Department	School of Computing
Supervisors	Dr. Oluwaseun Bamgboye, Prof. Xiaodong Liu
Project Title	Semantic Model-Driven Explainable Machine Learning Approach for IoT Applications

PROJECT DESCRIPTION

The increasing availability of sensors and smart things has caused a rise in Internet of Things (IoT) applications. Such technologies has permeated into every aspects of human activities, including technological advancement. The IoT applications heavily relies on the data produced either offline or "on-the-fly" to achieve great deal of automation or decision-making purposes. The data are sometimes by produced from heterogeneous sensor nodes and devices within the environment to drive the automation and decision-making process. Typically, such data needs to be harmonized, cleaned, and well analysed to support its usage. Furthermore, IoT has become a pivot for most emerging applications for critical systems in domains such as smart health, smart home, smart energy, smart transportation, safety-critical systems and so on.

Machine Learning approach have been known for its ability to support offline data cleaning with statistical methods, and predictive analytics but are not suitable to support data interoperability(for heterogeneous IoT data), semantic data reasoning and correlating different heterogeneous IoT data streams, which are readily provided by semantic stream modelling and reasoning techniques. Hence, the outcome of the statistical analysis are not yet explainable and easily interpreted by human or agents. This problem has created a gap between these two technologies, thereby widening the gap in achieving a full smart initiatives and intelligence in connected things.

In this PhD project, the successful candidate will explore the current state of machine learning and Internet of Things to develop a novel approach in other to achieve an efficient explainable model that bridge between the semantic technology and machine learning for a near real-time IoT applications. The approach will focus on providing key solution to a major issue in the current IoT-based critical systems or smart systems.

Prospective applicants are encouraged to contact the Supervisor before submitting their applications. Applications should make it clear the project you are applying for and the name of the supervisors.

Academic qualifications

A first degree (at least a 2.1) ideally in computer science or numerate disicpline with a good fundamental knowledge of computer programming, machine learning, semantic technologies, Internet of Things or artificial Intelligence.

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 Software engineering
- Competent in programming languages and research skills

- Knowledge of machine learning, semantic technologies, IoT, software architecture, and data modelling
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project

- Good time management

Desirable attributes:
Familiarity with knowledge graph or data analytics

Indicative Bibliography	Bamgboye, O., Liu, X., & Cruickshank, P. (2019, July). Semantic stream management framework for data consistency in smart spaces. In *2019 IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC)* (Vol. 2, pp. 85-90). IEEE.
Enquiries	For informal enquiries about this PhD project, please contact Dr. Oluwaseun Bamgboye (O.Bamgboye@napier.ac.uk)
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process