

Doctoral Candidate 9 - Unsupervised uncertainty prediction for trustworthy and unbiased qMRI

Host Institution	Helmholtz Munich, Germany
PhD enrolment	Technische Universität Munich, Germany
Primary Supervisor	Prof. dr. Julia Schnabel, Institute of Machine Learning in Biomedical Imaging
Subject area	Advanced machine learning, image reconstruction, uncertainty quantification, trustworthy AI

About this doctoral project and your tasks

You will address the issue of **diagnostic uncertainty** related to the variability of quantitative magnetic resonance (qMR) image acquisition, reconstruction, and/or expert labeling, and mitigate inherent biases related to the data and learning process within deep learning (DL) frameworks, in order to **increase their trustworthiness**.

Using **qMRI physics-based simulations**, combined with population-derived data biases e.g. due to scanner types, age or gender, DL models for disease classification or quantification (e.g. segmentation) tasks will be trained for predicting measurement over/under-confidence, and further modulated (de-biased) at inference time, to increase their diagnostic accuracy and trustworthiness. As some uncertainty can be traced back to the raw k-space MR data, a feedback loop to the qMR reconstruction process will be developed, ultimately **improving the diagnostic qMR image quality and DL model generalization properties**, while keeping the human expert in the loop for inspection of residual diagnostic uncertainty.

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:

- Dr. Dirk Poot (2 months) at **Erasmus MC** (the Netherlands)
- Prof. dr. Jorge Cardoso (3 months) at **King's College London** (United Kingdom)
- Prof. dr. Rita Nunes (2 months) at **Instituto Superior Técnico** (Portugal)

About the host institution and research group

The **Institute of Machine Learning in Biomedical Imaging** at Helmholtz Munich, alongside the Chair for Computational Imaging and AI in Medicine, Technical University of Munich, focuses on **developing novel machine/deep learning methods for solving complex medical image computing tasks**, such as motion reconstruction, image quality control, image segmentation, registration and classification, for improved diagnostics and prognostics.



About the offer

- The selected candidate will be employed by Helmholtz Munich for **36 months** on the MSCA-DN project.
- Doctoral candidates are offered a **competitive remuneration** based on the MSCA allowances and the regulations of the host institution. Helmholtz Munich has received the following EU-grant to recruit a Doctoral Candidate (DC): monthly Living Allowance € 3.342; monthly Mobility Allowance € 600; and monthly Family Allowance € 660 (only if applicable). Please note that the final monthly, gross salary will result from deducting (from the mentioned amounts) all compulsory national labour taxes (social security, etc.) to be borne by the employer. 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 **computer science, mathematics, engineering, physics, or related field** (or will have by the time of your appointment).
- Background in **machine learning and/or magnetic resonance imaging (MRI)** is desirable.
- Interest in **interdisciplinary research and collaboration**.

More information

For additional information about the research project, contact:

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or

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