Prediction of the Appearance of Cardiotoxicity with Mixture Cure Models and the npcure R Package

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Abstract

In survival analysis, there are situations in which not all subjects are susceptible to the final event. For example, if the event is a cancer therapy-related adverse effect, known as cardiotoxicity, there will be a fraction of patients (considered as cured) that will never experience it. Mixture cure models allow to estimate the probability of cure and the survival function for the uncured subjects. The R package npcure implements a completely nonparametric approach for estimating the cure rate and the survival function of the uncured population in mixture cure models. Bootstrap bandwidth selectors for the estimators are also included. In addition, the package implements a nonparametric covariate significance test for the cure probability which can be applied with a continuous, discrete or qualitative covariate. These methods are applied to a dataset related to cardiotoxicity in breast cancer patients from the University Hospital of A Coruña. The goal is to determine whether and how certain factors affect the probability of experiencing the cardiovascular problem and the amount of time it takes for it to manifest. Understanding risk factors may lead to a patient-based preventive medicine.

Keywords

Censored data, cure models, nonparametric methods, survival analysis