Time Series and Longitudinal Analysis

Chair: Eleanor Pullenayegum (University of Toronto & Hospital for Sick Children)

JOSHUA POHLKAMP-HARTT, Queen's University
Tackling Data Synthesis Using a Multitaper Spectrum Estimation Technique

Whether you are interested in interpolation or prediction of a time series, synthesizing data can be a difficult task. This is especially true under suboptimal conditions. Our method of modeling the periodic elements of a process using Multitaper Spectrum Estimation is no different. Using re-sampling and cross validation to improve the performance of our model, we demonstrate an effective synthesis method.

NADARAJAH THARSHANNA, Memorial University of NL
Variable Selection for Longitudinal Data Analysis

High-dimensional longitudinal data with large number of covariates, have become increasingly common in many biological applications. The joint likelihood function for longitudinal data is challenging, particularly for correlated discrete outcome data. In such a situation, we propose penalized empirical likelihood based on generalized estimating equations (GEE). The proposed approach only requires specifying the first two marginal moments and a correlation structure. Simulation studies show that when model assumptions are true, its performance is comparable to that of the existing methods and when the model is misspecified, our method has clear advantages over the existing methods.

SHAHEDUL KHAN, University of Saskatchewan
Modeling a Mixture of Linear and Changepoint Trajectories for Longitudinal Time-Series Data

Longitudinal changepoint data arise in many applications. Examples include transition of core body temperature following the hypothermia therapy and prostate-specific antigen levels following treatment. The trend change occurs due to a shock (e.g., treatment) to the system. Thus, an individual exhibiting a linear trend could be an indication of insignificant effects of the shock. One of the goals of this type of study is to investigate whether the shock is significantly associated in changing the trajectory trend. We develop bent-cable methodology accounting for trajectories exhibiting either a linear trend or a trend change characterized by gradual or abrupt transition.

KEXIN JI, University of Waterloo
A Bivariate Semiparametric Stochastic Mixed Model

The analysis of bivariate cyclic longitudinal data remains an open problem. In this talk, we propose a bivariate semiparametric stochastic mixed model for such analysis, where each univariate model is described by its own fixed effects, a periodic smooth nonparametric function for the underlying time effect, a random effect accounting for between-subject variance, and a Gaussian process driving the within-subject variance. We will briefly describe the likelihood estimation/prediction procedure of all model parameters/effects. The proposed method is applied to a simulation study and, as time permits, an analysis from a study of longitudinal levels of female hormone data.

WEI QIAN, Carleton University
Quadratic Inference Functions for Longitudinal Survey Data

This paper considers marginal models for longitudinal survey data, via the quadratic inference functions (QIF) method (Qu et al. 2000). We propose weighted QIF method, and sampling weights are used to account for survey design feature. We adopt a two-phase framework under which the inference subjects to two sources of randomness: model and sampling design. We study

large sample properties of the weighted QIF estimator: consistency and normality. We also use the weighted QIF to construct likelihood ratio type test and examine the limiting distribution of the test statistic. Simulation results are presented.

Key Words: Joint Randomization, Longitudinal Survey Data

YUKUN ZHANG, University of Calgary

On Covariance Misspecification in Repeated Measures Discriminant Analysis

Repeated measures discriminant analysis (RMDA) models have been developed for predicting group membership in multivariate repeated measures data. But these procedures are sensitive to departures from the multivariate normality assumption. This study investigates the effects of covariance structure misspecification on the predictive performance of the RMDA procedures based on Kronecker product covariance structures in non-normal repeated measures data using Monte Carlo techniques. The RMDA procedures exhibited inflated predictive accuracies when the covariance structures are misspecified under normally distributed data but becomes attenuated in non-normal repeated measures data. Some relevant guidelines for choosing among these proposed procedures are discussed.