CAUSAL SURVIVAL EMBEDDINGS: NON-PARAMETRIC COUNTERFACTUAL INFERENCE UNDER CENSORING

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ABSTRACT

Counterfactual inference at the distributional level presents new challenges with censored targets, especially in modern healthcare problems. To mitigate selection bias in this context, we exploit the intrinsic structure of reproducing kernel Hilbert spaces (RKHS) harnessing the notion of kernel mean embedding. This enables the development of a non-parametric estimator of counterfactual survival functions. We provide rigorous theoretical guarantees regarding consistency and convergence rates of our new estimator under general hypotheses related to smoothness of the underlying RKHS. We illustrate the practical viability of our methodology through extensive simulations and a relevant case study: the SPRINT trial. Our approach presents a distinct perspective compared to existing methods within the literature, which often rely on semi-parametric approaches and confront limitations in causal interpretations of model parameters.

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