

PhD Project Proposal

ECIT Interdisciplinary PhD Programme

Proposed Project Title: AI-Driven Millimetre-wave Industrial Wireless

Principal Supervisor(s):

Dr Simon Cotton and Prof Sean McLoone

Project Description:

With Industry 4.0 beginning to see widespread adoption around the globe, researchers are already beginning to turn their attention to developing the next generation of industrial technologies. Part of this evolution will see even greater connectivity of cyber-physical systems with the real and virtual worlds leading to data exchange on an unprecedented scale. For example, this may take the form of machine-to-machine (M2M) communication, machine-to-person (M2P) communication or machine type communication used to connect industrial devices to 5G infrastructure.

With wireless spectrum in the sub-6 GHz region already oversubscribed many of these applications will move to operate at millimetre-wave (mmWave) frequencies (between 30 and 300 GHz). Unfortunately, at present, very little is known about the behaviour of the mmWave channel within industrial settings. This knowledge is not only essential for robust wireless systems design but also understanding the limitations of the channel in relation to service delivery.

The aim of this PhD study will be to develop an understanding of the mmWave channel for industrial wireless communications through simulation and experimentation. Building upon this knowledge, novel machine learning (ML) / artificial intelligence (AI) algorithms will be developed to help assist with smart, context aware decision making at the physical (PHY) and medium access control (MAC) layers for industrial applications.

Throughout the course of the study, the PhD student will have the opportunity to work with a multi-disciplinary team of experts in the areas of wireless communications, intelligent systems and manufacturing. Additionally, they will develop knowledge / skills in the areas of industrial wireless, digital manufacturing, ML and AI, and MATLAB as well as having the opportunity to attend top national and international conferences.

Objectives:

The main objectives of this research are:

- To investigate emerging wireless technologies for industrial applications.
- Perform measurements to characterise the mmWave channel with industrial settings.
- Develop novel ML / AI algorithms to assist with smart, context aware decision making at the PHY and MAC layers.
- To disseminate research findings at top national and international conferences, and publish in leading IEEE journals.

Academic Requirements:

Students entering the programme will normally be required to have a 2.1 BSc/BEng in Computer Science, Electrical and Electronic Engineering, or a maths based engineering or physical science degree, or equivalent qualification recognised by the University. Students holding an appropriate MEng or MSc (Software conversion) will normally be required to have a 2.1 or commendation (distinction) respectively. Furthermore, additional criteria may be applied. All applicants must have significant mathematical and programming experience.

GENERAL INFORMATION:

This 4 year PhD studentship, potentially funded by the Department for Employment and Learning (DEL), commences on 1 October 2019.

Eligibility for both fees and maintenance 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/>

Deadline for applications: Friday 1 March 2019

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