

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

<b>Host Institution</b>	Instituto Superior Técnico, Portugal
<b>PhD enrolment</b>	Instituto Superior Técnico, Portugal
<b>Primary Supervisor</b>	Prof. Rita G. Nunes, LASEEB
<b>Subject area</b>	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.

### How to apply

All applications must be submitted via the **IQ-BRAIN job platform**:  
<https://www.uantwerpen.be/en/projects/iq-brain/jobopenings/apply/>.

**Deadline for applications: 1 December, 23:59.** More information about the application procedure is available in the [general information document](#) for IQ-BRAIN positions.

### More information

For additional information about the research project, contact:

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