Project Title:
Deciphering Oral Movements in Health and Disease using MRI Imaging and Computer Vision

Research Cluster:
Bioscience for Human Health

School:
School of Medicine, Sir Peter Mansfield Imaging Centre

Partner Organisation:
HALEON PLC

Project Description:
Oral health is vital for essential functions such as speech, chewing, and overall well-being, influencing both quality of life and health outcomes. However, current technologies for analysing oral movements are limited in accuracy, accessibility, and cost, leaving significant gaps in understanding and treatment. This project seeks to revolutionize the field by integrating Magnetic Resonance Imaging (MRI) with Artificial Intelligence (AI) and computer vision, focusing on the ground-breaking External-to-Internal Correlation Modelling (E2ICM). E2ICM is a cutting-edge AI approach that uses external facial signals to predict internal oral movements, transforming vocal tract modelling without requiring high-resolution MRI. The research is structured around four pivotal objectives: 1. **Developing advanced imaging tools** to capture real-time MRI data of oral movements with unprecedented precision. 2. **Creating innovative segmentation algorithms** to explore the interconnections within the oral cavity and vocal tract. 3. **Designing predictive AI-driven models** based on external observations for critical functions like speech and food oral processing (chewing). 4. **Integrating E2ICM and other AI technologies** into oral healthcare applications, paving the way for accessible and cost-effective solutions. This multidisciplinary project unites expertise in MRI, biomaterial characterization, computer vision, and machine learning with applications in biology, food science, and oral health. The research leverages cutting-edge resources from the Beacons for Precision Imaging and the Artificial Intelligence in the Biosciences Network.

By emphasising the transformative potential of AI, this project aims to advance oral healthcare, offering new tools for diagnostics, treatment, and personalised medicine. The cross-disciplinary approach ensures the student will gain extensive training in imaging techniques and AI methodologies, with exposure to dentistry, food sciences, and oral health. Industrial engagement through a placement at Haleon, UK will provide hands-on experience in project planning, steering activities, and outreach programs, bridging academic innovation with practical healthcare applications.

The project underscores the critical intersection of oral health and AI, highlighting how technological advancements can address unmet needs, improve accessibility, and deliver impactful healthcare solutions.

Applicants must have or should expect to obtain a 1st Class or 2:1 honours degree or distinction or high merit at MSc level (or international equivalents) in Physics, Chemistry, Computer Science or related discipline. Experience in biomaterials and in vitro cell culture will be beneficial.

Lead Supervisor:
Galina Pavlovskaya
Please email the lead supervisor to find out more about this project.
Terms & Conditions:
Home and international students are welcome to apply for this opportunity. Funding is available for four years from October 2025. The award covers tuition fee (£4,712) at the home rate plus an annual stipend which was (£19,273) for 2024. This is set by the Research Councils. Please note that successful international candidates will be put forward for a University Fees Difference Scholarship to cover the difference between the home and international fee. https://www.nottingham.ac.uk/bbdtp/apply/apply-online.aspx
Closing Date:
12 noon (UK time) 31 January 2025