ELECTRICAL AND COMPUTER ENGINEERING SEMINAR

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Deployable Learning Machines: From cost-to-go estimation to certification

Date: Monday, January 31st
Time: 1:00pm-2:00pm
Location: 442 Dana
Zoom Link:
https://northeastern.zoom.us/j/91069533439

Abstract: Autonomous robots have the potential to transform our everyday lives, yet most of these systems struggle outside of the lab or carefully designed warehouses. This talk will first describe our work toward a new generation of robots that learn to handle the highly dynamic and uncertain nature of human environments. In particular, I will highlight the importance of obtaining accurate cost-to-go models, which we show can be learned from self-play or aerial imagery for a variety of applications, from navigation among pedestrians to last-mile delivery. The talk will then dive into the challenges of certifying the safety and robustness properties of machines that learn. I will describe our work that uses convex relaxations and set partitioning to simplify the analysis of highly nonlinear neural networks used across AI. These analysis tools led to the first framework for deep reinforcement learning that is certifiably robust to adversarial attacks and noisy sensor data. The tools also enable reachability analysis -- the calculation of all states that a system could reach in the future -- for systems that employ neural networks in the feedback loop, which provides another notion of safety for learning machines that interact with uncertain environments. Finally, I will discuss my long-term vision that aims to spark a new era of learning machines that can be deployed in any environment without human supervision.

Bio: Michael Everett is currently a Research Scientist in the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology (MIT). He received the S.B., S.M., and Ph.D. degrees in mechanical engineering in 2015, 2017, and 2020, respectively, at MIT. His research lies at the intersection of machine learning, robotics, and control theory. His papers have been recognized as one of the Editors' Top 5 Articles of 2021 in IEEE Access, Best Paper Award on Cognitive Robotics at IROS 2019, Best Student Paper Award and Finalist for Best Paper Award on Cognitive Robotics at IROS 2017, and Finalist for Best Multi-Robot Systems Paper Award at ICRA 2017. He has been interviewed live on the air by BBC Radio and his team's robots were featured by Today Show and the Boston Globe.