



## Applied and Computational Mathematics Seminar

**Title:** Cyber-Physical Systems: a rendezvous between control theory, physics and computer science

**Speaker:** Giovanni Russo

**Date:** Mon 27th January 2020 at 1:00PM

**Location:** Seminar Room SCN 1.25

**Abstract:** This lecture is concerned with the analysis and design of cyber-physical systems, i.e. systems typically controlled via closed-loop computer-based algorithms and tightly integrated with the behavior of their users. We start with presenting the design of an e-bike system: the system, deployed on a real-world testbed, leverages tools from data analytics and control to manage the interactions between the cyclist and the bike motor. The ultimate goal is to influence the cyclist behavior, minimizing the intake of environmental pollution. After having discussed the main design challenges for the e-bike, we illustrate how similar solutions can be used to design smarter connected and automated vehicles: both the design of pedestrian-aware energy management systems for hybrid vehicles and of platoon systems are discussed. Finally, after presenting experimental evidences for the effectiveness of our algorithms, we present some of the underlying theory. In particular, we focus on optimal decision making under uncertainty, privacy and resilience in multi-agent systems. The lecture is concluded with a final application, where control-theoretical tools and reinforcement learning are used to design a learning agent that is able to beat the Atari game Pong with little training.

<https://maths.ucd.ie/ACMSeminars/1920/russo.html>