UNIVERSITÄTS KLINIKUM jena

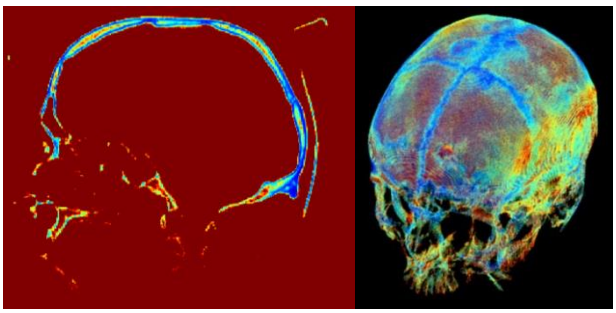
# Master Thesis

## *„Relaxation Parameter Mapping in the Human Skull using Ultra-Short Echo-Time MRI"*

### Project description

By using ultra-short echo-time (UTE) magnetic resonance imaging (MRI) sequences tissues, which are otherwise not visible due to very short $T_2$* relaxation times, can be directly imaged. One prominent example of such tissues is the compact bone of the human skull. By using state-of-the-art UTE imaging sequences, it has not only become possible to make the skull visible but also to quantify various parameters within the skull, while at the time avoiding ionizing radiation as associated with typically applied CT scans.

The aim of the project is to quantify and map the $T_1$ and $T_2$* relaxation time parameters of the skull (see figure below). For this purpose, multi-parametric images will be acquired and analyzed by using sophisticated mathematical models. The project will also investigate if multi-compartment effects arising, for example, from the presence of fat- and water-containing tissues within the same voxels can be modeled, separated and quantified.



### Place of work

Medical Physics Group
Institute for Diagnostic and Interventional Radiology
University Hospital Jena
Philosophenweg 3
07743 Jena
www.mrt.uni-jena.de

### Your profile

- B.Sc degree in physics, computer science, mathematics, biomedical engineering or related fields
- Interest in medical imaging and image reconstruction, processing and analysis
- Strong MATLAB programming skills
- Ability to study scientific literature

### Working environment

The Medical Physics Group at the Institute for Diagnostic and Interventional Radiology (IDIR) at the University Hospital Jena conducts interdisciplinary research in tomographic imaging methods, especially MRI. The group consists of a multi-disciplinary team of ambitious young scientists from the fields of physics, engineering and biology. The aim of our research activities is the development and provision of new methods to qualitatively and, where possible, quantitatively assess morphologic and functional parameters and thereby contribute to improved diagnostics and therapy.

You will be working at our MRI research center with a state-of-the-art 3T whole-body clinical MRI system and our high performance computation system. All required image reconstruction and analysis will be performed with an in-house developed MATLAB software framework that contains all tools to jump start your work in the field of magnetic resonance imaging.

The project is fully integrated in ongoing research projects.

### Project leader

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### Group leader

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