

Doctoral Candidate 5 - Robust DL Models for Accelerated Multi-Contrast MRI Reconstruction from Nonuniform k-space Data

Host Institution	Ghent University, Belgium
PhD enrolment	Ghent University, Belgium
Primary Supervisor	Prof. dr. Aleksandra Pizurica, Group for Artificial Intelligence and Sparse Modelling
Subject area	Geometric Deep Learning models; graph neural networks, multi-contrast MRI acquisition and image formation principles

About this doctoral project and your tasks

This project aims to address the challenge of improving the **reliability of Deep Learning (DL) methods** for accelerated multi-contrast MRI reconstruction. The focus will be on model-aware DL approaches that incorporate knowledge about the underlying MRI physics into the learning framework to enhance interpretability, robustness, and generalization. Geometric deep learning, particularly **Graph Neural Networks**, will be explored to enable more efficient, non-Cartesian subsampling of the spatial frequency space (k-space) and to leverage non-local similarities during image reconstruction. Performance will be maximized through the **joint optimization of sampling trajectories and reconstruction** in an end-to-end DL framework.

Your tasks will include :

- Acquiring expertise on **MRI reconstruction** and staying updated on its advancements through scientific literature and collaboration with IQ-BRAIN project partners.
- Developing an **advanced deep learning approach** for accelerated reconstruction of multi-contrast MRI images based on graph neural networks and self-supervised learning.
- Publishing your high-quality research in top journals and conferences in the field.
- Engaging with and supporting the research and (limited) teaching activities in the research group.

Foreseen secondments

For this project, we foresee secondments to:

- Prof. Dr. Jan Sijbers and Prof. Dr. Marleen Verhoye (6 months) at **University of Antwerp** (Belgium)
- Dr. Sascha Koehler (6 months) at **Bruker Biospin**, Germany

