

Pseudo-value regression in competing risks settings

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ABSTRACT: In a competing risks setting for time-to-event data the cumulative incidence, i.e. the proportion of an event type observed up to a certain time, is an easily interpretable quantity and patients can be compared with respect to their cumulative incidence for different competing risks. One way to analyze effects on the cumulative incidence is by using a pseudo-value approach, which allows, among others, the application of regression with time-varying effects. As the resulting effect estimates are often not smooth over time, we present a smoothing algorithm based on pairwise switches of the first observed event times and its impact on the estimates. In order to improve the interpretability we additionally present confidence bands for the separate estimates based on the resampling method.

These methods are illustrated for a stagewise regression algorithm based on pseudo-values for the cumulative incidence estimated at a grid of time points for a time-to-event setting with competing risks and right censoring. This algorithm provides an approach for estimating the effect of covariates in the course of time, by coupling variable selection across time points but allowing for separate estimates. We apply the algorithm to clinical cancer registry data from hepatocellular carcinoma patients.

The use of smoothing is seen to improve interpretability of results from pseudo-value regression which enables the estimation of model parameters that have a straightforward interpretation in particular in combination with smooth confidence bands. Additionally time-varying effects on the cumulative incidence can be judged with the confidence bands, as illustrated for the application.