

Scenario-based optimization: the wait-and-judge approach

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Abstract:

Scenario optimization is a well recognized data-driven constrained optimization methodology, where uncertainty is described by a statistical sample of constraints obtained from previous experience and one optimizes accounting for these constraints only. One fundamental issue of scenario optimization is then the evaluation of the generalization properties of the so-obtained solution. It is said that the scenario solution generalizes well if it satisfies most of the other constraints besides the collected sample. Over the past ten years, the main theoretical investigations on the scenario approach have related the generalization property of scenario solutions to the number of optimization variables. As is intuitive, the larger the size of the optimization domain, the more the degrees of freedom and the lesser the generalization ability.

This talk breaks into the new paradigm that the generalization level is a-posteriori evaluated after that the solution is computed and the actual number of so-called support constraints is assessed (wait-and-judge). A new theory will be presented, which shows that a-posteriori observing k support constraints allows one to draw conclusions almost as strong as those obtainable when the problem is from the outset in dimension k . This allows one to draw evaluations that largely outperform those carried out based on the number of optimization variables, and gives a clear picture of the structure of scenario-based optimization problems.