

phd Lyon/San Francisco

MR Spectroscopy signal analysis with deep learning

Lyon / San Francisco collaboration

The PhD will be carried out in Lyon, France www.creatis.insa-lyon.fr and San Francisco, USA lilabimaging.ucsf.edu.

Context:

Magnetic resonance spectroscopy (MRS) has demonstrated its potential to understand major metabolic and neuronal pathways involved in brain disease. However, the analysis of spectra is confronted with a lack of robustness, objectification and automation. Deep learning will offer an analysis that is not subject modeling bias. **However, the impossibility to get the ground truth from real invivo MRS acquisition prevent the use of supervised deep learning.**

Project description

The project proposes to leverage the latest methodological developments in **deep generative, regression and classification models** for the analysis of invivo NMR spectra from tumor patients.

As some parameters have no real ground truth, networks should be trained **unsupervised, weakly supervised or semi-supervised**.

To avoid the pitfalls of overfitting associated with the sole use of simulated data, unsupervised techniques based on **generative score-based models/diffusion models**, will be developed. We will also develop dedicated **domain adaptation** methods using simulated data with ground truth and real non-annotated data. This work will also build on recent advances in probabilistic scattering models, and propose an **hybrid AI to incorporate physical properties/parameters** into scattering and inversion processes.

Application

- Background: applied mathematics, machine/deep learning or signal processing
- Good software development skills (ideally with python/pytorch)
- Taste for working in a highly multidisciplinary environment (DL, MRI physics, medical applications)

Applications (CV, transcript, recommendations,...) should be sent to michael.sdika@creatis.insa-lyon.fr and helene.ratiney@creatis.insa-lyon.fr

More details here:

<https://www.creatis.insa-lyon.fr/site/en/recrutement/phd-lyonsan-francisco-magnetic-resonance-spectroscopy-signal-analysis-deep-learning>

You can also meet me here at MICCAI !

