Estimating Functionals of the Joint Distribution of Potential Outcomes with Optimal Transport

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Abstract

Many causal parameters depend on a moment of the joint distribution of potential outcomes. Such parameters are especially relevant in policy evaluation settings, where noncompliance is common and accomodated through the binary treatment, binary instrument model of Imbens and Angrist (1994). This paper shows that the sharp identified set of these parameters is an interval with endpoints characterized by the value of optimal transport problems. Sample analogue estimators are proposed based on the dual problem of optimal transport. These estimators are $\sqrt{n}$-consistent and converge in distribution under mild assumptions. Inference procedures based on the bootstrap are straightforward and computationally convenient.