USC Viterbi School of Engineering

Seminar

Ming Hsieh Department of Electrical and Computer Engineering

Pick-to-Learn for Systems and Control: Data-driven design with state-of-the art safety guarantees

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Abstract: Data-driven methods have become powerful tools for tackling increasingly complex problems in Systems and Control. However, deploying these methods in real-world settings — especially safety-critical ones — requires rigorous safety and performance guarantees. This need has motivated much recent work at the interface of Statistical Learning and Control, aiming to integrate formal guarantees with data-driven design methods. However, many existing approaches achieve this only by sacrificing valuable data for testing/calibration or by restricting the design space, thus leading to suboptimal performances.

Against this backdrop, in this talk I will introduce Pick-to-Learn (P2L) for Systems and Control, a novel framework designed to equipany data-driven control method with state-of-the-art safety and performance guarantees. Crucially, P2L enables the use of all available data to jointly synthesize and certify the design, eliminating the need to set aside data for calibration or validation purposes.

I will then demonstrate how, as a result, P2L delivers designs and certificates that outperforms existing methods across a range of core problems including optimal control, reachability analysis, safe synthesis, and robust control.

Bio: Dario Paccagnan is a Senior Lecturer (US Associate Professor) and a member of the Computational Optimization Group in the Department of Computing, Imperial College London. Previously, he was a Postdoctoral Fellow at the Center for Control, Dynamical System, and Computations, UCSB hosted by Prof. Francesco Bullo and Prof. Jason Marden. Paccagnan received a PhD in optimization and control from ETH Zurich under the guidance of Prof. John Lygeros. He was awarded a B.Sc. and two M.Sc. degrees from the University of Padova, and the Technical University of Denmark under the TIME double degree program. He is interested in the modeling, analysis, and control of multi-agent systems where self-interested agents take autonomous decisions. He leverages theoretical models and real world case studies to shed light on the societal impact of self-interested decision making.

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