

Matching Using Sufficient Dimension Reduction for Causal Inference

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Abstract: To estimate causal treatment effects, we propose a new matching approach based on the reduced covariates obtained from sufficient dimension reduction. Compared with the original covariates and the propensity score, which are commonly used for matching in the literature, the reduced covariates are nonparametrically estimable and are effective in imputing the missing potential outcomes, under a mild assumption on the low-dimensional structure of the data. Under the ignorability assumption, the consistency of the proposed approach requires a weaker common support condition. In addition, researchers are allowed to employ different reduced covariates to find matched subjects for different treatment groups. We develop relevant asymptotic results and conduct simulation studies as well as real data analysis to illustrate the usefulness of the proposed approach.