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)

About the host institution and research group

LaSEEB is a research lab within **ISR-Lisboa at Instituto Superior Técnico**, the engineering school of the University of Lisbon. The lab is dedicated to research in biomedical systems and engineering, including Magnetic Resonance Imaging methodology with a focus on developing new acquisition and image processing strategies. Current efforts concentrate on creating **MRI pulse sequences** using

open-source programming tools, as well as **deep learning tools** for image reconstruction, segmentation and quantitative MRI estimation approaches for diffusion, relaxometry (T1, T2) and perfusion imaging. Applications include brain, cartilage and cardiac imaging.

About the offer

- The selected candidate will be employed by Instituto Superior Técnico for **36 months** on the MSCA-DN project. In line with university regulations and following a positive evaluation by the doctoral committee, IST may provide additional funding for a maximum of 12 months to complete the doctoral degree.
- Doctoral candidates are offered a **competitive remuneration** based on the MSCA allowances and the regulations of the host institution. The gross PhD salary at IST will be 1,724.97€. Moreover, funding is available for technical and personal skills training and participation in international research events.
- **Expected start date**: between April and September 2025. We encourage last-year master students who will graduate by this time to already apply.

More information is available in the general information document for IQ-BRAIN positions.

Specific profile and requirements

- Your profile aligns with the **general requirements and eligibility criteria** of the IQ-BRAIN project.
- You have a master's degree in **biomedical engineering, physics, computer science or related fields** (or will have by the time of your appointment).
- Background in **magnetic resonance imaging (MRI) and/or scientific computing** is appreciated.
- **Python or Matlab** programming experience is preferential.

More information

For additional information about the research project, contact:

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