School of Computing, Engineering, and the Built Environment
Edinburgh Napier University

PHD STUDENT PROJECT

Funding and application details

Funding status: Self funded students only

Application instructions:
Detailed instructions are available at https://blogs.napier.ac.uk/scebe-research/available-phd-student-projects/

Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.

Project details

Supervisory Team:

- DIRECTOR OF STUDY: Gokula Vasantha (Email: G.Vasantha@napier.ac.uk)
- 2ND SUPERVISOR: Keng Goh

Subject Group: Engineering & mathematics

Research Areas: Integrated Engineering, Mechanical Engineering, Electrical Engineering, Electronic Engineering, Artificial Intelligence, Data Science, Human Computer Interaction

Project Title: Development of a Knowledge Architecture for Designing Smart Products

Project description:

Developing smart products aims to create unique in-built characteristics such as adaptiveness, context-awareness, personalisation, and pro-activeness to enhance customer value. The first generation of intelligent products mostly tracks and monitors product usage and provides feedback. For example, Procter & Gamble, Inc.'s smart toothbrush is one such product that uses a Bluetooth-enabled toothbrush to track and monitor brushing style and provides dentist-inspired real-time feedback. However, the next generation of smart products needs to interact with users and the environment. They should take autonomous decisions to the

best for delivering the intended functionalities, enhance value for all stakeholders and ensure safety. Considering multi-facet data elements involved in developing interactive and intelligent smart products, there is a need to create knowledge architecture for designing Smart Products. The design methodology should consider the types of real-time data to be captured and the process of converting data into actionable knowledge to develop unique interactive mechanisms to communicate with users.

The objectives of this PhD position in Smart Product research are:

- To understand and elicit the data requirements for creating a smart product that enables unique interactive mechanisms to communicate with users.
- To create artificial intelligence knowledge schema for real-time value creation that enhances operational performance objectives for end users by enabling through-life product intelligence within smart products.

The researcher joining this project will develop and train in the appropriate technical areas. In addition, the researcher will be actively encouraged to present the work at leading international conferences and workshops. Therefore, the researcher should have an appetite for undertaking an enquiring and rigorous approach to research together with a keen intellect and disciplined work habits.

References:

[1] Duffy, A., Whitfield, I., Ion, B., & Vuletic, T. (2016). Smart Products Through-Life: Research Roadmap. University of Strathclyde Publishing. https://pureportal.strath.ac.uk/en/publications/smart-products-through-life-research-roadmap

[2] Pessôa, M. P., & Becker, J. J. (2020). Smart design engineering: a literature review of the impact of the 4th industrial revolution on product design and development. Research in engineering design, 31(2), 175-195.

Candidate characteristics

Education:

A first-class honours degree, or a distinction at master level, or equivalent achievements in Mechanical Engineering, Electrical and Electronic Engineering, Computer Science, or Product Engineering with a good fundamental knowledge of Data Analytics and Knowledge Engineering.

Subject knowledge:

- Experience of Engineering Design product development and processes.
- Knowledge engineering with good understanding of data conversion processes.
- Competent in Programming and Data analytics.
- Knowledge of Statistical techniques and product data model

Essential attributes:

- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes: