

Master Student Project / Internship

Imaging neural activity underlying lower limb movements using the MRI-compatible stepping robot MARCOS-II

Vitznau, 100%, 3-6 months (flexible), flexible start date

The Lake Lucerne Institute (ex-cereneo Foundation) is a non-profit research centre with a research focus on developing and implementing technological solutions to improve neurorehabilitation outcomes. We work on digital, objective assessment solutions using a broad range of tools (fMRI, EEG, neurophysiology, movement analysis, robotics) and their implementation into clinical routine. The foundation works closely with a neurorehabilitation centre to ensure true multi-stakeholder integration within each research project.

To support our ongoing research projects, we are looking for a Master student or Intern with enthusiasm for human movement data collection and analysis, data mining, and machine learning approaches. We are passionate about bringing innovation to the field in neurorehabilitation, and you should equally bring a strong drive to work on real-world projects that have a direct impact on patients' rehabilitation experience.

Project Background

Functional magnetic resonance imaging (fMRI) is able to measure dynamic brain activity in humans. However, assessing the cerebral control of lower limb movements is challenging, and robotic systems that do not interfere the imaging process are required to carefully monitor active and passive lower limb movements in the MRI. Our institute has acquired the MRI-compatible stepping robot MARCOS-II developed at ETH Zurich (for further information: <https://sms.hest.ethz.ch/research/past-research-projects/mri-compatible-robotics.html>). This robot is unique in its capabilities world-wide and enables to assess neural activity underlying lower limb movements in an unprecedented manner. We are particularly interested how the neural motor networks reorganize over the course of rehabilitation training and whether these adaptations allow to guide clinicians in determining the most effective rehabilitation strategies tailored to individual patients.

Responsibilities

This master's project/internship includes the following tasks:

- Set up the MRI-compatible stepping robot in the MRI environment
- Establish communication between control PC and xPC target computer (Simulink Real-Time System)
- Adapt/develop MATLAB Simulink models controlling the robot
- Test stepping robot functionality in the MRI environment
- Conduct fMRI measurements with stepping robot
- *Optional (depending on progress and interests):*
 - Analyse fMRI data
 - Design and program a behavioral experiment ("game") to assess lower limb movements

Your Profile

- Background in biomechanical engineering, robotics, mechatronics or related field
- Strong programming skills, preferably in MATLAB
- Experience in signal processing
- Understanding of MATLAB Simulink models
- Hands-on person; enthusiastic, curious mind, capable of working independently

We offer

- A unique and stimulating work environment combining world-class neurorehabilitation practice with cutting edge research
- Exciting technology platforms including an MRI facility, robotics systems for state-of-the-art motor learning paradigms, mobile brain imaging systems and movement sensor systems, neuromodulation lab, movement lab (immersive virtual reality with 6D motion platform and motion capture), computer vision lab, GPU compute clusters
- Direct exposure and deep integration with a clinical research environment, incorporating a wide range of practitioners and patients
- Free on-site accommodation and parking in Vitznau, Switzerland

Curious? So are we!

To apply please send a cover letter outlining your motivation and experience in the field, CV and a transcript of records to L.marchalcespo@tudelft.nl and chris.awai@cereneo.foundation. Questions regarding the position should also be directed to these contacts.

Further information about the Lake Lucerne Institute can be found at: www.llui.org.