

Queen's Doctoral Training Programme on
Secure Connected Intelligent Design and Manufacturing

Title: DTP: Feature identification in 3D CAD models using machine learning	
<p>This project is part of the Queen's Doctoral Training Programme in Secure Connected Intelligent Design and Manufacturing. Many of today's industrial approaches require transformative changes to ensure long term societal, economic and environmental resilience and sustainability. PhD projects in this programme explore the potential of emerging digital technologies, such as artificial intelligence, robotics, and the Internet of Things, to transform the way we design, manufacture and operate products and services.</p> <p>Project description: The finite element modelling group in QUB has a long history in the creation of "geometric reasoning" techniques for the automated preparation of computational analysis and manufacturing models. The preparation of these models is currently extremely time consuming in industry, and is carried out by highly skilled individuals, so there are significant benefits to be made from automating it. The issues with these "geometric reasoning" techniques are that they usually involve algorithms that are slow to operate and where the cost of the procedure scales with the size and complexity of the model it is being used on. There are other issues in that these algorithms typically require the use of specialist processes that require the installation of specialist software (which companies wanting to use the approaches may not have) and which themselves are not always robust for complex component models.</p> <p>This project will aim to identify how to use machine learning in the preparation of these computational analysis and manufacturing models from CAD geometry. This would release companies from being tied to specialist software, and provides the potential to automatically carry out part of the model preparation process. There has already been some work carried out on this topic in QUB and it has shown a lot of promise.</p> <p>Aims and Objectives: The aim is to identify how to use machine learning in the preparation of these computational analysis and manufacturing models from CAD geometry.</p> <p>Project objectives are:</p> <ul style="list-style-type: none"> • Develop a thorough understanding of how machine learning has been applied to geometry based problems • Determine which analysis model preparation problems are most likely to be solvable using machine learning • Identify or create a suite of training/test data for the machine learning processes • Test the process and evaluate its effectiveness 	
Key skills required for the post: Interest in machine learning	
Key transferable skills that will be developed during the PhD: The programme offers a bespoke research and training programme that aims to develop students into cross-disciplinary, industry-conscious thinkers and leaders who will influence the roadmaps of future advanced manufacturing technologies and their applications. They will have a balanced understanding of ICT (security, communications and data analytics) in the context of their application to Advanced Manufacturing and High Value Design.	
Lead supervisor:	Dr Trevor Robinson, Mechanical and Aerospace Engineering, t.robinson@qub.ac.uk
Other supervisor(s):	Dr Yang Hua, Y.hua@qub.ac.uk
Guaranteed stipend:	This is a 3.5 year funded Queen's DfE DTPs studentship with Training Grant, to commence on 1 October 2020 (N.B. stipend for 20/21 is not yet known, but is likely to exceed £15,000). The studentship covers fees and maintenance and is available for UK residents (see full eligibility criteria - nationality, residency, and academic qualification at: http://go.qub.ac.uk/dfeterms).

	When applying using the Queen's portal please ensure you include "DTP:" along with the project title.
Conditional top-up available:	Add amount and condition if available from another source – there is no central funding available for this.
PhD students in the School have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to in excess of £2,400 per year.#	

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.