

AMS280B-01: Seminars in Statistics for Dec-3rd (Monday 4pm at BE 156)

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Title: Recurrent Events Analysis With Data Collected at Informative Clinical Visits in Electronic Health Records

Abstract: Although increasingly used as a data resource for assembling cohorts, electronic health records (EHR) pose a number of analytic challenges because they are primarily collected for clinical encounters rather than for research purpose. In particular, patient's health status influences when and what data are recorded, generating sampling bias in the collected data. In this paper, we consider recurrent event analysis using EHR data. Conventional regression methods for event risk analysis usually require the values of covariates to be observed throughout the follow-up period. In EHR databases, time-dependent covariates are intermittently measured during clinical visits, and the timing of these visits is informative in the sense that it depends on the disease course. Simple methods, such as the last-observation-carried-forward approach, can lead to biased estimation. On the other hand, complex joint models require additional assumptions on the covariate process and cannot be easily extended to handle multiple longitudinal predictors. By incorporating sampling weights derived from estimating the observation time process, we develop a novel estimation procedure based on inverse-intensity-weighting and kernel-smoothing for the semiparametric proportional rate model of recurrent events. The proposed methods do not require model specifications for the covariate processes and can easily handle multiple time-dependent covariates. The estimators for the regression parameters are asymptotically unbiased and normally distributed with a root- $\{n\}$ convergence rate. Simulation studies are conducted to evaluate the performance of the proposed estimator. Our methods are applied to a kidney transplant study for illustration. (Joint work with Yifei Sun, Charles McCulloch, and Kieren Marr)