

# Personalized treatment selection for joint optimization of survival and other outcomes

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## Abstract

In this work, we propose a novel method for individualized treatment selection when the treatment response is multivariate which includes a survival component that is subject to right censoring. Since our method covers arbitrary number of treatments and outcome variables, it can be applied to a broad set of models. In addition, the performance measure for each component response can be adjusted depending on the nature of the response. As for example, for a survival component, we might use the difference of mean survivals whereas, for some other clinical covariate, a difference of means may be more suitable. The proposed joint optimization method uses a rank aggregation technique to estimate an ordering of treatments based on ranked lists of treatment performance measures. The method has the flexibility to incorporate patient and clinician preferences to the optimal treatment decision on an individual case basis. An empirical study demonstrates the performance of the proposed method in finite samples. We also present a data analysis using a HIV clinical trial data to show the applicability of the proposed procedure for real data.

## Keywords

Design variables, Personalized treatments, Single index models, Rank aggregation.