Call for a PhD student at Université de Piardie Jules Verne

Amiens city (Close to Paris), FRANCE

SUBMISSION DEADLINE April 30th

(Multimodal brain imaging (EEG, NIRS) during neurodevelopment)

The PhD student will join the research team at INSERM U1105, Université de Picardie Jules verne, Centre Universitaire de Recherche en Santé (CURS), CHU Sud avenue Laennec, 80054 Amiens, directed by Professor Fabrice Wallois.

The Research Group for the Multimodal Analysis of Cerebral Function (GRAMFC-INSERM U 1105) conducts application-oriented research in the multimodal analysis of the cerebral function and dysfunction in newborns and children, as well as fundamental research on new functional neuroimaging techniques. We participate in European projects and work closely with academic and industrial partners in functional neuroimaging, with an emphasis on neurodevelopmental applications.

Over the past few decades, a large body of research has addressed electroencephalographic (EEG) markers of development and the follow-up of premature neonates in the clinic. To take a step further, we believe that a high-resolution multimodal approach to study the activities of the underlying multidimensional networks (i.e. neuronal and vascular networks) can shed light on the fine-tuned functionality of the developing network and hence identify new neurobiomarkers that are predictive of neurodevelopmental disorders. To better characterize the functional status of these developing networks, it is also essential to define biomarkers of endogenous non-sensory and sensory-driven neural activities. This project is dedicated to investigating the functional neuronal networks in preterm newborns through characterization of (i) endogenous activity and (ii) neural responses to exogenous stimuli. This study will be conducted at the Amiens University Hospital, at INSERM unit U1105 - the only facility able to perform high resolution-EEG (HR EEG) and high-density near-infrared spectroscopy (HD NIRS) on very preterm infants, and also optically pumped magnetometer fetal magnetoencephalography (OPM fMEG). This approach is highly innovative from both the scientific and clinical points of view.

What is the function of fine-tuned endogenous generators? The characterization of spontaneous endogenous EEG neurobiomarkers is essential for confirming that a premature newborn is developing normally. Are preterm infants and fetuses able to detect rhythms and violations in rhythmic structures? How does this ability change as the infant develops, and how is this process accomplished in the brain? Extracting temporal regularities from sound sequences and detecting violations are fundamental linguistic/musical abilities. The neural response to rhythmic stimuli and its dynamics/changes over the course of development can attest to the normal development of the underlying networks.

The first part of the project will seek to extract and characterize the endogenous EEG neurobiomarkers. The second part of the project will be dedicated to defining neurobiomarkers based on the neural response to exogenous stimuli by (*i*) studying the entrainment to rhythmic structures, and (*ii*) using a multimodal approach (HR EEG, HD NIRS and OPM fMEG) to address discriminative abilities during rhythm processing.

PHD STUDENT RESPONSIBILITIES

The PhD student will be involved in the multicenter project described above. The student will handle HR EEG and HD NIRS systems. He/she will be involved in the design of cognitive tasks. He/she will develop novel signal processing techniques to extract information from the aforementioned signals recorded in the NICU and from premature and full-term human neonates.

MINIMUM QUALIFICATIONS

The candidate needs to:

be graduated from an **Engineering MSc program before July 2021 from** one of the three disciplines Biomedical, Electrical, or Computer Engineering (student from a background of Information Technology with the following skills can also apply) from one of **the top 10 universities in the corresponding country**,

have a solid knowledge in the areas of digital signal processing and neural signal analysis (signal preprocessing, filtering design, time-frequency analysis, coherence analysis, etc.),

- have high level technical skills in MATLAB/PYTHON,
- have an English competence equal to a TOEFL iBT of 90 or IELTS 6 (the diploma is not required, however the English knowledge will be evaluated through an interview).

PREFERRED QUALIFICATIONS

- Experience with neural signal acquisition systems,
- Experience in EEG(ERP) and/or NIRS and/or MEG and/or LFP-MUA signal analysis,
- Experience with Fieldtrip, EEGLAB, Brainstorm, NIRS SPM, and HOMER, etc.
- Background in deep learning,(CCN, VAEs, GANs)
- Background in basic or cognitive neuroscience

APPLICATION

The position is available in **October 2021**, and the selected candidate will be expected **to join before the end of 2021** (earlier dates are preferred).
The program will be in English; therefore, French language skills are not mandatory.
The amount of the **grant is ~100 K€ brut for three years**. High performance computers and laptops will be provided.
Application evaluation will be through an initial evaluation of the **candidates' resume** and **an interview with** the selected candidate by the members of the doctoral school **in June**. Interested individuals should submit the following items only to the email address ApplicationInquiries@protonmail.com

1. 1-2 page summary of research interests and explanation of how the interests and skills fit with the objectives of the program.
2. Detailed CV including the experiences and skills, publications, and names and addresses of three references (preferably one from your final year project supervisor)
3. At least 2 recommendation letters.
4. Transcript of courses taken at graduate and undergraduate levels and their grades.