



## **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: Prof Leandros Maglaras (Email: [l.maglaras@napier.ac.uk](mailto:l.maglaras@napier.ac.uk))
- 2<sup>ND</sup> SUPERVISOR: Dr Zhiyuan Tan

**Subject Group:** Cyber-Security and System Engineering

**Research Areas:** Cyber Security

**Project Title:** On-the-go EV charging methods

#### **Project description:**

The promise of electric cars is tempered by the pragmatic reality that they are limited in range and hampered by a lack of charging infrastructure. But a new technology would allow electric cars to be charged wirelessly—“on the fly”—while in motion.

The concept, dubbed “dynamic wireless charging,” allows electric vehicles (EVs) to power up from the grid while on the road. Specially designed trucks or busses, called mobile energy disseminators (MEDs), allow EVs to extend their range in a typical urban scenario.

Any vehicle requiring an electric charge would approach the appropriate MED—after having booked a charging appointment via specially designed “negotiation” software—from the front or rear (depending on MED construction).

If the vehicles are located in an appropriate stationary location, for example a parking lot, a physical plug-in connection to the MED could be used instead of the wireless option.

The project objectives are:

1. Design of a holistic framework for on-the-go charging that combines static and dynamic techniques
2. Conduct extensive simulations and small scale experiments to showcase the efficiency of the proposed method
3. Perform several attack scenarios and apply mitigation methods
4. Create a prototype within a small scale city arrangement

**References:**

- [1] Dimitrios Kosmanos, Apostolos Pappas, Leandros Maglaras, Sotiris Moschoyiannis, Francisco J. Navarro, Antonios Argyriou and Helge Janicke, "A Novel Intrusion Detection System Against Spoofing Attacks in Connected Electric Vehicles", Elsevier Array, Accepted, November 2019
- [2] Dimitrios Kosmanos, Leandros Maglaras, Michalis Mavrovouniotis, Sotiris Moschoyiannis, Antonios Argyriou, Athanasios Maglaras, Helge Janicke, "Route Optimization of Electric Vehicles based on Dynamic Wireless Charging", IEEE Access, July 2018, DOI: 10.1109/ACCESS.2018.2847765
- [3] Leandros A. Maglaras, Jianmin Jiang, Athanasios Maglaras, Frangiskos Topalis, Sotiris Moschoyiannis, "Dynamic wireless charging of electric vehicles on the move with Mobile Energy Disseminators", International Journal of Advanced Computer Science and Applications (IJACSA), Volume 6, Issue 6, June 2015, DOI: 10.14569/IJACSA.2015.060634
- [4] Leandros A. Maglaras, Jianmin Jiang, Athanasios Maglaras, Frangiskos Topalis, "Mobile Energy Disseminators increase electrical vehicles range in a smart city", Proceedings of the 5th IET Hybrid and Electric Vehicle Conference (HEVC 2014), London, 5-6 November 2014, DOI:10.1049/cp.2014.0947

## Candidate characteristics

**Education:**

A second class honour degree or equivalent qualification in Electrical / Electronic / Communications Engineering, Computer Science/Engineering, Mathematics with a good fundamental knowledge of Network Communication Principles, Digital Communications, software engineering

**Subject knowledge:**

- Wireless communications, OMNET++, communication protocols, Jamming and spoofing attacks

**Essential attributes:**

- Experience of cybersecurity attacks and defenses
- Competent in software development
- Knowledge of wireless communication principles, protocols, algorithms
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

**Desirable attributes:**

- Team player, eager to learn new technologies, flexible and knowledge of Python, R or Matlab.