

## Doctoral Candidate 1 - Intra-scan modulation with model-guided AI for accelerated diffusion MRI

<b>Host Institution</b>	University of Antwerp, Belgium
<b>PhD enrolment</b>	University of Antwerp, Belgium
<b>Primary Supervisor</b>	Prof. dr. Jan Sijbers, imec-Vision Lab
<b>Subject area</b>	MR sequence design, simulations and modelling, parameter estimation, physics-informed Deep Learning

### About this doctoral project and your tasks

You will develop a **physics-informed AI-supported framework** for the direct estimation of diffusion parameter maps from multi-shot diffusion weighted MRI data, of which each shot (k-space trajectory) is encoded with a different diffusion weighting ( $q$ ). The framework will merge the advantages of both **data-driven and physical model-based** methods, thereby exploring recently emerging physics-aware deep learning strategies such as the hybrid (quantitative) Recurrent Inference Machine. Finally, the acquisition settings of the framework will be optimized to allow parameter estimation with minimal quantified uncertainty.

#### Your tasks will include:

- Following the state-of-the-art on **quantitative diffusion MRI** and staying up-to-date with scientific literature on quantitative diffusion MRI throughout the PhD trajectory.
- Developing a **forward model** that describes the dependency of the measured k-q space on the diffusion parameters and acquisition settings and accounts for inter-shot motion.
- Developing, training and testing a **physics-informed neural network (PINN)** for direct, motion-compensated diffusion mapping from intra-scan modulated multi-shot k-q space data.
- Quantifying the **uncertainty** of the estimated diffusion parameter maps.
- Developing a strategy for **optimal experiment design**.
- Testing the network on **(pre)clinical MRI scanners**.

### Foreseen secondments

For this project, we foresee secondments to:

- Prof. dr. Julia Schnabel (2 months) at **Helmholtz Munich** (Germany)
- Prof. dr. 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

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 the 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](mailto:jan.sijbers@uantwerpen.be)

or

**Dr. ir. Arjan den Dekker**  
[arjan.dendekker@uantwerpen.be](mailto:arjan.dendekker@uantwerpen.be)