

## PhD Studentship – Machine Learning for Multi-Stage Attacks in Computer Networks

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### **Project Detail:**

Cybersecurity attacks are an international priority in the agenda of many nations, particularly in the UK. A common trait of recurring top cyber threats, such as Botnets, DDoS, phishing, is that they are dependent on multiple stages in the cyber Kill Chain, and exploit communication protocols vulnerabilities and/or employ social engineering. These attacks are referred to as Multi-stage attacks.

The successful applicant will perform high-quality research, at Wolfson School's Signal Processing and Networks research group, in topics related to multi-stage attacks and malware hunting in computer networks. Therefore, a strong background in computer network communications is essential (e.g. the OSI stack).

The project aims to perform fundamental research in computer networks, focusing on creating real-time statistical learning and machine learning algorithms for identifying individual stages of the kill chain sequence in the network traffic. The developed methodologies will be applied on network traffic captured both from aggregated flows and per packet statistics satisfying different scaling requirements.

The project will be supervised between Dr Kostas Kyriakopoulos and Professor Lambbotharan Sangarapillai, combining their expertise in network security and signal processing techniques.

In addition, the project will follow a practical/demonstrable approach, rather than restrict just in theoretical research. This combinational approach will provide the candidate with significant expertise transferable to the private sector.

### **Entry requirements:**

Applicants should have, or expect to achieve, at least a 2:1 Honours degree (or equivalent) in Electronic/Electrical Engineering, Computer Science or a related subject. A relevant

Master's degree and/or experience in one or more of the following will be an advantage: Machine Learning, Network Security, Signal Processing, OpenFlow.

Candidates may check the International qualification equivalencies by clicking this [link](#).

**Skills:**

High level knowledge of computer networks and the communication protocol stack (TCP/IP stack) and network traffic monitoring are required. Good analytical research and communication skills are essential. The successful candidate is also expected to be an enthusiastic team player who can work both independently and with others.

Strong, demonstrable coding skills in either C, Python or MATLAB and Linux OS are desirable. Experience with machine learning techniques and mathematical frameworks for decision making are desirable.

All applicants must also meet the minimum English language requirements, details of which are available on the [Loughborough University website](#).

**Funding information:**

Please note that studentships will be awarded on a competitive basis to applicants who have applied to this project and other advertised projects in the School of Mechanical, Electrical and Manufacturing Engineering.

If awarded, each 3 year studentship will provide a tax-free stipend of £14,777 p.a (provisional), plus tuition fees at the UK/EU rate (currently £4,260 p.a). While we welcome applications from non EU nationals, please be advised that due to funding restrictions it will only be possible to fund the tuition fees at the international rate and no stipend will be available.

**Important Application information and date**

Reference number: WSS03

Application deadline: 28 August 2018

Start date: 01 January 2019

**Contact details:**

Name: Dr. Konstantinos Kyriakopoulos

Contact Dr Kyriakopoulos at "elkk [at] lboro.ac.uk" with email subject "WSS03".

Apply:

<http://www.lboro.ac.uk/study/postgraduate/research-degrees/funded/multi-stage-attacks/>