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Distributed Optimization in uncertain networks & the price of anarchy in electric vehicle charging control games

Prof. Kostas Margellos

Department of Engineering Science
University of Oxford

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Aula O1, Corpo O

About the speaker

Kostas Margellos received the Diploma in electrical engineering from the University of Patras, Greece, in 2008, and the Ph.D. in control engineering from ETH Zurich, Switzerland, in 2012. He spent 2013, 2014 and 2015 as a post-doctoral researcher at ETH Zurich, UC Berkeley and Politecnico di Milano, respectively. In 2016 he joined the Control Group, Department of Engineering Science, University of Oxford, where he is currently an Associate Professor. He is also a Lecturer at Worcester College. His research interests include optimization and control of complex uncertain systems, with applications to generation and load side control for power networks.

Abstract

This talk comprises two parts: In the first part we provide a distributed algorithm based on proximal minimization for distributed ocnvex optimization over time-varying multi-agent networks. Agents' constraints depend on an uncertain parameter; to tackle this problem we follow a scenario-based methodology and offer probabilistic guarantees regarding the feasibility properties of the resulting solution. Extensions on weakly coupled programs are also highlighted. In the second part we study a particular class of quadratic games, arising in optimal charging of heterogeneous plug-in electric vehicles. We approach the problem as a multi-agent game in the presence of constraints and formulate an auxiliary minimization program whose solution is shown to be the unique Nash equilibrium of the charging control game. We study the price of anarchy for this class of games, showing that in the limiting case of high population sizes. drawn randomly from a given distribution, we show that, as the number of agents tends to infinity, the value of the game achieved by the Nash equilibrium and the social optimum of the cooperative counterpart of the problem under study coincide for almost any choice of the random heterogeneity parameters. To the best of our knowledge, this result quantifies for the first time the asymptotic behaviour of the price of anarchy for this class of games.

Contact

Prof. Giuseppe Notarstefano `giuseppe.notarstefano@unisalento.it`