Doctoral Candidate 3 - Implementation of efficient simultaneous T2 and diffusion brain mapping

Host Institution	Instituto Superior Técnico, Portugal
PhD enrolment	Instituto Superior Técnico, Portugal
Primary Supervisor	Prof. Rita G. Nunes, LASEEB
Subject area	Design and practical implementation of MRI pulse sequences; development of image reconstruction and parametric estimation algorithms

About this doctoral project and your tasks

Recently, **multi-compartment qMRI models** such as the diffusion tensor including free water elimination (*Samani et al., Sci Rep 11(1), 2021*) and multi-component T2 relaxometry (*Bontempi et al., Front Oncol 11, 2021*) have shown promising results in the characterization of brain tumours and microscopic infiltration in peritumoral regions. A remaining challenge with such models is fitting degeneracy: depending on noise, different solutions for the component fractions may be found corresponding to very different clinical interpretations. To address this issue, you will implement a methodology to enable **simultaneous relaxometry and diffusion mapping**. To keep scanning times clinically feasible, **highly accelerated acquisitions** will be implemented by exploring multi-channel coil information, efficient k-space sampling, low-rank assumptions and model-based Deep Learning estimation approaches.

Your tasks will include:

- Carrying out independent PhD research on the topic proposed.
- Publishing your high-quality research in international journals and conference proceedings.
- Collaborating with IQ-BRAIN project partners as well as local experts for your project.
- Engaging with and further supporting the research and (limited) teaching activities in the lab.

Foreseen secondments

For this project, we foresee secondments to:

- Prof. Jan Sijbers (3 months) at the **University of Antwerp** (Belgium)
- Prof. Dirk Poot (3 months) at **Erasmus MC** (The Netherlands)
- Dr. Thomas Janssens (2 months) at **Siemens Healthineers** (Belgium)

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