

## PhD Position Lyon/San Francisco

# Deep Learning for MR Spectroscopy Analysis in Gliomas

### Lyon / San Francisco collaboration

The PhD will be carried out partly at the CREATIS laboratory in Lyon [www.creatis.insa-lyon.fr](http://www.creatis.insa-lyon.fr) and partly at Yan Li's laboratory at the University of California San Francisco <https://lilabimaging.ucsf.edu> as part of an international thesis co-direction. This thesis project is co-funded by the graduate school medical device (<https://graduate-plus.fr/en/medical-device-engineering-2/mde-call-for-project-phd-scholarship/>) and UCSF.

### 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. Nevertheless, **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](mailto:michael.sdika@creatis.insa-lyon.fr) and [helene.ratney@creatis.insa-lyon.fr](mailto:helene.ratney@creatis.insa-lyon.fr) and [yan.li@ucsf.edu](mailto:yan.li@ucsf.edu)

### More details here:

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

