

From Data to Decisions: Decision Making with Side Information

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ABSTRACT

Uncertainty in classical stochastic programming models is often described solely by independent random parameters, ignoring their dependence on multidimensional side information. In this talk, we focus on two popular stochastic programming frameworks, namely chance-constrained and expected-value-constrained programming. We describe a novel contextual chance- and expected-value- constrained programming formulations that incorporate side information into the decision-making framework. We argue that solutions that do not take the side information into account may not be implementable. Our formulations cannot be solved exactly in most cases, and we propose tractable and fully data-driven approximate models that rely on weighted sums of random variables. Borrowing results from large deviation theory, we show the convergence of our schemes as the number of data points increases. We illustrate our findings on synthetic as well as real data.

Keywords

Decision Making, Data, Stochastic programming, Information.