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TITLE: A Bayesian Approach to Mixture Cure Models from Low-to High-Dimensional Covariate Settings

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Abstract

When dealing with survival data, the presence of substantial censoring following a prolonged follow-up period often indicates the presence of cured individuals who may never experience the outcome of interest. This phenomenon can be observed in certain clinical investigations, such as cancer studies, and becomes more noticeable among patients diagnosed in the early stages of disease progression. Furthermore, advancements in cancer treatments have led to a substantial number of patients being classified as cured. In such circumstances, it is reasonable to consider a mixture cure model that combines cured and uncured fractions, rather than using traditional methods in survival analysis, which assume that all individuals in the sample will eventually experience the outcome of interest. In the mixture cure model, the overall population lifetime is defined by weighting the survival time of susceptible and cured patients with the uncured and cured rates, respectively.
In this study, we aim to investigate mixture cure models under different settings using a Bayesian approach for both low-dimensional and high-dimensional covariate cases. First, we introduce a Bayesian method to handle low-dimensional covariates for the semiparametric mixture cure model, and compare it with the corresponding frequentist alternatives. Subsequently, we extend this model to the high-dimensional covariate setup, proposing a novel approach that incorporates penalization. We will present simulation study results to assess the performance of the models in both low-and high-dimensional covariate scenarios.

Keywords: Mixture cure frailty model; Bayesian variable selection; High-dimensional covariates.