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Location: D2 LECT 2

Networked Strategic Learning for Autonomous Systems

Abstract: Networked multi-agent systems consist of multiple autonomous decision-makers that aspire to achieve their objectives in the absence of a central coordinator. Examples of these decision-makers include robots in a team, or smart meters in the electricity grid. The main challenge in these systems is to design decision-making rules that result in desired overall behavior given the limitations of agent sensing and communication. In a networked autonomous system, barring unreasonable accuracy of environmental information and unjustifiable levels of coordination, agents cannot be sure of what other agents are optimizing, as their objectives depend on the actions of others, and the dynamic and unknown environment. In such settings, agents have persisting differences in their estimates of their objectives. This talk adopts game-theoretic equilibrium notions as the optimal behavior, and presents a family of decentralized algorithms based on fictitious play, where agents reason about the actions of other agents to make their selections in random communication settings, and unknown and dynamic environments. We show the convergence of the decentralized fictitious play to an equilibrium under a general condition for communication. Based on this general condition, we provide novel communication protocols, and discuss trade-offs in communication cost versus optimality. Lastly, we provide convergence guarantees when environmental uncertainty among agents persists, i.e., when consensus is not feasible. Our results contribute to a better understanding of the value of communication and local information for succeeding as a team in autonomous systems.

Biography: Ceyhun Eksin is an assistant professor at the Industrial and Systems Engineering Department at Texas A&M University. He received his Ph.D. in Electrical and Systems Engineering from the University of Pennsylvania in 2015, and was later a Postdoctoral Fellow at the Georgia Institute of Technology, affiliated with both the School of Electrical & Computer Engineering and the School of Biological Sciences. He also holds a M.S. degree in Industrial Engineering from Boğaziçi University, Istanbul, Turkey in 2008. His B.S. degree is in Control Engineering from Istanbul Technical University, Istanbul, Turkey, which he received in 2005. His research interests are in the areas of distributed optimization, network science, game theory and control theory. His current research focuses on game theoretic modeling and optimization of multi-agent systems in biological, communication and social networks. He is a recipient of the 2023 NSF CAREER award.