EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Nonconvex and Nonsmooth Stochastic Optimization With Modern Applications

ABSTRACT - In recent years, motivated by the modern applications in operations research and machine learning, there is a growing interest of nonconvex, nonsmooth and nondeterministic optimization problems. In this talk, we address two classes of "non-problems" with the goal of computing stationary solutions by sampling-based algorithms and the nonconvex-nondifferentiable methodology. In the first part of this talk, we focus on the nonconvex piecewise affine regression when the training data is contaminated by outliers. We propose a risk-based robust learning model so that the outliers are automatically removed in model fitting. With the piecewise affine regression function, the parameter estimation problem can be reformulated as a difference-of-convex stochastic program (SP). We develop a sampling-based difference-of-convex algorithm to obtain an asymptotically critical point with probability 1. Numerical experiments show that the risk-based robust regression model has smaller mean absolute errors and smaller variance than the ordinary least square model and classical robust regression models. In the second part of the talk, we study a structured compound stochastic program involving two-layer expectations coupled by nonconvex and nonsmooth functions. This class of problems are motivated from multiple risk measure minimization problems, including generalized deviation optimization problems and the cost-sensitive multiclass classification. To solve the nonsmooth and nonconvex compound SP, we present a successive convex-programming based sampling algorithm with the subsequential convergence, and describe stationarity properties of the limit points for several specific classes of problems. For such sampling-based algorithm, we further discuss probabilistic stopping rules based on the computable error bound.

Dr. Junyi Liu
Postdoctoral Associate
Epstein Dept. of Industrial & Systems Engineering, USC

SPEAKER BIO – Junyi Liu is currently a Postdoctoral Associate at the Department of Industrial and Systems Engineering at the University of Southern California. She obtained a Ph.D. degree in Industrial and Systems Engineering at the University of Southern California in 2019. She obtained a B.S. degree in Statistics in the School of Gifted Young at the University of Science and Technology of China in 2015. Her research interests lie in stochastic programming with intersections of machine learning and statistics, and the applications in inventory management, revenue management, and renewable power planning.

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

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