ID de Contribution: **290** Type: **Non spécifié**

Multistage Distributionally Robust Mixed-Integer Programming with Decision-Dependent Moment-Based Ambiguity Sets

mardi 29 juillet 2025 12:21 (24 minutes)

We study multistage distributionally robust mixed-integer programs under endogenous uncertainty, where the probability distribution of stage-wise uncertainty depends on the decisions made in previous stages. We first consider two ambiguity sets defined by decision-dependent bounds on the first and second moments of uncertain parameters and by mean and covariance matrix that exactly match decision-dependent empirical ones, respectively. For both sets, we show that the subproblem in each stage can be recast as a mixed-integer linear program (MILP). Moreover, we extend the general moment-based ambiguity set in Delage and Ye (2010) to the multistage decision-dependent setting, and derive mixed-integer semidefinite programming (MISDP) reformulations of stage-wise subproblems. We develop methods for attaining lower and upper bounds of the optimal objective value of the multistage MISDPs, and approximate them using a series of MILPs. We deploy the Stochastic Dual Dynamic integer Programming (SDDiP) method for solving the problem under the three ambiguity sets with risk-neutral or risk-averse objective functions, and conduct numerical studies on multistage facility-location instances having diverse sizes under different parameter and uncertainty settings. Our results show that the SDDiP quickly finds optimal solutions for moderate-sized instances under the first two ambiguity sets, and also finds good approximate bounds for the multistage MISDPs derived under the third ambiguity set. We also demonstrate the efficacy of incorporating decision-dependent distributional ambiguity in multistage decision-making processes.

Author: YU, Xian (The Ohio State University)

Co-auteur: Prof. SHEN, Siqian (University of Michigan)

Orateur: YU, Xian (The Ohio State University)

Classification de Session: Mini-symposium