Two PhD student positions

Magnetic Resonance Imaging of the brain & heart

Two PhD student positions are available jointly hosted by the Lausanne University Hospital (CHUV) and the University of Lausanne, Switzerland. These positions are part of a new research initiative aimed at developing cutting-edge Magnetic Resonance Imaging (MRI) technologies for applications in brain and heart imaging.

Project description: Recent technological and scientific advances have enabled the use of MRI to measure microscopic properties of soft body tissues, such as fiber myelination and intracellular volume. Because MRI is non-invasive, these developments have paved the way for monitoring *in vivo* microscopic disease-related changes in patients affected by e.g. Multiple Sclerosis or myocardial iron overload. However, further methodological improvements are needed to enable MRI-based markers of disease progression.

This research initiative aims to enable the robust assessment of microscopic tissue properties of the brain and heart using MRI data. To achieve this goal, two interdependent doctoral research projects are planned:

(i) **Project I** will focus on the development of MRI data acquisition strategies that maximize the quality of images acquired across a large range of echo times. Both Cartesian and radial sampling trajectories will be explored and optimized to meet the specific requirements of brain and heart imaging. The optimization will be conducted using both classical principles of data sampling as well as AI techniques.

(ii) **Project II**, building on the acquisition strategies developed in Track I, will center on the design of advanced image reconstruction methods to further enhance image quality. This will involve the investigation of model-based compressed sensing and AI techniques, tailored specifically for applications in brain and heart imaging.

Successful completion of this research initiative will require close integration of the data acquisition and image reconstruction strategies developed in Projects I and II. Therefore, the two recruited PhD candidates will be required to work in close collaboration.

Main supervisors

Project I

Name: Antoine Lutti
Affiliation: Laboratory for Neuroimaging Research, Department of Clinical Neuroscience, University Hospital (CHUV) and University of Lausanne (UNIL), Switzerland
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Project II

Scientific co-supervisor: Dr Jérôme Yerly
Official (main) supervisor: Prof. Matthias Stuber
Affiliation: CIBM MRI CHUV UNIL, Center for Biomedical Imaging (CIBM) and Department of Diagnostic and Interventional Radiology, University Hospital (CHUV) and University of Lausanne (UNIL), Switzerland
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Dr Antoine Lutti is an MRI physicist specializing in the development of data acquisition technologies for neuroscience applications. His research focuses on creating markers of brain tissue derived from MRI data that enable the investigation of microscopic pathological changes associated with neurological

diseases. Improving image quality by mitigating artifacts caused by factors such as head motion and physiological noise is another active area of his research.

Dr Jérôme Yerly is an MRI engineer specializing in the development of advanced acquisition and reconstruction technologies for cardiac MR imaging. His research aims to mitigate physiological motion and harness multidimensional data to reconstruct highly undersampled images of the heart with both high spatial and temporal resolution. A central goal of his work is to translate these cutting-edge technologies from benchmark settings to clinical practice, with a strong emphasis on simplifying the complex cardiac MRI workflow to make it more accessible and time-efficient for routine use.

Environment

The post-holders will be closely integrated with the other members of the LREN lab in the Department of Clinical Neuroscience and the Translational MR research lab in the Department of Diagnostic (Project I) and Interventional Radiology (project II), fostering a stimulating inter-disciplinary environment for scientific exchange. They will have access to the MRI facilities of the Center for Biomedical Imaging (CIBM), which include a Siemens 3T Prisma MRI scanner and a low-field Siemens 0.55 T Free.Max MRI scanner.

Salary

This project is funded by the Swiss National Science Foundation (SNSF CR00I5-235940) for a total duration of 48 months. Salaries will be in compliance with the guidelines of the SNSF and the University of Lausanne.

Entry requirements

Applicants must have completed a Masters degree in physics, mathematics, biomedical engineering, or a comparable subject. Strong programming skills (e.g. C++, MATLAB) are required. Previous experience with MRI is a plus. Candidates should be fluent in spoken and written English, French a plus. Candidates short-listed for an interview may be required to give a presentation about their academic training or previous research experience.

Application procedures

Application procedures: Application is by CV and motivation letter, including two referees' contact details, emailed to: antoine.lutti@chuv.ch and Jerome.Yerly@chuv.ch. The position will remain open until a suitable candidate is found.

About CIBM

The CIBM Center for Biomedical Imaging was founded in 2004 and is the result of a major research and teaching initiative of the partners in the Science-Vie-Société (SVS) project between the Ecole polytechnique fédérale de Lausanne (EPFL), the Université de Lausanne (UNIL), Université de Genève (UNIGE), the Hôpitaux Universitaires de Genève (HUG) and the Centre Hospitalier Universitaire Vaudois (CHUV), with the generous support from the Fondation Leenaards and Fondation Louis-Jeantet.
CIBM brings together highly qualified, diverse, complementary and multidisciplinary groups of people with common interest in biomedical imaging.
We welcome you in joining the CIBM Community.