MASTER 2 Computational Neurosciences

Internship proposal 2026-2027

(internship from January to June 2027)

Host laboratory: Lyon's Neurosciences Research Center (U1028/UMR5292)

Host team : EDUWELL Team, CRNL, https://www.crnl.fr/fr/equipe/eduwell

Internship supervisors : *name + position + email*

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Project title : SEIZURE (Seeing the Epileptogenic Zone through machine Learning on structural and functional neuroimaging data)

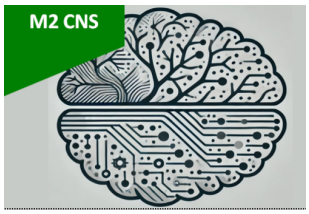
Project summary : *5-10 lines*

This project is integrated within the framework of the ANR-funded SEIZUZE project.

Localizing the epileptogenic zone—the brain region responsible for epileptic seizures—is a critical step in the pre-surgical evaluation of drug-resistant patients. Magnetoencephalography (MEG) is a promising non-invasive method to identify these epileptic foci, particularly through the detection and localization of interictal "spikes."This internship aims to compare the effectiveness of three approaches for detecting and localizing epileptic foci using interictal MEG data from a database of over 50 patients assessed in a clinical setting:

- Automated AI Approach: Spike detection using artificial intelligence models developed by the team (deep convolutional networks, transformers), followed by source localization using inverse modeling.
- Semi-Automated Approach: Manual validation of homogeneous spike clusters detected by AI, followed by source localization.
- Manual Approach: Expert visual detection of spikes, followed by source localization.

Please send your proposal to matteo.divolo@univ-lyon1.fr for publication on the Master of Neuroscience website.



Ground truth for focus localization will be based on available clinical data (invasive investigations, MRI, surgery, etc.).

Related publications :

P Mouches, T Dejean, J Jung, R Bouet, C Lartizien, R Quentin Time CNN and Graph Convolution Network for Epileptic Spike Detection in MEG Data 2024 IEEE International Symposium on Biomedical Imaging (ISBI), 2024•ieeexplore.ieee.org

Zotova D, Pinon N, Trombetta R, Bouet R, Jung J, Lartizien C. GAN-based synthetic FDG PET images from T1 brain MRI can serve to improve performance of deep unsupervised anomaly detection models. Comput Methods Programs Biomed. 2025 Jun;265:108727.

Bouet R, Mauguière F, Daligault S, Isnard J, Guenot M, Bertrand O, Jung J. The relationship between morphological lesion, magnetic source imaging, and intracranial stereo-electroencephalography in focal cortical dysplasia. Neuroimage Clin. 2017 Apr 20;15:71-79.

Jung J, Bouet R, Delpuech C, Ryvlin P, Isnard J, Guenot M, Bertrand O, Hammers A, Mauguière F. The value of magnetoencephalography for seizure-onset zone localization in magnetic resonance imaging-negative partial epilepsy. Brain. 2013 Oct;136(Pt 10):3176-86.