University of Leicester
AIM studentship project 2026

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Section 2 – *Project Information*

Project Title	Integrating Diffusion and 4D Flow MRI to Uncover Mechanistic Links Between Haemodynamic Stress and Myocardial Microstructure in Aortic Stenosis

Project Summary

This PhD project will use magnetic resonance imaging (MRI) techniques to investigate how abnormal blood flow and tissue remodelling interact in patients with aortic stenosis. In aortic stenosis, narrowing of the aortic valve produces turbulent blood flow and high stresses on the heart, leading to thickening, scarring, and changes in the heart muscle's microscopic structure. Valve replacement surgery restores blood flow, but recovery varies between patients.

This project is jointly led by the University of Nottingham and is part of an exciting collaboration between the University of Leicester and the University of Nottingham. The student will use two MRI methods: diffusion MRI, which maps organisation of heart fibres, and four-dimensional (4D) flow MRI, which measures blood flow patterns in the aorta. By studying patients before and after valve replacement, the project will explore how turbulent flow and microstructural changes are linked, and whether combined imaging measures can predict recovery.

Research will be conducted at both the University of Leicester and the University of Nottingham, where the student will gain experience in image acquisition, analysis, and modelling. The supervisory team includes academics from both universities, providing training in MRI physics, cardiovascular imaging, and translational research, with strong potential to improve healthcare.

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