Industrial & Systems Engineering
Seminar Announcement

An Introduction to Two-Stage Stochastic Mixed-Integer Programming

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Abstract: Over the years, mixed-integer programming (MIP) and stochastic programming (SP) have not only earned the reputation of addressing some of the more important applications of optimization, but they also represent two of the more challenging classes of optimization models. The discrete and non-convex aspects of MIP, and the need to capture uncertainty via SP, raise serious conceptual and computational challenges. It is then no surprise that a combination of these two classes of models, namely stochastic mixed-integer programming (SMIP), engenders even further hurdles. Nevertheless, success with SMIP models is likely to pay tremendous dividends because of their vast applicability. Applications of SMIP models have appeared in a variety of domains such as power grid operations, location under uncertainty, capacity expansion for manufacturing, supply chain design, and many more. Because of this growing array of applications, there is also growing interest in models and algorithms for SMIP.

In this talk, we provide an introduction to algorithms for two-stage stochastic mixed-integer programs. Our focus is on methods which decompose the problem by scenarios, which represent the randomness in the problem data. The design of these algorithms depend on where the uncertainty appears (right-hand-side, recourse matrix and/or technology matrix) and where the continuous and discrete decision variables are (first-stage and/or second-stage). In addition, we provide computational evidence that, similar to other classes of stochastic programming problems, decomposition methods can provide desirable theoretical properties (such as finite convergence) as well as enhanced computational performance when compared to solving a deterministic equivalent formulation using an advanced commercial MIP solver.

This talk is based on a tutorial given at the 2017 INFORMS Annual Meeting with Suvrajeet Sen.

Bio: *Simge Küçükyavuz* is an Associate Professor in the Industrial & Systems Engineering Department at the University of Washington. Prior to joining the faculty at the University of Washington, Dr. Küçükyavuz was a faculty member at the Ohio State University and the University of Arizona and a research associate at Hewlett-Packard Laboratories. She received her Ph.D. degree in Industrial Engineering and Operations Research from the University of California, Berkeley. Her interests are in mixed-integer programming, large-scale optimization, optimization under uncertainty, and their applications. Her research is supported by multiple grants from the National Science Foundation, including the 2011 CAREER Award. She is the co-winner of the 2015 ICS (INFORMS Computing Society) Prize, and serves on the editorial boards of several journals.

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