

The University of Queensland - IIT Delhi Academy of Research Joint PhD Project

PROJECT TITLE	EFFICIENT IMAGE ACQUISITION FOR LOW FIELD MRI.
PROJECT CODE	UQIDAR 00126
PROJECT DESCRIPTION	<p>Magnetic resonance imaging (MRI) is a powerful medical diagnostic tool that is beyond the reach of many patients throughout the world. Ultra Low Field (ULF) MRI is a less expensive technology with the potential to complement traditional MRI with new contrast mechanisms. At the Centre for Advanced Imaging, we are developing a low-cost, portable ULF MRI instrument based on dynamic permanent magnet arrays. An initial image acquisition sequence for the prototype has been developed, but it requires long acquisition times and has limited image resolution. Furthermore, ambient electromagnetic noise reduces image quality. The objective of the proposed project is to optimise the image acquisition sequence and ambient noise reduction strategy.</p> <p>The candidate will develop:</p> <ol style="list-style-type: none"> 1. An efficient spatial encoding sequence based on permanent magnets. Electromagnetic field simulations and MRI spin evolution simulation platforms will be employed. Numerical optimisation tools will be used to find an efficient combination of permanent magnet trajectories, pre-polarisation and radio frequency pulses. 2. A noise reduction strategy which improves image SNR by attenuating the ambient electromagnetic noise coupled into the MRI acquisitions using machine learning.
PROJECT OUTCOMES	The student is expected to design, develop, and implement an optimised ULF MRI 3D imaging sequence. The candidate will also improve image quality through attenuating ambient noise. The combination of both methods is expected to considerably reduce ULF MRI acquisition time towards clinically feasible timespans. The student will gain in-depth knowledge in state of the art machine learning algorithms, and further her/his insight in fields like magnetic resonance physics, image reconstruction and ultra-low noise electronics.
ADVISORY TEAM	<p>Professor David Reutens https://cai.centre.uq.edu.au d.reutens@uq.edu.au Centre for Advanced Imaging The University of Queensland</p> <p>Assistant Professor Anup Singh http://cbme.iitd.ac.in/content/dr-anup-singh Anup.Singh@cbme.iitd.ac.in Department of Biomedical Engineering Indian Institute of Technology Delhi</p>
TYPE OF STUDENT	Applications are open to i/a students who meet eligibility criteria . note: i-students must have own scholarship to apply (CSIR, UCG-NET, etc)
DISCIPLINE BACKGROUND OF STUDENT	Ideally, this project requires students with a background in electrical engineering, physics, biomedical engineering, computer science.

IDEAL
CANDIDATE

Essential capabilities:

- An understanding of MR physics
- Experience in inverse problems / image reconstruction

Desirable capabilities:

- Strong communication skills
- Experience with MATLAB and simulations

Expected qualifications (courses, degrees, etc):

- MSc. in Biomedical Engineering, MSc. in Electronic Engineering, MSc. in Computer Science and Physics.

APPLICATION
PROCESS

Apply online by the due date: <https://www.uqidar.org/students/how-to-apply/>