

ANR Post-Doctoral Position MultiModel Project

In vivo electrophysiology, optical and MR imaging of neurovascular coupling in epilepsy

See details of MultiModel project on <http://insermu751.org/pmwiki/pmwiki.php?n=Multimodel.HomePage>

Despite significant progress in the past decades, the characterization of the basic mechanisms involved in excitation-, inhibition- and synchronization-related processes in brain neuronal systems from electrophysiological (scalp EEG, MEG or intracerebral EEG) and hemodynamic (fMRI, NIRS) data is still considered as a difficult and unsolved problem. Difficulties arise from the fact that each technique can only provide, by itself, a partial, specific and indirect measurement of the activity in considered systems, and from the incomplete knowledge about the neurophysiological and the biophysical aspects involved in the generation of observations. In this context, models provide a unified framework in which knowledge on the physiology of neuronal activity and neurovascular coupling can be incorporated, in order to simulate the output signals for given parameters. The general objectives of the MULTIMODEL project are twofold: the first objective is to develop computational models at the level of neuronal systems that will help interpreting neuroimaging data in terms of excitation-, inhibition- and synchronization-related processes; the second objective is to acquire multimodal datasets, obtained in rats and humans under physiological and epileptogenic conditions, which will be used to develop the biophysical models and to test their validity and predictability. The MULTIMODEL project involves 5 partners (INSERM U751 in Marseille, U678 in Paris, U836 in Grenoble, U642 in Rennes and the INRIA Athena project-team in Sophia Antipolis).

The aim of the present post-doctoral project is to obtain multi-modal recordings of a wide range of electrical and hemodynamic variables in animals during evoked neuronal activity as well as during epileptiform activity. These data will allow comparing the neurovascular coupling in physiological and pathological conditions. The focus of data acquisition is on obtaining a maximum of multimodal information in the same session through LFP, MUA, EEG, laser-doppler flowmetry and fMRI, the common modality recorded during all sessions being electrophysiology.

The project comprises two distinct phases of one year each. First, invasive multimodal data (LFP, MUA and laser-doppler flowmetry) will be acquired and processed in Marseille. Subsequently, the animal models will be transferred to Grenoble, where fMRI/EEG experiments (data acquisition and analysis) will be performed.

The successful candidate should be experienced in pre-clinical imaging, especially cerebral imaging of rodents. Proficiency in the analysis of experimental data is required, preferentially using Matlab, LabView or similar high-level programming. Previous work on: animal models, microsurgery, in vivo imaging is mandatory. Skills in electrophysiology and/or MRI would be appreciated. The postdoc will perform the electrophysiology recordings, MRI exams and data pre-processing, and will contribute to writing reports and publications. He or she will be helped by staff from Inserm U751 in Marseille and U836 in Grenoble (animal models, recording methods, EEG/fMRI acquisitions).

In practice, the candidate will preferably be located in Marseille during the first year and in Grenoble during the second year. Alternate arrangements may be possible. Meetings will be organized in Marseille, Grenoble and Paris.

Salary: 2000 euros / month.

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