EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Wasserstein Distributionally Robust Optimization: Theory and Applications in Machine Learning

ABSTRACT - Many decision problems in science, engineering and economics are affected by uncertain parameters whose distribution is only indirectly observable through samples. The goal of data-driven decision-making is to learn a decision from finitely many training samples that will perform well on unseen test samples. This learning task is difficult even if all training and test samples are drawn from the same distribution - especially if the dimension of the uncertainty is large relative to the training sample size. Wasserstein distributionally robust optimization seeks data-driven decisions that perform well under the most adverse distribution within a certain Wasserstein distance from a nominal distribution constructed from the training samples. In this talk we will see that this approach has many conceptual and computational benefits. Most prominently, the optimal decisions can often be computed by solving tractable convex optimization problems, and they enjoy rigorous out-of-sample and asymptotic consistency guarantees. We will also show that Wasserstein distributionally robust optimization has interesting ramifications for statistical learning and motivates new approaches for fundamental learning tasks such as classification, regression, maximum likelihood estimation or minimum mean square error estimation, among others.

Dr. Daniel Kuhn
Chair
Risk Analytics and Optimization
The Ecole Polytechnique
Fédérale de Lausanne (EPFL)

SPEAKER BIO – Daniel Kuhn holds the Chair of Risk Analytics and Optimization at EPFL. Before joining EPFL, he was a faculty member at Imperial College London (2007–2013) and a postdoctoral researcher at Stanford University (2005–2006). He received a Ph.D. in Economics from the University of St. Gallen in 2004 and an M.Sc. in Theoretical Physics from ETH Zürich in 1999. His research interests revolve around robust optimization and stochastic programming.

USC Viterbi
School of Engineering
Daniel J. Epstein Department of Industrial and Systems Engineering

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