MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG

MAX-PLANCK-INSTITUT
FÜR KOGNITIONS- UND NEUROWISSENSCHAFTEN

Call for applications

Master's Thesis Research Student (m,f,d)

Patient-specific transcranial ultrasonic neurostimulation (field modeling & validation)

BACKGROUND

We are offering a jointly supervised Master's thesis at the interface of ultrasonics, brain stimulation technologies and human neuroimaging. The project lays the groundwork to identify optimal targeting practices for future human transcranial focused ultrasound (TUS) studies using a 256-element 2D matrix array.

PROJECT

The goal is to build and validate a practical characterization pipeline for our TUS system to support human neuromodulation studies. Work focuses on (i) verifying transducer ouput and beam quality across depths, steering angles and drive parameters; (ii) modeling and experimentally testing ultrasound transmission through ex-vivo skulls; and (iii) benchmarking imaging inputs for simulation by comparing micro-CT with MR-based pseudo-CT scans. Insights will be used to refine phase-aberration correction and safety analyses and translate them into robust targeting recommendations.

WHAT YOU WILL GAIN

Hands-on experience in ultrasonic field mapping and skull-phantom experiments, ultrasound field simulation and beamforming (e.g., Python/MATLAB), and (potentially) MR-based verification. You will work within two institutes and contribute directly to a translational TUS pipeline.

YOUR PROFILE

- Enrolled in a Master's program in (Medical) Physics, Biomedical/Electrical/Mechanical Engineering, Computer Science or a related field.
- Comfortable with Python and/or MATLAB; interest in numerical simulation and data analysis.
- Bonus: Experience with lab instrumentation, signal processing or MRI welcome but not required.
- Proactive, organized, and keen to work in an interdisciplinary team across two institutes.

SUPERVISION & SETTING

The project will take place at Martin Luther University Halle-Wittenberg (Research Group Medical Physics, PIs: Dr. Thomas Kirchner, Prof. Dr. Jan Laufer) and at MPI CBS (Department of Neurology). Time will be spent at both sites and partial remote work is possible. You will be directly supervised by Dr. Thomas Kirchner (MLU) and Niklas Kroner-Weigl (MPI CBS).

START DATE & DURATION

Flexible (as soon as possible). Duration of 9-12 months.

HOW TO APPLY

Send your CV, a transcript, and a brief motivation statement of max. 2000 characters to both:

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Responsible Scientist: Professor Dr. Arno Villringer