UMM
UNIVERSITÄTSMEDIZIN
MANNHEIM

Medizinische Fakultät Mannheim
der Universität Heidelberg

Universitätsklinikum Mannheim

Master Thesis in Preclinical Sodium MRI

Institution: Computer Assisted Clinical Medicine, Heidelberg University, Germany
Start date: flexible
Duration: 6-12 months

Profile:
Applicants will be M.Sc. candidates in physics, computer science, mathematics, biomedical engineering or a related field; basic knowledge of a programming language is required; willingness to learn programming languages such as MATLAB and C++ as well as an affinity towards practical measurements are expected; basic knowledge of MRI physics is a plus.

Project Description:
Sodium ions are decisive for energy-consuming processes of membrane transport (Na-K-ATPase) and for the balancing charges of tissue anionic macromolecules. Sodium MRI is a sensitive biomarker for tissue viability, cellular metabolism and pathological changes but suffers from an around 12000 times smaller signal-to-noise ratio compared to the standard hydrogen MRI. As a spin 3/2 nuclei, sodium MRI enables the measurement of multi-quantum coherences. These coherences are created during the interaction of sodium ions with macromolecules (e.g. proteins) resulting in an intracellular sensitivity. During the Master thesis, the candidate will develop a new MR sequence designed for multi-quantum studies. Evaluations will be performed in phantoms and in vivo measurements on a preclinical 9.4 T MRI scanner. The Master project can be executed in German or English.

Working Environment:
Our group is composed of more than thirty scientists from physics, electrical engineering, medicine and computer science and is working in close co-operation with the local medical departments. We are developing new imaging techniques and translate them with our clinical partners into daily practice. In particular, we are doing basic research on the development of novel MR-techniques for measuring perfusion, diffusion, BOLD + oxygenation, and sodium in the human brain or other organs like lung, liver or heart. Tasks include the implementation of novel MRI techniques at whole body MRI systems (Siemens) at different field strengths (3x 1.5 Tesla; 2x 3.0 Tesla) with transfer to a small bore animal system 9.4 T (Bruker) for mice and rats. Beside this we are developing molecular innovative imaging technologies by fusion of several imaging modalities (CT, MRI, PET) to enable image-guided, high-precision interventions using high-end CT and robotic systems (ZEEGO, Siemens). Ongoing collaborations with other researchers involve the Central Institute of Mental Health (ZI, Mannheim), the German Cancer Research Centre (DKFZ, Heidelberg), and across Europe with multiple opportunities to visit leading international laboratories and to attend taught schools.

Interested?
If you enjoy working in an interdisciplinary, young, creative and open team, we are looking forward to your application! For more information on the project or for application please contact:

Project leader:

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