



Fully Funded PhD scholarship in Civil Engineering

Project Title:	A generalized data-drive framework for real-time condition monitoring of offshore wind turbines using transfer learning		
School / Department:	School of Civil Engineering		
Location	Newstead Building, UCD, Dublin 4, Ireland		
Award Level	PhD	Position Type:	Full time
Supervisor	Dr. Abdollah Malekjafarian	Start Date:	September 2023
Research Field:	Civil Engineering/ Wind Energy/ 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. For more information, visit <https://sdal.ucd.ie/>.

PhD role description:

In this project, a Structural Health Monitoring data analytics and interpretation framework for real-time condition monitoring of offshore wind turbines (OWTs) will be developed. This will include processing of currently available data from wind farms and recommendations for installing new sensing systems in future, including using these systems for model updating. The successful candidate will develop robust estimates of structural health monitoring features of interest, their performance, and uncertainties. This will lead to guidelines and recommendations around their applications, interpretation and limitations.

The developed features will be employed to create a physics-informed data-driven framework where the damages at super-structure and sub-structure levels of OWTs can be detected in real-time. In addition, a transfer learning-based approach will be developed which will employ similarities of anomalous patterns across different OWTs to allow using labelled data from a known OWT for anomaly detection in other OWTs in a wind farm. This framework will improve our understanding from the remaining life of the turbine and extend our capability of translating ideas of monitoring to practice. Field experimental data measured from real wind farms are available for this PhD. Furthermore, data from scaled testing will be collected and assessed where the challenges around scaling for structural health monitoring will be investigated.

In-house training and career support will be provided by the research team, along with extensive support through academic and industrial networks in this topic. The member will be working with

several researchers on the topic of renewable energy, in a multi-disciplinary and multi-cultural environment.

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 €18,500 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/1FAIpQLSeQ1Dnair-8pewB1-h8xZrSSo0BTj-VhaYz5EbpE4SUeMte_A/viewform?usp=sf_link

Deadline: The application should be submitted no later than **26 May 2023**.