PERFORM Centre

Postdoctoral and/or MSc/PhD positions available in the Multimodal Functional Imaging Lab

PERFORM center and Physics Dpt, Concordia University, Montreal
Biomedical Engineering Dpt, McGill University, Montreal

The candidates will join a multidisciplinary team composed of neurologists and methodologists within the Multimodal Functional Imaging Laboratory, directed by Pr. Christophe Grova. The laboratory of Pr. Grova is based on two sites: (i) Physics Dpt at Concordia University and PERFORM center, (ii) Biomedical Engineering Dpt and part of the epilepsy group of the Montreal Neurological Institute, McGill University. Both environments offer unique platforms with access to several modalities (simultaneous high-density EEG/fMRI, MEG, simultaneous EEG/NIRS, TMS, SPECT/CT, PET/CT). The candidates will notably have access to the brand new multimodal imaging platform of PERFORM center, dedicated to neuroscience studies over large cohort of subjects (effect of age, exercising, ...), whereas clinical applications during the presurgical investigation of patients with epilepsy will be primarly based at the Montreal Neurological Institute. The main expertise of the team is the development and the validation of source localization methods dedicated for EEG, MEG and NIRS as well as multimodal characterization of brain activity and especially resting state functional connectivity.

Project 1: Multimodal characterization of resting state functional connectivity.

The main originality of this project is to consider frequency-based source localization of EEG and MEG data, using notably wavelet-based Maximum on the Mean (Lina et al IEEE TBME 2012) in order to investigate resting state functional connectivity from simultaneous EEG/MEG data and simultaneous high-density EEG/fMRI data. These multimodal data will be considered in order to investigate the dynamic of resting state functional connectivity patterns in healthy controls and patients with epilepsy.

Project 2: Multimodal assessement of the integrity of the neurovascular coupling.

The main originality of this project is a complete multimodal investigation of neurovascular coupling processes involving EEG/MEG, EEG/fMRI and EEG/NIRS data. Neurovascular coupling during excitation and inhibition will be analyzed either in healthy conditions during well-controlled paradigms (e.g. finger tapping, electrical median nerve stimulation, TMS stimulations) or in resting state conditions and notably at the time of transient epileptic activity. One of the main objective will consist in assessing the integrity of the neurovascular coupling processes in these conditions. Developpments will involve statistical analysis of NIRS signal, 3D tomographic reconstruction of EEG and NIRS data, evaluation of neurovascular coupling models.

Supervisor: Christophe Grova Ph.D.
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Requirements: The candidate should have expertise in image and signal processing, involving notably one or few of the modalities mentioned. Computational skills including neuroimaging softwares and Matlab are important additional qualifications. Experience in the field of epilepsy will be appreciated.

Please send your CV and motivation letter before Sept. 15th 2014 to christophe.grova@concordia.ca