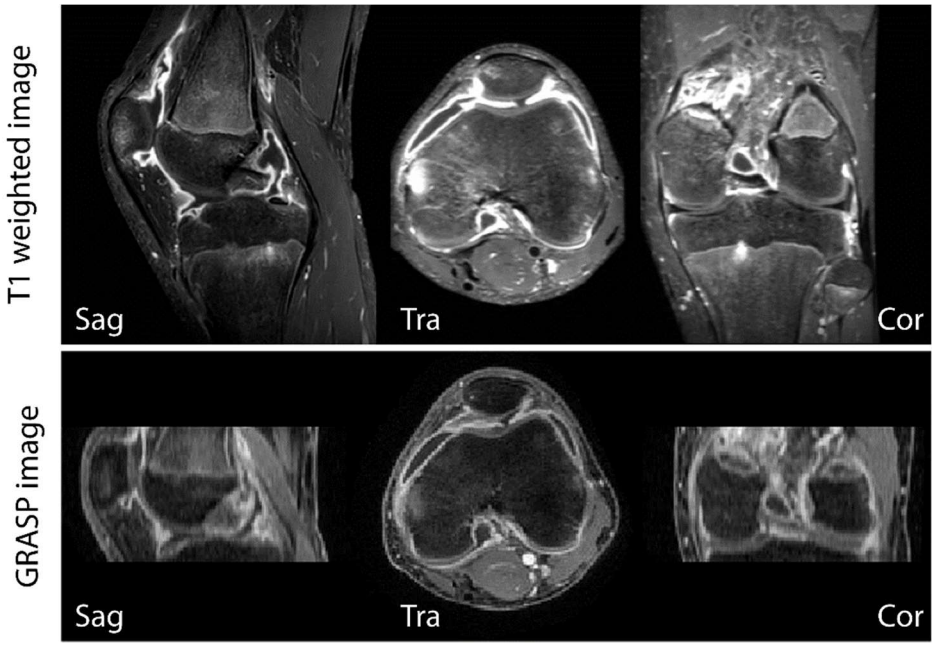
Greatly accelerating dynamic contrast enhanced MRI reconstruction

Dynamic contrast enhanced (DCE) MRI is a MRI technique that allows generating maps of the local perfusion in a patient. For DCE, patients receive an intravenous injection of contrast agent (often gadolinium-based) during continuous MRI acquisition. By continuously acquiring images, the distribution of the contrast agent within the patient can be studied. By modelling the observed dynamics of the contrast agent distributing in tissue, tissue perfusion and capillary permeability can be quantified. Blood vessels in tumours exhibit a disordered structure, with high dilation and permeability, which can be studied with DCE MRI and parameters related to tumour hypoxia can be investigated.

In DCE, there is a trade-off between temporal and spatial resolution of the acquired images. Clinicians often prefer assessing high resolution images of a certain contrast enhancement phase. This requires long (20+ seconds) acquisitions and results in high-quality images. However, the long acquisition prevents accurate studying of contrast agent dynamics necessary for quantitative modelling and generation of the perfusion maps, which requires high temporal resolution (~3 seconds). However, this, in turn, comes at the price of poor image quality.

In our lab, we now acquire DCE in such a way that we can generate both high-resolution slow images, and low resolution fast images from the same data. The pipeline for analyzing this data, however, is far from trivial. **In this project, the candidate will work on improving this reconstruction pipeline and investigating the optimal parameters for reconstruction.**



Requirements

We are looking for Bachelor and Master students with a technical background (e.g. Technical Medicine, Medical sciences, Computational sciences, Physics, Mathematics) with an interest in medical imaging. Experience with programming (preferably in Matlab) is strongly desired.

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Learning goals

Next to general programming and research skills, the student will gain a in depth understanding of MRI physics and data processing. **Depending on the length of the project and the results, we will aim at getting the work published by the end of the project, particular for 1-year projects.**

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