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Industrial and Systems Engineering Seminar Series
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Approximate Percentile Optimization in Linear Programming

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3024 Emerging Technologies Building

Abstract: We investigate an iterative, data-driven approximation to a linear optimization problem with uncertain parameters (objective coefficients or constraint parameters) for which sample observations are available. In the first part of the work, we introduce the concept of pw-robustness to aid in the solution methodology and compare the performance of our proposed approach to that of the exact mixed integer programming formulation when the problem is of scale small enough to be solved as a MIP in a reasonable time frame. We use our observations to derive guidelines to solve percentile optimization for larger problems. Our application of choice is portfolio optimization, although the technique can be applied to other areas such as revenue management. In the second part of the work, we compare solution performance with that obtained using traditional techniques drawn from the financial literature, such as Gaussian approximation. We further incorporate factor models and model uncertainty into our framework, and show how the approach can be used to provide the decision-maker with insights into which scenarios (historical data points) drive the solution. Numerical results indicate that the approximation exhibits strong empirical performance.

Joint work with Virginie Gabrel and Cécile Murat of the Université Paris-Dauphine and Elcin Cetinkaya of Lehigh University.

Bio: Aurélie Thiele is an Associate Professor in Industrial and Systems Engineering at Lehigh University in Bethlehem, PA. Her research focuses on decision-making under high amounts of uncertainty. She currently serves as the co-director of the Master of Science program in Analytical Finance at Lehigh and is the recipient of an IBM Faculty Award, a P.C. Rossin Assistant Professorship (2006-2008) and several NSF grants, among others. She holds a MS and a PhD from the Massachusetts Institute of Technology and a "diplôme d'ingénieur" from the Ecole des Mines de Paris in France.