

Post-doc position offer

ECOFEC: Evolution of cognitive functions in epileptic children

Context. Epilepsy is a multi-causal neurological disorder affecting more than 50 million of the population worldwide. Epilepsy is known for its clinical manifestations (seizures) and subclinical manifestations (interictal epileptic discharges - IEDs -). Although subclinical, IEDs perturb neuroplasticity processes by altering the physiological activity of cortical networks. IEDs have long-term adverse effects on developing brain circuits and can cause long-term cognitive deficits in children that negatively impact their lives as much as seizures do. Yet, one of the most recurrent questions in epilepsy neuro-pediatric clinics is whether IEDs should be treated or not. While research studies have advanced our understanding of the relation between some cognitive impairments and IEDs, their translation to clinical practice is limited due to a lack of quantification of the long-term relationship between interictal EEG abnormalities and cognitive functions and the accessibility of this information with available techniques.

Objective. The ECOFEC aims to (i) understand how the relation between the electrophysiology and neuropsychological tests evolved over the years in children with epilepsy and (ii) unveil the electrophysiological biomarkers that may lead to a IEDs and cognitive deficits treatment if there are any.

Mission. Neuropsychological test scores and EEG recordings collected during four years of the patient's follow up and MRI will be considered as clinical data. Low-resolution EEG analysis enhanced by machine-learning techniques will be considered to detect the biomarkers that can be related to the cognitive dysfunctions. In the first stage of the project, the post-doctoral researcher will focus on resting-state scalp EEG signals to define the intrinsic networks, detect the IEDs and define their spatiotemporal and connectivity features (e.g. IED morphology, frequency, functional connectivity etc.). All the analyses will be done in the source-space after solving the inverse problem on patient-specific anatomical models. In the second stage of the project, the interactions between the intrinsic connectivity networks and IED networks will be studied to capture network-level variations and to define whether there is a relationship between these variations and neuropsychological assessments.

Profile. The ECOFEC project is at the interface between signal processing (EEG, independent component analysis, and inverse problem), cognitive neuroscience (neuropsychological) and clinics (epilepsy, neuropediatrics). The post-doctoral fellow should have a strong background in electrophysiology, EEG analysis and processing, functional connectivity and statistical analysis. Knowledge on machine learning, cognitive neuroscience, and neuroanatomy would be an asset. The post-doc fellow will join a multidisciplinary team including research scientists in biomedical engineering, neurophysiological modeling, bio-physics, signal processing, electrophysiology, neurology, and interact with clinicians.

Contract. The 1-year contract is supported by the Institute of Clinical Neuroscience of Rennes (INCR, <https://www.incr.fr/>), starting as soon as suitable candidates are identified.

Location. The position is located in Signal and Image Processing Laboratory (LTSI, <https://www.ltsi.univ-rennes1.fr/>) Rennes, France. LTSI is affiliated to INSERM and University of Rennes.

Contact. Applicants should send a CV and a list of two reference via e-mail to Elif Köksal-Ersöz (elif.koksal-ersoz@inserm.fr) and Isabelle Merlet (isabelle.merlet@inserm.fr). Please put [ECOFEC post-doc application] in the subject of the mail.