

Optimize, then Predict

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This paper proposes an Optimize-then-Predict framework in which we identify the optimal decision before predicting or observing the realized values. The optimization part can be run in low-demand environments, saving computational time during runtime. We also propose computationally efficient inferences for the evaluation of model performance.

This paper shows that in any optimization problem, the expected loss always equals the covariance between the optimal decision and the decision variables, such as costs. The decision variables may be known or unknown at the time the optimal decision is made. However, the expected loss can be estimated in advance from historical or even simulated data.

This paper also derives an ex ante optimal closed-form solution for any predict-then-optimize problem. In addition, the paper shows that in expectation, predict-then-optimize problems are equivalent to optimize-then-predict problems. Empirical experiments on the shortest path algorithm verify the claims in the paper.

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Classification de Session: Contextual stochastic programming

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