

Title: From machine learning and AI to control theory and physics: a holistic view of autonomy

Abstract: Despite the recent advancements in Machine Learning and AI, there is an ongoing debate and skepticism in academia as well as in industry with regards to the applicability of AI algorithms to safety critical systems. This skepticism arises from the fact that scientific communities have different standards as to when something works and how often. Another reason for this skepticism is epistemological and has to do with the way how communities evolve and pose new scientific questions.

Motivated by this debate, in this talk I will present advancements in the area of autonomy for aerial and terrestrial navigation that bridge the gap between the two scientific communities of control and AI. The underlying mathematical principles are at the intersection of stochastic control, statistical physics, machine learning and parallel computing. Inspired from these principles, new algorithms arise for perceptual control that can incorporate physics-priors. In addition, these perceptual control algorithms can be equipped with uncertainty quantification mechanisms for anomaly detection in safety critical systems. I will conclude this talk with future directions in the areas of safe AI, machine learning and control for applications in autonomy.

Bio: Evangelos A. Theodorou is an assistant professor with the Guggenheim School of aerospace engineering at Georgia Institute of Technology. He is also affiliated with the Institute of Robotics and Intelligent Machines. Evangelos Theodorou earned his Diploma in Electronic and Computer Engineering from the Technical University of Crete (TUC), Greece in 2001. He has also received a MSc in Production Engineering from TUC in 2003, a MSc in Computer Science and Engineering from University of Minnesota in spring of 2007 and a MSc in Electrical Engineering on dynamics and controls from the University of Southern California(USC) in Spring 2010. In May of 2011 he graduated with his PhD, in Computer Science at USC. After his PhD, he was a Postdoctoral Research Fellow with the department of computer science and engineering, University of Washington, Seattle. Evangelos Theodorou is the recipient of the King-Sun Fu best paper award of the IEEE Transactions on Robotics for the year 2012 and recipient of the best paper award in cognitive robotics in International Conference of Robotics and Automation 2011. He was also the finalist for the best paper award in International Conference of Humanoid Robotics 2010 and International Conference of Robotics and Automation 2017. His theoretical research spans the areas of stochastic optimal control theory, machine learning, information theory and statistical physics. Applications involve learning, planning and control in autonomous, robotics and aerospace systems.