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

PHD STUDENT PROJECT

Application instructions:
Detailed instructions are available at :
https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply

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: Saima Rafi (Email: s.rafi@napier.ac.uk)
- 2ND SUPERVISOR: Dr Amjad Ullah

Subject Group: Computer Science

Research Areas: Computer Science

Project Title: Quantum Software Engineering: Pioneering the Next Frontier in Computing

Project description:
Quantum computing (QC) is advancing from a research interest to an industrial technology with the potential to overcome classical computing limitations. However, developing quantum software requires specialized methodologies, processes, and tools. This project aims to create a Quantum Software Engineering (QSE) lifecycle tailored for industrial applications, addressing the unique challenges of quantum software development.

Current software engineering practices, such as traditional SDLCs, are insufficient due to quantum software's inherent complexities, including probabilistic algorithms, debugging difficulties, and novel testing needs. The project will establish a robust QSE framework, integrating theory with practical implementation. By defining a dedicated SDLC for quantum applications, the project seeks to enhance industrial access to QC, drive innovation, and address the specific challenges of quantum software development.

References:

Zhao, J., 2020. Quantum software engineering: Landscapes and horizons. arXiv preprint arXiv:2007.07047.

Piattini, M., Serrano, M., Perez-Castillo, R., Petersen, G. and Hevia, J.L., 2021. Toward a quantum software engineering. IT Professional, 23(1), pp.62-66.

Ali, S., Yue, T. and Abreu, R., 2022. When software engineering meets quantum computing. Communications of the ACM, 65(4), pp.84-88.

Candidate characteristics

Education:
A first-class honours degree, or a distinction at master level, or equivalent achievements in computer science

Subject knowledge:
Software engineering process management and Machine Learning

Essential attributes:
- Knowledge of ML performing classification (decision trees, support vector machines etc.)
- Strong grip of statistical concepts