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****Please read accompanying guidance notes****

Department	School of Engineering and the Built Environment
Supervisors	Dr Gokula Vasantha, Dr Keng Goh, Mr Jim McWhinnie
Funding Status	Funded PhD Project (Worldwide)
Application Deadline	14/04/2022
Project Title	Digital-Twin System Modelling of a Smart Manufacturing Factory

PROJECT DESCRIPTION

Applications are invited for a research studentship in designing digital twin system modelling of an intelligent manufacturing factory leading to the award of a PhD degree.

Many parameters, such as movements of input raw materials to machine performance, impact the productivity of a manufacturing factory. Manufacturers are interested in developing tools and techniques based on the digital-twin concept to monitor manufacturing units in real-time and develop smart, proactive strategies to improve performance. This research project aims to develop intelligent real-time system modelling techniques for industries to assess manufacturing performance. The project focuses on the following research objectives: (i) collecting and analysing real-time factory data, (ii) predicting adaption required in smart manufacturing factory based on real-time information, and (iii) developing a knowledge-based system for providing automatic suggestions to improve manufacturing performance.

The digital twin system modelling tools will be trial tested in a Flexible Manufacturing laboratory before studying in an actual manufacturing industry. The research project requires an excellent understanding of manufacturing systems, system engineering principles, data analytics, and predictive modelling techniques. The candidate should have experience in system modelling software such as SimUl8 and using advanced programming interfaces.

The researcher joining this project will develop and train in the appropriate technical areas. The researcher will be actively encouraged to present the work in leading international conferences and workshops. The researcher should have an appetite for undertaking an enquiring and rigorous approach to research together with a keen intellect and disciplined work habits. The researcher will benefit from collaborating with professors at the University of Edinburgh and Strathclyde through an ongoing EPSRC funded research project.

Academic qualifications

A first degree (at least a 2.1) ideally in mechanical or systems engineering or operation research with a good fundamental knowledge of data analytics and manufacturing performance analysis, or equivalent Masters degree.

English language requirement

IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.

Essential attributes:

- Experience of fundamental intelligent manufacturing systems and processes
- Competent in data analytics and statistical techniques
- Knowledge of simulation processes and prediction approaches
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

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Desirable attributes: - Experience in system modelling simulation software such as SimUl8. - Knowledge of programming skills in Python and Matlab.	
Indicative Bibliography	Vasantha, G., Komoto, H., Hussain, R., Roy, R., et al. (2013). A manufacturing framework for capability-based product-service systems design. Journal of remanufacturing, 3(1), 8. Rosen, R., Von Wichert, G., Lo, G., & Bettenhausen, K. D. (2015). About the importance of autonomy and digital twins for the future of manufacturing. IFAC-PapersOnLine, 48(3), 567-572.
Funding notes	This project may be funded by a scholarship of the School of Engineering and Built and Environment. Please see School-funded PhD scholarships - RESEARCH AND INNOVATION (napier.ac.uk) for information on the scholarships and how to apply for them.
Enquiries	For informal enquiries about this PhD project, please contact Dr Gokula Vasantha (G.Vasantha@napier.ac.uk)
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process

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