

## **PhD Position in Automatic Control co-supervised by University of Lille, France, and University of Kent, United Kingdom**

Project Title: "Finite time observation of networks of nonlinear time delay systems"

Keywords: networks of nonlinear time delay systems, sliding mode observers, finite time impulsive observers.

A fully funded PhD position is available under collaborated supervision between the *SHOC team* of the laboratory CRISAL, Lille, the *Defrost Team* of INRIA Lille - Nord Europe and the *School of Engineering and Digital Arts*, University of Kent, UK.

Topic of the proposal:

Networked systems are prevalent in many research areas, for example vehicle platoons, synthetic biological networks, power grids or water distribution networks. It appears that the topology of the network and its associated connectivity play an important role in determining the dynamical behaviour of the networked system. Thus, due to the importance of solving monitoring and cooperative control issues, the problem of topological identification of network systems has been extensively studied for several years.

The main goal of this research is to investigate the topology identification problem for networks of dynamical complex systems, which are modelled by nonlinear ordinary differential equations with or without delays. The topology connections will be mainly considered as unknown parameters. Therefore, the topology identification will be considered as a possible way to identify both states and unknown parameters, simultaneously, of the systems involved in the network. A set of identifiable conditions will have to be developed via constructive algorithms using, for instance, differential geometry tools or algebraic methods. Then, observers need to be designed if partial or full estimation is possible. Specifically, fast and robust estimation will be required to enhance system performance. Thus, higher order sliding mode and impulsive observers, providing for finite time convergence, need to be further studied.

Applicants must have, or expect to achieve a Master's degree or the equivalent from an internationally recognised institution, in Engineering, Applied Mathematics, or a related subject, with strong theoretical skills and interest in Control Engineering / Automatic Control, and more particularly in observation of nonlinear systems. A strong background or/and experience in nonlinear time delay systems and sliding mode control theory is desirable. The applicant should have an English level of B2 or higher at the start of the PhD.

The successful candidate will be spending at least one year in the University of Kent during the three years of the doctorate research. Following a successful PhD Thesis defence, the PhD candidate will obtain a doctoral degree from each institution. Interested individuals should send their detailed curriculum vitae, a cover letter with previous academic performance and motivation, and two references to Dr Thierry FLOQUET ([thierry.floquet@ec-lille.fr](mailto:thierry.floquet@ec-lille.fr)), Dr Gang ZHENG ([gang.zheng@inria.fr](mailto:gang.zheng@inria.fr)) and Dr Xinggang YAN ([x.yan@kent.ac.uk](mailto:x.yan@kent.ac.uk)). Only potential suitable candidates will be contacted.

**Application closing date : 31 March 2021.**