

MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2025-2026

(internship from January to June 2026)

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

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

Internship supervisors :

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

Project summary :

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

Despite ongoing therapeutic advances, epilepsy is considered to be resistant to drug treatment in around 30% of patients. In these patients with drug-resistant partial epilepsy, surgical treatment may aim to remove the brain area causing the seizures. This is currently the only treatment that can lead to a cure for epilepsy, which is achieved in around 65% of patients who undergo surgery. The aim of this internship is to better predict the chances of success of surgery using clinical and imaging data from epilepsy patients.

This course comprises several stages:

- Recognizing and segmenting (using ITKsnap) lesions on patients' preoperative brain MRI scans.
- Segment the areas of surgical excision with the help of patients' operative reports, in order to establish precisely which brain structures have been removed.
- Retrieve patients' pre- and post-operative clinical data, already collected prospectively in an Excel file by neurologists in the Functional Neurology and Epileptology Department. However, missing data may need to be retrieved, especially concerning the outcome of patients after surgery.
- Finally, to familiarize ourselves with artificial intelligence tools applied to imaging and clinical data in order to find predictive factors for surgical success.

3-5 recent 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.

Alaverdyan Z, Jung J, Bouet R, Lartizien C. Regularized siamese neural network for unsupervised outlier detection on brain multiparametric magnetic resonance imaging: Application to epilepsy lesion screening. Med Image Anal. 2020 Feb;60:101618.

Haegelen C, Perucca P, Châtillon CE, Andrade-Valença L, Zelmann R, Jacobs J, Collins DL, Dubeau F, Olivier A, Gotman J. High-frequency oscillations, extent of surgical resection, and surgical outcome in drug-resistant focal epilepsy. Epilepsia. 2013 May;54(5):848-57.