THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Electrical and Computer Engineering Department and the UAH IEEE student branch invite you to a

RESEARCH SEMINAR

SPEAKER: Bosen Lian, Assistant Professor, Electrical and Computer Engineering, Auburn University

TITLE: Inverse Reinforcement Learning of Optimal Control Systems and Differential Games

TIME & PLACE: February 21, 2025, 11:00 AM; ENG 258

ABSTRACT: Natural systems and organisms optimize their actions based on implicit rewards for growth, embodying inherent optimality. This inspires engineers to design optimal feedback controls for engineering systems such as aircraft, robots, and industrial processes by optimizing a performance index (PI) to achieve desired behaviors. However, selecting suitable PIs for desired behaviors is challenging, motivating researchers to learn them from desired expert behaviors, whether from humans or autonomous systems. Classical Inverse Optimal Control (IOC) and Inverse Reinforcement Learning (IRL) infer the PI from observed expert behaviors, but IOC is offline and requires explicit system dynamics, while IRL is mainly for discrete Markov decision processes. These limitations make them less suitable for engineering systems that operate in continuous state-action spaces, have uncertain dynamics, and require stability and fast convergence. This presentation introduces a new class of data-driven IRL control techniques that integrate RL, IOC, dynamic programming, and game theory to learn desired PIs from expert demonstrations, tailored for engineering systems modeled by optimal control systems and differential games.

SPEAKER BIOGRAPHY:

Dr. Bosen Lian received his Ph.D. in Electrical Engineering Department from University of Texas at Arlington in 2021 in Arlington, TX, USA. He is currently an Assistant Professor in the Electrical and Computer Engineering Department at Auburn University. His research interests include reinforcement learning, inverse RL control, graphical games, distributed Kalman filters, cooperative control, and robotics. He is an Associate Editor of ISA Transactions and IEEE Transactions on Neural Networks and Learning Systems. For details visit the [website](#).