University of California, Irvine
Statistics Seminar

Time-varying Coefficient Models for Joint Modeling of Mixed Longitudinal Outcomes

Esra Kurum
Assistant Professor
University of California, Riverside

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(Bldg. #314 on campus map)

We propose two joint modeling frameworks for estimating the time-varying association between longitudinal responses of mixed type, e.g., binary and count. A major challenge in joint modeling mixed responses is the lack of a multivariate distribution. To overcome this challenge, when the longitudinal outcomes of interest are binary and continuous, we suggest introducing a normal latent variable underlying the binary response and factorizing the model into two components: a marginal model for the continuous response, and a conditional model for the binary response given the continuous response. We develop a two-stage estimation procedure and establish the asymptotic normality of the resulting estimators. This approach is illustrated by an empirical analysis of ecological momentary assessment data (EMA) collected in a smoking cessation study, in which the question of interest is to investigate the association between urge to smoke, continuous response, and the status of alcohol use, the binary response, and how this association varies over time. A generalization of the first approach is proposed via bringing arbitrary response type and dimension greater than two to time-varying joint modeling, which is achieved by proposing a copula-based joint modeling framework for mixed longitudinal responses. Our approach permits all model parameters to vary with time, and thus will enable researchers to reveal dynamic response–predictor relationships and response–response associations. We call the new class of models timecop because we model dependence using a time-varying copula. We develop a one-step estimation procedure for the timecop parameter vector, and also describe how to estimate standard errors. We illustrate the applicability of our approach by analyzing longitudinal responses from the Women's Interagency HIV Study.

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