

**Project Title:** Self-supervised representation deep reinforcement learning for advanced persistent threat detection in large scale networks

**Supervisors:** Dr. Shagufta Henna, Dr. Bernard Butler

**Keywords:** Machine learning/ Artificial Intelligence, Cybersecurity, Collaborative learning, Advanced persistent threats, Information Security, Computer Networks, Artificial Intelligence.

### **Project Summary:**

Advanced persistent threats (APTs) have become more widespread, and several attacks have made headline news over the last couple of years in healthcare, financial, and governmental organisations. These attacks are often combined with other attack methods, such as zero-day, phishing, and baiting, etc. These attacks have caused substantial financial losses and significant disruption of core public services. Since the advancement of the Internet of Things (IoT), number of devices has increased significantly posing various APTs. Existing cybersecurity solutions to APTs rely on typical network traffic patterns and are not effective and scalable for large-scale networks. The proposed approach aims to develop self-supervised machine learning or deep reinforcement learning approaches that will enable effective APT detection for a large-scale network with less computational cost to train the supervised machine learning models.

The project offers the candidate new opportunities to gain invaluable experience in cybersecurity, machine learning, and networks. The successful candidate will have the opportunity to work within a dynamic and multi-disciplinary team.

### **Candidate Qualifications/Requirements:**

1. At least a 2:1 Honour's degree/ Bachelor's degree, or equivalent, in Computer Science or related disciplines such as Information Security, Cyber Security, Computer Networks, Artificial Intelligence/Big Data Analytics.
2. Strong interest in Cyber Security, Artificial Intelligence, Machine Learning and IoT.
3. Experience in Machine Learning, i.e., supervised, and unsupervised and tools (TensorFlow, PyTorch, Keras), Optimisation Theory, and Computer Networks.
4. Good analytical skills - knowledge of foundations of computer science, ability to think independently
5. Strong oral and written communication skills, in both plain English and academic language.
6. Ideally, publications in an international conference or journal as a primary author.



Ollscoil  
Téicneolaíochta  
an Atlantaigh

Atlantic  
Technological  
University

