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://www.napier.ac.uk/research-and-innovation/research-degrees/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: Dr. Isam Wadhaj (Email: I.Wadhaj@napier.ac.uk)
- 2ND SUPERVISOR: Dr. Craig Thomson

Subject Group: Cyber-security and system engineering

Research Areas: Computer Science

Project Title: Intelligent & Privacy-preserving security solutions for Vehicular Ad-hoc Networks (VANETs)

Project description:

Vehicular Ad-hoc Networks (VANETs) have gained increasing popularity and significance within the broader context of Intelligent Transportation Systems (ITS). VANETs leverage advanced communication technologies to enable seamless communication between vehicles (V2V) and between vehicles and infrastructure (V2I). This connectivity forms the foundation for a range of applications such as enhanced road safety, traffic management, infotainment services, improved emergency response and reduced traffic congestion. The continued advancement and integration of VANETs into ITS will likely revolutionize the way we perceive and utilize transportation systems. However, VANETs are vulnerable to security

threats due to the open and dynamic nature of data transmission. The potential for adversaries to manipulate or intercept critical information in Vehicular Ad-hoc Networks (VANETs) and disrupt their normal operations is a significant concern in the context of VANET security. Despite numerous authentication mechanisms developed for VANETs, many of them fall short of the required security standards and efficiency. This highlights the need for ongoing research efforts to overcome technical and security challenges to ensure ensure the safe and reliable operation of these networks.

This project aims to conduct cutting-edge research that goes beyond the current state of the art, focusing on the development of a novel, robust, and advanced Secure and Privacy-Preserving Authentication Mechanism. This mechanism will address the following crucial aspects of authentication in Vehicular Ad-hoc Networks (VANETs):

- Design an authentication mechanism that can withstand insider threats, ensuring that malicious entities within the VANET cannot compromise the security of the communication.
- Implement a mechanism for establishing session keys securely between communicating entities in VANETs.
- Develop a mechanism that ensures mutual authentication between the participating entities in the VANET.
- Devise a suite of privacy-preserving solutions for VANETs that satisfy critical privacy requirements.

The innovative authentication mechanism to be developed in this project is expected to contribute significantly to the field of VANET security by addressing these fundamental requirements. The goal is to enhance the security, privacy, and reliability of VANETs, ultimately paving the way for safer and more efficient vehicular communication systems.

Perspective 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.

References:

Candidate characteristics

Education:

A second class honour degree or equivalent qualification in Computer Science

Subject knowledge:

- Programming

Essential attributes:

- Experience of fundamental IoT security and privacy
- Competent in c/c++ programming
- Knowledge of Machine learning, and Privacy-preserving techniques
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes: