Feedback Control Perspectives on Learning

Jeff Shamma, Professor, Department of Industrial and Enterprise Systems Engineering, University of Illinois at Urbana-Champaign

The impact of feedback control is extensive. It is deployed in a wide array of engineering domains, including aerospace, robotics, automotive, communications, manufacturing, and energy applications, with super-human performance having been achieved for decades. Many settings in learning involve feedback interconnections, e.g., reinforcement learning has an agent in feedback with its environment, and multi-agent learning has agents in feedback with each other. By explicitly recognizing the presence of a feedback interconnection, one can exploit feedback control perspectives for the analysis and synthesis of such systems, as well as investigate trade-offs in fundamental limitations of achievable performance inherent in all feedback control systems. This talk highlights selected feedback control concepts — in particular, robustness, passivity, tracking, and stabilization — as they relate to specific questions in evolutionary game theory, no-regret learning, and multi-agent learning.

Jeff S. Shamma is the Department Head of Industrial and Enterprise Systems Engineering (ISE) and Jerry S. Dobrovolsky Chair in ISE at the University of Illinois at Urbana-Champaign. Prior academic appointments include faculty positions at King Abdullah University of Science and Technology (KAUST), as Adjunct Professor of Electrical and Computer Engineering, and Georgia Institute of Technology, where he was the Julian T. Hightower Chair in Systems and Controls. Shamma received a PhD in Systems Science and Engineering from MIT in 1988. He is a Fellow of IEEE and IFAC; recipient of IFAC High Impact Paper Award, AACC Donald P. Eckman Award, and NSF Young Investigator Award; and a past Distinguished Lecturer of the IEEE Control Systems Society. Shamma is currently serving as Editor-in-Chief for IEEE Transactions on Control of Network Systems.