

Title

Using Reinforcement Learning to Solve Control Problems for Robotics

Presenter

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Abstract

The use of reinforcement learning to solve control problems is an area that has attracted a significant amount of research attention in recent years and will continue to grow, as autonomy becomes a necessity. This talk will highlight some new methods for the design of optimal policies that do not require full information of the physics of the systems. Optimization-based design has been responsible for much of the successful performance of engineered systems in aerospace, industrial processes, vehicles, ships, robotics, and elsewhere since the 1960s. We will present novel data-driven methods for nonlinear control-theoretic problems evolving in a continuous-time sense. The dynamics do not need to be known for these online solution techniques. These methods implicitly solve the required design equations without ever explicitly solving them. Different aspects of the control inputs (decision makers) in terms of cooperation, collaboration, altruistic versus selfish behavior, antagonism, competition, incentives, cheating, and other concepts of multiplayer team play will be explored.

Bio

Kyriakos G. Vamvoudakis was born in Athens, Greece. He received the Diploma (a 5 year degree, equivalent to a Master of Science) in Electronic and Computer Engineering from the Technical University of Crete, Greece in 2006 with highest honors. After moving to the United States of America, he studied at The University of Texas at Arlington with Frank L. Lewis as his advisor and he received his M.S. and Ph.D. in Electrical Engineering in 2008 and 2011 respectively. From May 2011 to January 2012, he was working as an Adjunct Professor and Faculty Research Associate at the University of Texas at Arlington and at the Automation and Robotics Research Institute. During the period from 2012 to 2016 he was a project research scientist at the Center for Control, Dynamical Systems and Computation at the University of California, Santa Barbara. He was an assistant professor at the Kevin T. Crofton Department of Aerospace and Ocean Engineering at Virginia Tech until 2018. He currently serves as an Assistant Professor at The Daniel Guggenheim School of Aerospace Engineering at Georgia Tech. He holds a secondary appointment in the School of Electrical and Computer Engineering. His research interests include reinforcement learning, control theory, cyber-physical security, bounded rationality, and safe/assured autonomy. Dr. Vamvoudakis is the recipient of a 2019 ARO YIP award, a 2018 NSF CAREER award, and of several international awards including the 2016 International Neural Network Society Young Investigator (INNS) Award, the Best Paper Award for Autonomous/Unmanned Vehicles at the 27th Army Science Conference in 2010, the Best Presentation Award at the World Congress of Computational Intelligence in 2010, and the Best Researcher Award from the Automation and Robotics Research Institute in 2011.