Mixture Cure Models: some recent extensions and a new challenging goal

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Abstract: Cure models are special survival models that allow a fraction of subjects to be immune to the event of interest. It is natural to model the survival data with a cure fraction as a mixture of the cured and uncured subjects. The goal of a mixture cure model is to estimate the probability of experiencing the event and the survival distribution of uncured subjects, both as functions of covariates of interest. Handling survival data with a cured fraction entails a major problem. A subject whose event is observed (uncensored) is known to be uncured. However, censoring prevents from observing whether a censored subject would eventually experience the event or not. This hinders the classification of censored observations as cured or uncured, thus cure status is usually modelled as a latent variable. In this talk I will briefly revisit main mixture cure models and recent extensions related to this limitation.

The concept of dependence among random observations plays a central role in many fields. In survival analysis, measuring the relationship between the lifetime and a covariate is usually of major interest. *Distance correlation* is a novel class of multivariate dependence coefficients with advantages over classical correlation coefficients: it is applicable to random vectors of arbitrary dimensions not necessarily equal, and it is zero if and only if when the random vectors are independent. I will explore the challenges when the goal is to measure dependence between the survival time and a covariate in presence of cure using distance correlation, along with some open questions.

Keywords: Bootstrap, Censoring, Distance correlation; Nonparametric estimation; U-statistic.