Northumbria University NEWCASTLE

AMT

Self-funded PhD opportunities at the Advanced Manufacturing Technology (**AMT**) research group, Department of Mechanical and Construction Engineering, Faculty of Engineering and Environment, Northumbria University, Newcastle Upon Tyne, UK

Project Title:

Reduced-order modelling of offshore floating wind farm based on deep learning

Project Description [300 words]
(Please include links to further web page information in this section, if needed)

The demand for carbon reduction has triggered the installation of new and large offshore wind farms in deeper water depth. Conventionally, the understanding of wind flow fluctuations on wind farm operation & maintenance (O&M) is to appropriately model the whole wind farm system, containing hundreds of turbines. Modelling each wind turbine using a full-system analysis would significantly increase the computational costs. Therefore, a suitable reduced order model, decreasing the computational costs, while at the same time retaining selected behaviour is essential for wind farms. This research project will focus on developing reduced-order models for an offshore floating wind farm based on advanced numerical simulations, field measurements (such as Supervisory Control & Data Acquisition (SCADA) & Lidar data), and deep learning.

The objectives of this project are:

[1]. Investigate the significance of various input features on the target output based on SCADA & Lidar data of an offshore wind farm.

[2]. Based on selected features in [1], develop a novel reduced-order model for an offshore floating wind farm to support safe O&M.

The proposed study is the first of its kind in reduced-order model developments using real wind farm database and advanced algorithms, which will further benefit wind farm designer & operator for deep-water wind farms.

The candidate should have knowledge or at least an interest in:

- Offshore wind turbine
- Numerical modelling
- Machine learning

Faculty: Engineering and Environment

Department

Mechanical and Construction Engineering

Principal Supervisor

Dr Zi Lin, Prof Ahmed Elmarakbi

Recent publications by supervisors relevant to this project

1. Lin Z, Cevasco D, Collu M. A methodology to develop reduced-order models to support the operation and maintenance of offshore wind turbines. Appl Energy 2020;259:114228. https://doi.org/10.1016/j.apenergy.2019.114228.
2. Lin, Z., Liu, X. Assessment of Wind Turbine Aero-Hydro-Servo-Elastic Modelling on the Effects of Mooring Line Tension via Deep Learning. Energies 2020, 13, 2264. https://doi.org/10.3390/en13092264

3. Lin Z, Liu X. Wind power forecasting of an offshore wind turbine based on high-frequency SCADA data and deep learning neural network. Energy 2020;201:117693. https://doi.org/10.1016/j.energy.2020.117693

Eligibility and How to Apply

Qualification

Applications are invited from exceptional candidates who have a good first or upper second class degree (or equivalent) in engineering, materials science. Students who are not UK/EU residents are eligible to apply, provided they hold the relevant academic qualifications, together with an IELTS score of at least 6.5. This project is well suited to motivated and hard-working candidates with a keen interest in design, materials and manufacturing. The applicant should have excellent communication skills including proven ability to write in English.

For more information and informal enquiries please contact Dr Zi Lin
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Deadline for applications:

- 1st December for March (following year) start; 1st June for October (same year) start.

Start Date: March and October of each year