

Algorithm is Experiment: Machine Learning, Market Design, and Policy Eligibility Rules

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Abstract

Machine learning, market design, and other algorithms produce a growing portion of decisions and recommendations. Such algorithmic decisions are natural experiments (conditionally quasi-randomly assigned instruments) since the algorithms make decisions based only on observable input variables. We use this observation to characterize the sources of causal-effect identification for a class of stochastic and deterministic algorithms. Data from almost every algorithm is shown to identify some causal effect.

This identification result translates into a treatment-effect estimator. We prove that our estimator is consistent and asymptotically normal for well-defined causal effects. The estimator is easily implemented even with high-dimensional data and complex algorithms. Our estimator also induces a high-dimensional regression discontinuity design as a key special case.