3-year PhD Proposal

Title: Instrumental and Electrophysiological studies of transcranial electrical stimulations impact on the human brain

Keywords: transcranial electrical stimulation, fast periodic visual stimulations, intracerebral and scalp electroencephalography, cognitive neurosciences, human in-vivo

Summary :
This project proposes to investigate the impact of transcranial electrical stimulations (TES) on the human brain and more precisely on the visual ventral stream that supports vision and memory processes. In order to precisely validate the impact of TES, we will use simultaneous multi-scale electroencephalographic (EEG) recordings and fast periodic visual stimulations (FVPS). This coupling in human in-vivo is unique in worldwide. Multi-scale EEG recordings (intracerebral and scalp) is rare and allow the precise investigation of brain functioning from the neural populations to the surface of the scalp (Koessler et al., 2015; Jacques et al., 2019 & 2020). The FPVS is a robust, fast, specific method which allows to measure evoked potentials of the human brain in the frequency domain. In order to evaluate the impact of the TES, we will investigate both drug resistant epileptic patients and healthy subjects. We will analyze cognitive EEG biomarkers (evoked by the FPVS) in terms of amplitude, signal to noise ratio and anatomical distribution during three steps: before the TES, during the TES and after the TES. Finally, we will design and evaluate the abilities of a new FPVS-EEG system (Bioserenity®) to record these cognitive biomarkers in these clinical and experimental contexts.

Lab: CRAN Neurosciences, joint research center of CNRS and Lorraine University, University Hospital of Nancy, Nancy, FRANCE, http://www.cran.univ-lorraine.fr/anglais/themes_rech/biosis/index.php

Company: Bioserenity, Paris Brain Institute, Paris, FRANCE, https://www.bioserenity.com/en/

PhD supervisors:
Laurent KOESSLER (PhD), CNRS Researcher, https://laurent-koessler.webnode.fr/
Bruno ROSSION (PhD), CNRS Researcher, https://face-categorization-lab.webnode.com/people/bruno-rossion/
Company supervisors:
Umar SALEEM & Nicolas JURADO

Strengths/Originalities: interactions between neurosciences, engineering and medicine, multi-scale EEG investigation, clinical investigations, brain stimulations, high technology (electroencephalography and transcranial electrical stimulation), signal analysis

Salary: 27 000 euros brut / year (ANRT, CIFRE fund) ; 3 years (CDD)

Expected training: neurosciences (clinical or cognitive) or signal/image analysis (engineer) or biomedical engineering or neuropsychology.