

Engineer Position

Integration and development of applications using an MRI and EEG compatible NIRS system to explore brain function

Deadline for application: September 15th, 2021

Research teams: Empenn U1228 team / Neurinfo platform, IRISA Rennes (<http://www.irisa.fr/>)

Associate Supervisors:

Elise Bannier (elise.bannier@irisa.fr) – MRI Physicist

Emmanuel Caruyer (emmanuel.caruyer@irisa.fr) – Scientific director

Isabelle Corouge (isabelle.corouge@irisa.fr) – Technical manager

Location:

- Plateforme Neurinfo, Hôpital Pontchaillou, CHU Rennes, Rennes, France
- IRISA-Inria Rennes Bretagne Atlantique, Campus de Beaulieu, Rennes, France

Duration: 12 months, from October 2021 - renewable for one year

Net income: from 2000 € / month depending on experience

Keywords: Neuroimaging, Brain Function, Near Infra-Red Spectroscopy (NIRS), Signal and Image Processing, MRI

Description:

The Neurinfo platform and the Empenn U1228 research team are seeking an engineer with motivation in neuroimaging to set-up, develop and operate a software platform using a near infrared spectroscopy (NIRS) system in a Magnetic Resonance Imaging (MRI) and Electroencephalography (EEG) compatible environment design.

The objective of this project is to extend our technological capabilities toward NIRS-EEG-MRI simultaneous imaging. A first step is to exploit a NIRS device, develop applications and analysis pipelines to record the brain activity in and outside MRI. In the scope of the project, novel computational/statistical models, signal processing, empirical protocols and visualizations will be proposed and studied, partly via their computational implementations, tested on healthy controls and later in clinical protocols in patients.

The selected engineer will collaborate with the other members of the team in specifying and designing an integrative software architecture that allows the integration of NIRS measurements potentially acquired jointly with fMRI and/or EEG. The significance and the effectiveness of the computational platform will be tested through a large set of local *in vivo* experiments (normal controls, psychiatric disorders, stroke patients...). Further, the selected tenure may be requested to implement additional data processing algorithms, software components and computational improvements as needs arise from the research progress.

Research environment

The NIRS system allows to indirectly measure the brain activity through hemodynamic responses associated with neuron behaviour. The system is compatible with an electroencephalography (EEG) device to measure cerebral electrical activity and with an MRI system to measure brain anatomy and function. EEG and fNIRS systems are portable devices that can be used outside of MRI in free movement. A wearable multichannel fNIRS-EEG device can provide a continuous recording of brain activity. Thus, in addition to the MRI device available on the Neurinfo platform, these fNIRS-EEG devices provide two simultaneous and complementary measurements of brain activity when used outside MRI. It is the first equipment of its kind in western France, and even a unique set of equipment in France (and probably also in Europe), combining EEG-NIRS outside and under MRI.

This work will benefit from research-dedicated 3T MRI and EEG/MRI compatible system provided by the Neurinfo platform on which these new research protocols will be set up (<https://www.neurinfo.org>). The experimental part will be conducted in close collaborations with the engineering staff of Neurinfo, and the clinical departments of Radiology, Rehabilitation and Psychiatry of the Hospitals of Rennes.

The engineer will be affiliated to the Empenn U1228 unit. The Empenn research group is jointly affiliated with Inria, Inserm (National Institute of Health and Scientific Research), CNRS (INS2I institute), and University of Rennes I. It is a team of IRISA/UMR CNRS 6074. Empenn is based in Rennes, at both the medical and science campuses. The team is dedicated to fostering research in medical imaging, neuroinformatics and population cohorts. In particular, the Empenn team targets the detection and development of imaging biomarkers for brain diseases and focuses its efforts on translating this research to clinics and clinical neurosciences at large. The Empenn group operates the Neurinfo imaging facility in the context of a partnership with the University Hospital of Rennes, Inria, the CNRS, and the Cancer Research Center.

Skills and applicant profile

The ideal applicant should have a strong background in computational sciences, image and signal processing, biophysics and statistics. A very good practice in programming, especially in Matlab and/or Python is required. The position is opened for an initial period of 12 months with a range of net salary starting from 2000 € per month, according to experience.

Application package

Applicants should send their complete application package by email. It will include:

- Motivation letter
- Complete CV
- Recommendation letters would be welcome (preferably directly sent by the mentor).