

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

Proposed Project Title: DTP: Dynamic Bayesian modelling of disk drive manufacturing	
Principal Supervisor: Professor Roger Woods	Research Area
Contact Details: QUB Address: Room 7.21, Ashby Building Tele No: 02890 974081 E-Mail: r.woods@qub.ac.uk	AI, data analytics, computing hardware Proposal open to other School (indicate area of Interest) Maths and Physics
Degree linked to ELE (delete as appropriate)	
Degree linked to CSC (delete as appropriate)	
<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>	
Project Description:	
<p>Manufacturing companies such as Seagate, are currently investing a considerable amount in monitoring their manufacturing processes by installing a large number of sensors and recording the resulting data. This data then becomes an invaluable asset for decision making and understanding behaviours in the manufacturing industry. The challenge is then to be able to sensibly interpret the information created by this data. The purpose of this work is to explore probabilistic models for analysing the data, whilst accounting for any uncertainties within the system.</p> <p>Previous research has suggested that Bayesian Networks (BNs) offer capabilities for analysing manufacturing data, but their full potential has not been demonstrated across a variety of case studies with differing characteristics e.g. missing data levels, imbalance etc. BNs are commonly used in machine learning research when there is a presence of uncertainty, where probability theory can assist in modeling the behaviour of the data. They allow a transparent representation of uncertain domains, where features are represented as nodes and probabilistic dependencies between them are shown as directed arcs. BNs have demonstrated their suitability for representing structure in industrial data, although difficulties associated with learning an unknown structure in large manufacturing systems has not been fully investigated.</p>	
Objectives:	
<ul style="list-style-type: none">• Obtain a database of relevant industrial datasets covering typical manufacturing environment and which contain relevant processing faults/issues.• Explore BN implementations for analysing these datasets and attempt to identify and explore relevant relationships.• Develop new BN algorithms to better identify these relationships.	
Academic Requirements:	
<p>A minimum 2.1 honours degree or equivalent in Computer Science or Electrical and Electronic Engineering or Applied Maths/Statistics or relevant degree is required.</p>	

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