Fully Funded PhD scholarship in Civil Engineering

Project Title:	An unsupervised data-driven framework for drive-by bridge monitoring		
School / Department:	School of Civil Engineering		
Location	Newstead Building, UCD, Dublin 4, Ireland		
Award Level	PhD	Position Type:	Full time
Supervisor	Prof. Eugene OBrien and Dr. Abdollah Malekjafarian	Start Date:	May 2026
Collaborators	Prof. Keith Worden (The University of Sheffield) and Dr. David Hester (Queen's University Belfast)		
Research Field:	Civil Engineering/ Structural Health Monitoring/ Structural Dynamics		
General enquiries Email:	abdollah.malekjafarian@ucd.ie		

SDA-Lab:

Structural Dynamics and Assessment Laboratory (SDA-Lab) is a research laboratory based in the School of Civil Engineering at University College Dublin and led by Dr. Abdollah Malekjafarian. The main focus of the research activities is on developing novel solutions for structural assessment of critical infrastructure such as offshore and onshore wind turbines, railway and highway bridges and railway tracks. We have a dynamic and active research group including PhD students and postdoctoral researchers from different backgrounds and with a diverse skills and capabilities.

About the project:

This PhD position is part of NETSENS, which is a research project funded by Research Ireland under the Frontiers for the Future call. Existing techniques for bridge inspection rely heavily on visual techniques – a person having a look. In recent years electronic monitoring is starting to happen, using sensors installed directly on the bridge. However, these methods are expensive and ineffective. NETSENS will develop "drive-by" bridge monitoring techniques, where sensors inside vehicles will indirectly infer bridge condition without the need to install anything on the bridge. This approach will provide a unique opportunity for infrastructure owners to perform a rapid assessment of all their bridge assets. It has the potential to greatly support decision-making regarding operation, maintenance, and repair of bridges.

PhD role description:

In this project, a novel drive-by and data-driven bridge anomaly detection framework will be developed.

This will include developing feature engineering for unsupervised learning using real-life experimental data to identify and extract condition-sensitive features from drive-by measurements. The PhD candidate will be looking for the features with systematic variation due to damage and least sensitivity to environmental and operational conditions. In addition, a novel cointegration algorithm will be developed to mitigate EOVs for drive-by bridge anomaly detection using multiple-vehicle passes. The data collected from the lab-scale model at different temperatures will be employed for the validation of the proposed approach for steel bridges. In addition, the data collected from experiments from a full-scale bridge in Joint Research Centre in Ispra, Italy will be used for the validation of the approach for concrete bridges.

Finally, the latest state-of-the-art approaches will be employed to develop an optimal threshold for unsupervised anomaly detection for drive-by bridge monitoring. This will be developed using the statistical distributions of the damage indexes developed, before and after implementing the concept of co-integration. The threshold will be set to achieve maximum detection accuracy and a minimum false alarm rate.

Essential qualifications/skills knowledge:

- Candidates must have an honours Level 8 degree in science or engineering or a related discipline.
- Good communication and writing skills.
- Good time management skills.
- Aptitude for multidisciplinary research approaches.
- Background in engineering (Civil Structural/Mechanical).
- Fluent in English. UCD Minimum English Language Requirements (http://www.ucd.ie/registry/admissions/elr.html)

Desirable qualifications/skills knowledge:

- Masters in Civil/Structural/Mechanical/Engineering or Computer Science with a strong research component or an exceptional undergraduate demonstrating research evidence
- A strong foundation in numerical and statistical methods for both anomaly detection and system identification for inverse problems
- Proficiency in programming languages (e.g. Matlab, Python, etc.)
- Knowledge of machine learning and data analysis methods, especially with deep learning models and various transfer learning techniques
- Background in structural dynamics and vibrations including experimental aspects and fieldwork.
- Academic writing skills.

Behavioural competencies:

- Ability to work as part of a team, including collaboration with other disciplines but also independently.
- Strives for high quality of work and demonstrates commitment to the project.
- Ability to communicate effectively to enable knowledge and technology transfer

Funding: The scholarship will be awarded for maximum period of 4 years and funding will cover the following elements:

- A stipend of €25,000 per annum
- Travel/ Consumables/Materials budget
- EU Tuition fees for 4 years (non-EU fees in exceptional circumstances)

How to apply: Applicants submit their applications by filling the following online form (**Applications received by email will not be considered**):

https://docs.google.com/forms/d/e/1FAIpQLScSU3XR72WTymAvZ4e7DGmllTrZDLeYW1tyZwqWPFk2U3-b-g/viewform?usp=header

Deadline: The application should be submitted no later than **30 Jan 2026.**