

Tuesday, March 24, 2026 | 011 Kariotis Hall | 3:30 pm–4:30 pm

Distributionally Robust Learning – From Traditional to Deep and to Reinforcement Learning

Seminar Presented By:

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Abstract: In this talk I will present a distributionally robust optimization approach to machine learning, using general loss functions that can be used either in the context of classification or regression. Motivated by medical applications, we consider a setting where training data may be contaminated with (unknown) outliers. The robust learning problem is formulated as the problem of minimizing the worst case expected loss over a family of distributions that are close to the empirical distribution induced by the training data. We will explore the generality of this approach, its robustness properties, its ability to explain a host of "ad-hoc" regularized learning methods, and we will establish rigorous out-of-sample performance guarantees. Beyond predictions, we will discuss methods that can leverage the robust predictive models to make decisions and offer specific personalized prescriptions and recommendations to improve future outcomes. We will also discuss how distributionally robust learning can be used in deep neural network classification, considering applications in computer vision. Finally, we will discuss how this framework can be used for safe reinforcement learning, solving a robust variant of a constrained Markov Decision Process problem with applications in robotics and autonomous systems.

Bio: Ioannis (Yannis) Paschalidis is a Distinguished Professor of Electrical and Computer Engineering, Systems Engineering, and Biomedical Engineering, and Founding Professor of Computing & Data Sciences at Boston University. He is the Director of the Hariri Institute for Computing and Computational Science & Engineering -- BU's federation and convergence accelerator of all University centers and initiatives in this area of research. He obtained a Diploma (1991) from the National Technical University of Athens, Greece, and an M.S. (1993) and a Ph.D. (1996) from the Massachusetts Institute of Technology (MIT), all in Electrical Engineering and Computer Science. His current research interests lie in the fields of optimization, control, stochastic systems, robust learning, computational medicine, and computational biology. He has published a monograph and more than 300 refereed papers in these topics, and he has been the primary advisor to 40 Ph.D. theses. His work has been recognized with a CAREER award from the National Science Foundation, several best paper awards, and an IBM/IEEE Smarter Planet Challenge Award. His work on health informatics won an IEEE Computer Society Crowd Sourcing Prize and a best paper award by the International Medical Informatics Associations (IMIA). He was an invited participant at the 2002 Frontiers of Engineering Symposium organized by the National Academy of Engineering, and at the 2014 National Academies Keck Futures Initiative (NAFKI) Conference. He is a Fellow of IEEE, IFAC (International Federation of Automatic Control), American Institute for Medical and Biological Engineering (AIMBE), and the Asia-Pacific Artificial Intelligence Association. He is also a Distinguished Member of the IEEE Control Systems Society. From 2013 to 2019 he was the founding Editor-in-Chief of the IEEE Transactions on Control of Network Systems and he was the General Co-Chair of the 2025 IEEE Conference on Decision and Control.

Hosted by: Prof. Xubo Yue, Assistant Professor in the Department of Mechanical and Industrial Engineering