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Application-Driven Optimal Pointwise Forecasts for a Class of Two-Stage Stochastic Programs

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We consider the class of two-stage stochastic programs with uncertainty only on the right-hand side. Such a class encompasses practical many problems, especially in inventory models. We show that, under certain conditions, there exist an optimal scenario, in the sense that solving the problem with that scenario yields the same optimal solution as the original problem. In the case data-driven problems with contextual information, the result means that pointwise forecasts of the uncertain variables can be optimal. While such a scenario—which does not have be unique—is usually unknown, we present an integrated learning and optimization procedure that yields the best approximation of that scenario within the modeler's pre-specified set of parameterized forecast functions. Numerical results conducted with inventory problems from the literature as well as a microgrid energy management problem with real data demonstrate that the proposed approach performs well when compared to benchmark methods.

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