

Applicants interested in this project can send a CV, motivation letter, and eventually recommendation letters to Jean-Luc Gennisson.