UNIVERSITY of GREENWICH

Information on Postgraduate Research Scholarship - Ref: Eng-PhD-07-25			
Faculty:	Engineering and Science	**Department:**	School of Engineering
Lead Supervisor:	Dr Kamran Pedram		
Project Title:	Improved defect detection of Guided Wave Inspection Using Machine Learning-Driven Signal Processing Techniques		
Project Description: (maximum 500 words)	Leakage and structural failure in chemical and petrochemical pipelines pose a significant risk to public safety, the environment, and industrial continuity. High-profile incidents, such as the Buncefield fire at the Hertfordshire Oil Storage Depot, demonstrate the potentially catastrophic consequences of undetected defects in pipeline infrastructure. As pipeline networks age and operate under increasingly demanding conditions, there is a growing need for reliable, long-range inspection technologies capable of identifying early-stage damage before it escalates into failure. Guided Wave Testing (GWT) has emerged as a powerful non-destructive evaluation technique for the inspection of pipelines over long distances, enabling the detection of corrosion, cracks, and wall thinning in structures that are buried, insulated, or otherwise inaccessible. Despite its advantages, the effectiveness of GWT is often limited by complex signal behaviour arising from multimodal wave propagation, boundary reflections, and low signal-to-noise ratios. These factors complicate signal interpretation and can result in uncertainty or missed defects, restricting the full industrial potential of the technology. This PhD project aims to address these limitations by developing an advanced, data-driven framework that integrates state-of-the-art signal processing with artificial intelligence techniques to enhance defect detection, classification, and predictive capability in guided wave pipeline inspection. By leveraging machine learning approaches, the research will focus on extracting meaningful patterns from noisy guided wave signals and translating them into reliable indicators of defect type, location, and severity. The research will involve the acquisition of real guided wave inspection data from coated and buried steel pipelines using industrial GWT systems, alongside simulated datasets generated using numerical modelling tools such as MATLAB and finite element software. Advanced signal processing methods, including split-spectrum processing, wavelet analysis, and adaptive filtering, will be applied to improve signal quality and isolate defect-related features. These features will then be used to train and validate supervised machine learning models capable of automated defect identification and severity estimation. Particular emphasis will be placed on model robustness, interpretability, and generalisation across different pipeline conditions.		

	Validation of the developed framework will be carried out using industrial field data provided by major pipeline operators, enabling direct assessment of performance under realistic operating conditions. The outcome of the project will be an AI-assisted GWT inspection framework capable of reducing uncertainty, extending inspection range, and supporting predictive maintenance decisions. The research will contribute to improved pipeline safety, reduced inspection costs, and enhanced asset integrity management. It will also provide the successful PhD candidate with advanced training in non-destructive evaluation, signal processing, machine learning, and industrial data analysis, while fostering strong collaboration between academia and the energy sector. This scholarship is awarded competitively, and all applications are carefully reviewed. While we cannot guarantee an offer, we encourage strong candidates to apply.
Duration:	3 years, Full-Time Study or 6 years, Part-Time Study

Support available (subject to satisfactory performance):

A successful Home candidate will receive:

- A Full tuition fee waiver at the university Home-student rate for the specified duration of the scholarship

A successful International candidate will receive:

- A tuition fee waiver for 50% of the International-student rate for the specified duration of the scholarship.

Tuition fees are subject to annual increases.

This scholarship does not include funding for living expenses.

Person Specification of Essential (E) or Desirable (D) requirements:

Criteria:	**E or D**
Education and Training:	
• 1st Class or 2nd class, First Division (Upper Second Class) honours degree or a taught master's degree with a minimum average of 60% in all areas of assessment (UK or UK equivalent) in a relevant area to the proposed research project	**E**
• For those whose first language is not English and/or if from a country where English is not the majority spoken language (as recognised by the UKBA), a language proficiency score of at least IELTS 6.5 (in all elements of the test) or an equivalent UK VISA and Immigration secure English Language Test is required, if your programme falls within the faculty of Engineering and Science a language proficiency score of at least IELTS 6.5 overall with a minimum of 6.0 in all elements of the test or an equivalent UK VISA and Immigration secure English Language Test is required. Unless the degree above was taught in English **and**	**E**

obtained in a majority English speaking country, e.g. UK, USA, Australia, New Zealand, etc, as recognised by the UKBA.	
Experience & Skills:	
• Previous experience of undertaking research (e.g. undergraduate or taught master's dissertation)	**E**
• Strong understanding of Signal Processing, data analysis, or applied mathematics.	**E**
• Proficiency in Python, MATLAB, or other relevant programming languages for machine learning and digital signal processing applications.	**E**
• Prior experience conducting independent research, including data collection, analysis, and implementation of signal processing applications.	**E**
• Prior experience or knowledge in non-destructive testing (NDT), ultrasonics, or guided wave inspection	**D**
• Knowledge of machine learning or artificial intelligence techniques, such as pattern recognition or neural networks	**D**
Personal Attributes:	
• Understands the fundamental differences between a taught degree and a research degree in terms of approach and personal discipline/motivation	**E**
• Able to, under guidance, complete independent work successfully	**E**
Other Requirements:	
• This scholarship may require Academic Technology Approval Scheme approval for the successful candidate if from outside of the EU/EEA	**E**
• The scholarship must commence before 15th July 2026 (offers will be withdrawn if this condition is not met)	**E**
Closing date for applications:	***midnight UTC on 20th February 2026***
For further information contact:	***Dr Kamran Pedram (Kamran.pedram@gre.ac.uk)***

Making an application:

Please read this information before making an application. Information on the application process is available at: https://www.gre.ac.uk/research/study/apply/application-process. Applications need to be made online via this link. **No other form of application will be considered**.

All applications **must include** the following information. **Applications not containing these documents will not be considered.**

- **Scholarship Reference Number (*insert reference*)**– included in the personal statement section together with your personal statement as to why you are applying
- **a CV including 2 referees** *
- **academic qualification certificates/transcripts and IELTs/English Language certificate if you are an international applicant or if English is not your first language or you are from a country where English is not the majority spoken language as defined by the UK Border Agency** *

**upload to the qualification section of the application form. Attachments must be a PDF format.*

Before submitting your application, you are encouraged to liaise with the Lead Supervisor on the details above.

September 2021