Doctoral Candidate 8 - Developing a Deep learning-based qMRI method for multi-TE arterial spin labelling MRI

Host Institution	University of Antwerp, Belgium
PhD enrolment	University of Antwerp, Belgium
Primary Supervisor	Prof. dr. Jan Sijbers, imec-Vision Lab
Subject area	Image modelling, acquisition and processing, physics-informed Deep Learning

About this doctoral project and your tasks

You will develop a novel physics-informed deep learning (DL) framework for the estimation of perfusion parameter maps from **under-sampled multi echo-time arterial spin labelling (ASL)** MRI images. These maps can be used to study the permeability of the blood-brain barrier, which is a promising candidate biomarker for early prediction of age-related cognitive decline or neurological diseases. **The framework will leverage** 1) deep image priors to improve the trade-off in quality versus scan-time in quantitative ASL; 2) intra-scan motion to increase the spatial resolution of the perfusion parameter maps; 3) uncertainty quantification of perfusion parameter maps.

Your tasks will include:

- Starting from a profound literature search, staying up-to-date on the state-of-the-art on **ASL perfusion MRI** throughout the PhD trajectory.
- Developing a **forward model** that describes the dependency of the measured ASL images on the perfusion parameters and acquisition settings and accounts for intra-scan motion.
- Developing, training and testing a **physics-informed neural network** for motion-compensated perfusion mapping from under-sampled ASL images, thereby exploring recently emerging deep learning strategies.
- Quantifying the **uncertainty** of the estimated perfusion parameter maps.
- Developing a strategy for **optimal experiment design**.
- Testing the framework on **(pre)clinical MRI scanners**.

Foreseen secondments

For this project, we foresee secondments to:

- Prof. Matthan Caan (3 months) at **Amsterdam UMC** (The Netherlands)
- Prof. Patricia Figuieredo (2 months) at **Instituto Superior Téchnico** (Portugal)

About the host institution and research group

The **University of Antwerp** is a dynamic, forward-thinking university in the second largest city in Belgium. We offer an innovative academic education to more than 20000 students, conduct pioneering scientific research and play an important service-providing role in society. With more than 6000 employees from 100 different countries, we are helping to build tomorrow's world every day.

Imec-Vision Lab is a research group of the Physics department at the University of Antwerp. The Vision Lab has unique expertise in **reconstruction, processing and analysis of imaging data**. The working environment is strongly interdisciplinary, combining techniques and insights from Physics, Engineering, Mathematics and Computer Science. The group has a broad range of national and international collaborations with both academic and industrial partners. More details on Vision Lab's research are available at http://visielab.uantwerpen.be.

About the offer

- The selected candidate will be employed by University of Antwerp for **36 months** on the MSCA-DN project. In line with university regulations and following a positive evaluation by the doctoral committee, University of Antwerp 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 monthly amount at University of Antwerp corresponds to the amount for doctoral scholarship holders. 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 **physics, computer science, mathematics, biomedical engineering, or related field** (or will have by the time of your appointment).
- Background in **scientific computing and/or magnetic resonance imaging (MRI)** is appreciated.
- You are proficient in at least one **programming language**.

More information

For additional information about the research project, please contact:

Prof. Dr. Jan Sijbers
jan.sijbers@uantwerpen.be

or

Dr. ir. Arjan den Dekker
arjan.dendekker@uantwerpen.be