



Online
seminar

Wednesday **January 12** at 09:30

Hosted on: [Zoom](#)

Dario PACCAGNAN

Imperial College London

Two birds with one stone: optimal approximation for integral routing and congestion pricing

Prof. Como introduces the seminar.

Abstract

Motivated by fleet management in autonomous mobility, we consider the classical problem of minimizing total congestion in integral multicommodity routing, for which we provide the first polynomial time algorithm with optimal approximation. Perhaps surprisingly, we show that efficiently computed taxation mechanisms also yield the same optimal approximation achieved by the best polynomial time algorithm, even if the latter has dictatorial control over the agents' actions. It follows that no other tractable approach geared at incentivizing desirable system behavior can improve upon this result, regardless of whether it is based on taxations, coordination mechanisms, information provision, or any other principle. In short: judiciously chosen taxes achieve optimal approximation. Three technical contributions underpin this conclusion. First, we show that minimizing the total congestion is NP-hard to approximate within a given expression depending solely on the class of admissible resource costs. Second, we design a tractable taxation mechanism whose efficiency (price of anarchy) matches the hardness factor. As these results extend to coarse correlated equilibria, any no-regret algorithm inherits these same performances, allowing us to devise polynomial time algorithms with optimal approximation. Joint work with: Martin Gairing (University of Liverpool).

Biography

Dario Paccagnan is an Assistant Professor at the Department of Computing, Imperial College London since the Fall 2020. Before that, he was a postdoctoral fellow with the Center for Control, Dynamical Systems and Computation, University of California, Santa Barbara. He obtained his PhD from the Automatic Control Laboratory, ETH Zurich, Switzerland, in 2018. He received a B.Sc. and M.Sc. in Aerospace Engineering from the University of Padova, Italy, in 2011 and 2014, and a M.Sc. in Mathematical Modelling and Computation from the Technical University of Denmark in 2014; all with Honors. Dario's interests are at the interface between game theory and control theory, with a focus on the design of behavior-influencing mechanisms for socio-technical systems. Dario was a finalist for the 2019 EECI best PhD thesis award and was recognized with the SNSF Early Postdoc Mobility Fellowship, the SNSF Doc Mobility Fellowship, and the ETH medal for his doctoral work.