

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

School of Electronics, Electrical Engineering and Computer Science

PhD Studentship 2020/21

<b>Proposed Project Title: Personalized dynamic learning and skill delivery for Industry 4.0</b>	
<b>Principal Supervisor:</b> Nikolaos Athanasopoulos, EEECS, i-AMS (Second supervisor: Dr Matthew Rodger, Psychology)	<b>Research Area</b>  Control and Systems Theory, Psychology, Cyber-Physical Systems, Learning, Skill acquisition
<b>Contact Details:</b> QUB Address: Ashby Building, Stranmillis Road, Room 08.017 Tele No: +44 (0)28 9097 4567 E-Mail: n.athanasopoulos@qub.ac.uk	<b>Proposal open to other School (indicate area of Interest)</b>  EEECS, Psychology
<b>Degree linked to ELE</b>	
<b>Degree linked to CSC</b>	
<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>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.</p>	
<b>Project Description:</b>	
<p>While the scope and reach of intelligent manufacturing systems is marching ahead through advances in digital technology, artificial intelligence, Industry 4.0, and the Internet of Things, an ongoing critical challenge is the smooth and effective integration of human operators into such systems. Since many manufacturing protocols still necessitate human operators to assemble components, repair processes, or monitor system behaviours. Operators' skill levels, and contextual factors which may influence execution of operator skills, thus constitute constraints on the efficiency and productivity of manufacturing systems, through limiting process rates and potentially introducing errors.</p> <p>The proposed research in the project lies in the intersection of Psychology (theories of perception, learning etc), Systems and Control Engineering, and Applied Mathematics (dynamical systems modelling, analysis and control). The issue of learning and acquiring skill in the Industry 4.0 setting specifically poses also exciting challenges, such as learning safely and acquiring quite complex skills related to coordination, sequential tasks in a dynamic environment, quite different from a controlled space in a laboratory. Last, effective learning and skill acquisition will require personalized customization of the learning mechanism to each individual, which in turn requires an analytic, complex dynamical model of the learning process and a corresponding, well-informed decision mechanism.</p>	
<b>Objectives: - Establish a modelling framework of learning and skill delivery of specific tasks in an industry 4.0 setting, taking into account the dynamics of each individual.</b>	

- **Adapt and improve the model via structured experiments in the laboratory, and potentially in a real industrial setting.**
- **Propose and test new decision algorithms that guide the learning process, taking into account the task complexity, the (dynamic) environment, and the individual's (dynamic) characteristics.**

**Academic Requirements:**

A minimum 2.1 honours degree or equivalent in Engineering, Psychology, Applied Mathematics, Computer Science, or relevant degree is required.

**GENERAL INFORMATION**

This 3.5 year PhD studentship, potentially funded by the Department for Employment and Learning (DfE), commences on 1 October 2020.

Eligibility for both fees and maintenance (approximately £15,000) depends on the applicants being either an ordinary UK resident or those EU residents who have lived permanently in the UK for the 3 years immediately preceding the start of the studentship. Non UK residents who hold EU residency may also apply but if successful may receive fees only.

Applicants should apply electronically through the Queen's online application portal at: <https://dap.qub.ac.uk/portal/>

Further information available at: <https://www.qub.ac.uk/schools/eeecs/Research/PhDStudy/>

**Closing date for applications: 15 March 2020**