Online Seminar Series for IFAC TC 1.2 Adaptive & Learning Systems

Organizers: Tiago Roux Oliveira, State University of Rio de Janeiro – UERJ, TC 1.2 Chair
Bing Chu, University of Southampton, TC 1.2 Vice-Chair for Social Media

Details of the Seminar

Title: The role of adaptation in learning, safety, and optimality

Speaker: Prof. Anuradha Annaswamy, Massachusetts Institute of Technology

Time: April 25, 2024 (09:30am ET)

Abstract: The design of complex dynamic systems involves the simultaneous realization of several performance metrics ranging from mission goals, safety, management of real-time uncertainties, and optimality. This talk will focus on this realization using adaptive control. The core building blocks of adaptation and parameter learning and their integration with performance, safety, and optimality form the main focus of the talk. Three specific integrations will be examined, which include (1) adaptation and safety, (2) adaptation and optimality, and (3) adaptation and learning. For topic (1), the underlying designs will examine how adaptive control can be combined with Control Barrier Functions; for topic (2) the interconnections between adaptive control and reinforcement learning will be explored. For Topic (3), the role of persistent excitation, and the phenomenon of bursting will be discussed. Examples will be drawn from a range of engineering applications.

Bio: Dr. Anuradha Annaswamy is Founder and Director of the Active-Adaptive Control Laboratory in the Department of Mechanical Engineering at MIT. Her research interests span adaptive control theory and its applications to aerospace, automotive, propulsion, and energy systems as well as cyber physical systems such as Smart Grids and Smart Cities. She has received best paper awards (Axelby, 1986; CSM, 2010), as well as Distinguished Member and Distinguished Lecturer awards from the IEEE Control Systems Society (CSS), best paper award from the IFAC journal Annual Reviews in Control for 2021-23, and a Presidential Young Investigator award from NSF, 1991-97. She is a Fellow of IEEE and International Federation of Automatic Control. She is the recipient of the Distinguished Alumni award from Indian Institute of Science. Anu Annaswamy is the author of a graduate textbook on adaptive control, a coauthor of a 2021 report on *Future of Electric Power in the United States*, and a 2023 report on the *Role of Net-metering in the Evolving Electricity System*, both published by National Academy of Sciences, Engineering, and Medicine. She served as the President of CSS in 2020. She has been serving as a Faculty Lead in the Electric Power Systems workstream in the MIT Future Energy Systems Center since September 2021. Anu has served as the Associate Editor of IEEE Transactions on Automatic Control and Automatica. She has served as the Editor in Chief of a Special Issue on Control Theory and Technology in the IEEE Transactions on Smart Grid, and as a Guest Editor on Smart City Networks in the IEEE Transactions on Control of Network Systems. She is on the editorial board of the IEEE Open Journal of Control Systems, IEEE Access, the IFAC Annual Reviews in Control, and Asian Journal of Control. She has served as the Deputy Editor of Annual Reviews in Control from 2016-2020. With Tariq Samad, she co-edited the CSS report on Impact of Control Technology (first edition: 2011; second edition 2013). With Karl Johansson and George Pappas, she edited the CSS report “Control for societal-scale Challenges: Road Map 2030,” published in 2023. She is currently serving as the President-elect of the American Automatic Control Council. She will serve as the Editor in Chief of IEEE Control Systems magazine from January 2025.

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