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A Two-Step Warm Start Method Used for Solving Large-Scale Stochastic Mixed-Integer Problems

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Solving large-scale stochastic optimization problems is challenging, especially when uncertainties are represented by a large number of scenarios. To tackle this, we introduce TULIP ("Two-step warm start method Used for solving Large-scale stochastic mixed-Integer Problems"), an efficient approach for solving two-stage stochastic (mixed) integer programs with an exponential number of constraints. TULIP consists of two steps: we first generate a reduced set of representative scenarios and solve the root node of the corresponding integer linear program using a cutting-plane method. The generated constraints are then used to accelerate solving the original problem with the full scenario set in the second phase. We demonstrate the generic effectiveness of this method on two benchmark problems: the Stochastic Capacitated Vehicle Routing Problem and the Two-Stage Stochastic Steiner Forest Problem. In our numerical experiments, we find that TULIP yields significant computational gains compared to solving the problem directly with branch-and-cut.

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