Ad hoc course announcement

Title: **From observability to privacy and security in discrete event systems**

Lecturers:

	Prof. Gianmaria De Tommasi *University of Naples Federico II – Department of Electrical Engineering and Information Technology - Via Claudio, 21 80125 – Naples (Italy)* ***Email: detommas@unina.it***
	Prof. Francesco Basile *University of Salerno – Department of Electrical Engineering, Computer Science and Applied* *Math - Campus di Fisciano – Fisciano, 84084 (Italy)* *Email: fbasile@unisa.it*
	Prof. Claudio Sterle *University of Naples Federico II – Department of Electrical Engineering and Information Technology - Via Claudio, 21 80125 – Naples (Italy)* ***Email: claudio.sterle@unina.it***

Credits: **5 ECTS (19 hrs)**

Overview

This course tackles several topics related to the state estimation of Discrete Event Systems (DES) in presence of events whose occurrence cannot be detected, although their effect on the system is assumed to be known, and hence modeled. Starting from the state estimation problem for non-deterministic (uncertain) DES, the notion of diagnosability for unobservable fault will be introduced. Both *graph-based* and *optimization-based* techniques to assess diagnosability and to perform fault detection will be presented. If the unobservable events are used to model *secret behaviors*, the techniques adopted for state estimation and fault diagnosis can be further extended to deal with security issues such as non-interference and opacity. All the aspects will be framed both in the context of finite state automata (i.e., when dealing with regular languages), and for Petri nets, being these modeling tools the most used ones in the context of control engineering and industrial automation.

At the end of the course there will be a final assessment.

Schedule*

Lecture	Date	Time	Topics	Lecturer
1	14/12/2020	10:30-12:30	Discrete Event Systems (DES), Languages and Automata	Gianmaria De Tommasi
2	14/12/2020	14:30-16:30	Petri nets (PNs) and their twofold representation to model DES	Gianmaria De Tommasi
3	15/12/2020	10:30-12:30	MILP and ILP formulations: logical conditions, binary variables 'do everything', and variable connecting	Claudio Sterle
4	15/12/2020	14:30-16:30	Adding uncertainty: unobservable events and observers for finite state automata and PNs	Gianmaria De Tommasi
5	16/12/2020	10:30-12:30	Augmenting the observers: diagnosability of prefix-closed languages, diagnosers and the fault detection for finite state automata	Francesco Basile
6	16/12/2020	14:30-16:30	Diagnosability and fault detection in PNs - Part I: graph-based approaches	Francesco Basile
7	17/12/2020	10:30-12:30	Diagnosability and fault detection in PNs - Part II: algebraic approaches for bounded systems	Gianmaria De Tommasi
8	18/12/2020	10:30-12:30	Security issues in DES: non-interference and opacity	Gianmaria De Tommasi
9	21/12/2020	10:30-13:30	Non-interference enforcement and open-issues	Gianmaria De Tommasi
	TBD		Assessment test	

The course is provided in Microsoft Teams platform mode

https://teams.microsoft.com/l/team/19%3a742bacf1629f49e9a77cf504b490dd8a%40thread.tacv2/conversations?groupId=290c33e5-82ee-49a7-bc3a-ddd52b927b75&tenantId=2fcfe26a-bb62-46b0-b1e3-28f9da0c45fd

Teams code **1ab63rj**

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