Speaker: Dr. Ayal Taitler, Department of Industrial Engineering & Management

Title: Integrated Planning, Learning and Control for Robots in Hybrid Environments.

Abstract: Robots operate in the real world, which is hybrid, i.e. comprised of continuous and discrete properties, uncertain, constrained, non-linear, and often cooperation or at least synchronization with other agents, human and robotic is required. Moreover, usually for an agent to reach its desired goal, a long-time horizon is required, which accumulates errors and makes it dimensionally impossible to discretize the problem. Each of these separately poses a major challenge for autonomous behavior. Robots must be able to come up with long-term plans in the face of these challenges in order to reach autonomy. Various communities have addressed these problems, e.g., the control, automated planning, machine learning, and robotics communities, each with its own merits and weaknesses. In this work, we attempt to bridge the gap between these communities and present a unified method leveraging accurate short-term control strategy, long-term abstract planning methods, and deep neural networks tailored on the fly. Our method can handle long, continuous horizons, allowing for concurrency and synchronization, incorporation of accurate non-linear dynamic models, while balancing between expensive accurate computations and "simple" abstract computations.

Bio: Dr. Ayal Taitler is an Assistant Professor in the Department of Industrial Engineering at Ben-Gurion University. His research focuses on hybrid discrete-continuous problems, particularly in utilizing models for decision-making in complex systems. Prior to that, Ayal was a Lyon Sachs postdoctoral fellow at the University of Toronto and a teaching fellow at the Technion's Faculty of Electrical and Computer Engineering. Ayal holds a Ph.D. from the Technion's Autonomous Systems and Robotics interdisciplinary program, where his work focused on mixed discrete-continuous planning for autonomous robotic missions. He also holds a master’s degree in reinforcement learning and a bachelor’s degree from the Technion’s Faculty of Electrical and Computer Engineering.