Submittee: Gemai Chen
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Department of Mathematics and Statistics, University of Calgary

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Topic:
The 37th Annual Meeting of Alberta Statisticians

Organizers:
Chen, Gemai, Department of Mathematics & Statistics, University of Calgary
Chough, Keumhee, Department of Mathematical and Statistical Science, University of Alberta

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Speakers:
Ms Iram Usman
Department of Mathematical and Statistical Sciences, University of Alberta

Title: An examination of spatial scan statistics for time to event data

Abstract: The spatial scan statistic (SSS) has been used for the identification of geographical clusters of higher numbers of cases of an illness than expected. Disease outbreaks in a geographic area are a typical example. These statistics can also identify geographic areas with longer time to events if the SSS uses appropriate distributions. Other authors have proposed the exponential and Weibull distributions for the event times. We propose the log-Weibull as an alternative distribution for the SSS and compare and contrast the three distributions through simulation studies to investigate Type I censoring. Methods are also illustrated on time to specialist visit (cardiology or internal medicine) data for discharged patients presenting to Emergency Departments for atrial fibrillation and flutter in Alberta during 2010-2011. The results from the exponential, Weibull, and log-Weibull SSS's show that, all distributions were capable of detecting the same most likely cluster for the patients presenting to ED for an AFF in Alberta, but the Weibull distribution had the highest power of detecting the potential cluster amongst all. This was true under all differential right censoring situations for each generated dataset from four different probability models.

Dr. Bei Jiang
Department of Mathematical and Statistical Sciences, University of Alberta

Title: Latent class modeling using matrix-valued covariates with application to identifying early placebo responders based on EEG signals

Abstract: Latent class models are widely used to identify latent subgroups based upon one or more manifest variables. The probability of belonging to each subgroup can be simultaneously related to a set of measured covariates. In this talk, we extend existing latent class models to incorporate matrix covariates. This research is motivated by a placebo-controlled depression clinical trial. One study goal is to identify a subgroup of subjects who benefit from placebo effect (i.e., early placebo responders) as manifested by a clinical depression severity measure; and to relate the likelihood of belonging to this subgroup to baseline Electroencephalography (EEG) measurement that takes the form of a matrix. The proposed method is built upon a low rank Candecomp/Parafac (CP) decomposition to express the target coefficient matrix through low-dimensional latent variables, which effectively reduces the model dimensionality, and utilizes a Bayesian hierarchical modeling approach to estimating these latent variables, which provides a way to incorporate prior knowledge on the patterns of covariate effect heterogeneity and provides a data-driven method of regularization. Our simulation studies suggest that our proposed method is also robust against potentially mis-specified rank in the CP decomposition. Finally in our motivating example, we show that the proposed method allows us to extract useful information from baseline EEG measurements that explains the likelihood of belonging to the early placebo responder subgroup

Dr. Hua Shen
Department of mathematics and Statistics, University of Calgary

Title: The statistical analysis of recurrent event processes subject to interval-censoring and resolution

Abstract: In life history studies, the event of interest can occur multiple times but the process may not be observed continuously thus the exact occurrence times of the event maybe unknown. Interval-censored recurrent event data arise when the subject is observed only at discrete time points and only the cumulative event counts are recorded at these periodic assessment times. In some settings, the underlying chronic disease processes may resolve, and adverse events will cease to occur at the time of disease resolution. An expectation-maximization algorithm was developed to fit a dynamic mover-stayer model to interval-censored recurrent event data under a Markov model with a piecewise-constant baseline rate function given a latent process. The multi-state model is motivated by the challenge that both the event times and the resolution time of the disease process are unobserved and it accounts for two types of uncertainty simultaneously. The likelihood and algorithm are shown to yield estimators with small empirical bias in simulation studies. The methodology is applied to analyze the cumulative number of damaged joints in patients with psoriatic arthritis where some individuals experience disease remission.

Dr. Ying Yan
Department of mathematics and Statistics, University of Calgary

Title: Improving Efficiency of Parameter Estimation in Case-Cohort Studies with Multivariate Failure Time Data

The case-cohort study design is an effective way to reduce cost of assembling and measuring expensive covariates in large cohort studies. Recently, several weighted estimators were proposed for the case-cohort design when multiple diseases are of interest. However, these existing weighted estimators do not make use of the covariate information available in the whole cohort. Furthermore, the auxiliary information for the expensive covariates, which may be available in the studies, cannot be incorporated directly. In this talk, we propose a class of updated-estimators. We show that, by making effective use of the whole cohort information, the proposed updated-estimators are guaranteed to be more efficient than the existing weighted estimators asymptotically. Furthermore, they are flexible to incorporate the auxiliary information whenever available. The advantages of the

proposed updated-estimators are demonstrated in simulation studies and a real data analysis.

Links:

File Uploads:
Additional Upload 1: http://www.pims.math.ca/files/final_report/ScientificReporttoPIMS2015.pdf

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