Submittee: Gemai Chen
Date Submitted: 2017-10-15 15:10
Title: 39th Annual Meeting of Alberta Statisticians
Event Type: Conference-Workshop

Location:
Department of Mathematics & Statistics, University of Calgary

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Dates:
September 30, 2017

Topic:
39th Annual Meeting of Alberta Statisticians

Organizers:
Chen, Gemai, Department of Mathematics & Statistics, University of Calgary

Mizera, Ivan, Department of Mathematical and Statistical Sciences, University of Alberta

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Speakers:
Adam Kashlak
Department of Mathematical and Statistical Sciences, University of Alberta
Title: Concentration inequality based methods for covariance estimation and inference

Abstract: In this talk, we will consider a brief overview of the topics covered in my PhD thesis, which is concerned with the estimation of and inference on covariance matrices and operators using non-asymptotic tools known as concentration inequalities. First, we will discuss the estimation of high dimensional sparse covariance matrices. Secondly, we develop inferential techniques for covariance operators in the functional data setting including a statistical classifier and clustering algorithm. And lastly, we look more closely at a concentration of measure result known as the symmetrization inequality and how it is connected to topics in optimal transport.

Ivan Mizera
Department of Mathematical and Statistical Sciences, University of Alberta
Title: Shape-constrained density estimation

Abstract: Shape constraints play an increasingly prominent role in nonparametric function estimation. In the domain of nonparametric density estimation, considerable recent attention has been focused on log concavity as a regularizing device; weaker forms of concavity constraints that encompass larger classes of densities have received less attention but offer additional flexibility, in particular in regard to heavier tail behavior and sharper modal peaks. When paired with appropriate estimation criteria, these weaker constraints yield tractable, convex optimization problems that broaden the scope of shape constrained density estimation in a variety of applied subject areas.

Sile Tao
Department of Mathematical and Statistical Sciences, University of Alberta
Title: Nonparametric empirical Bayes prediction under check loss

Abstract: We propose a novel nonparametric empirical Bayes approach in Gaussian predictive models under check loss, motivated by Mukherjee, Brown and Rusmevichientong (2015). In contrast to previous methods for this problem, our method does not assume any parametric form of prior distribution and no explicit tuning parameters involved. Estimation of the prior can be efficiently done by solving a convex optimization problem, based on the work of Koenker and Mizera (2014). Our new procedures are compared with the methods proposed by Mukherjee, Brown and Rusmevichientong in simulations.

Zixiang Guan

Department of mathematics and Statistics, University of Calgary

Title: An introduction to the monitoring of high-speed train rail track irregularity

Abstract: As technology develops, high-speed railway has been the preferred public transit in China. The safety of high-speed trains is always the primary concern of engineers. In this presentation, track irregularity, which is how engineers assess the status of railway tracks, will be introduced. Some methods used by engineers on how the measurements of track irregularity is analyzed will be presented. Finally, I will introduce two statistical methods from time domain and frequency domain respectively which might be applied to the monitoring of track irregularity.

Kaida Cai

Department of mathematics and Statistics, University of Calgary

Title: Group variable selection in Andersen-Gill model for recurrent event data

Abstract: In many scienti?c applications, such as biological studies, the predictors or covarites are usually high dimensional and naturally grouped. In this research, we consider the Andersen-Gill regression model for the analysis of recurrent event data with high dimensional group covariates. In order to study the e?ects of the covariates on the occurrence of recurrent events, a hierarchically penalized group selection method is introduced to address group selection problem under the Andersen-Gill model. We also consider an adaptive hierarchically penalized method for selecting covariates more e?ciently, especially for identifying the important covariates in important groups. The asymptotic oracle properties of these methods are investigated. Our simulation studies show that the proposed methods perform well in selecting important groups and important individual covariates in these groups simultaneously. We illustrate these methods using some real life data sets from medicine.

Brian Franczak

Department of mathematics and Statistics, MacEwan University

Title: Mixture of contaminated shifted asymmetric Laplace factor analysis

Abstract: Cluster analysis can be lucidly de?ned as the process of sorting similar objects into groups. When a ?nite mixture model is utilized for cluster analysis, we call the process model-based

clustering. This presentation will discuss the development of a mixture of contaminated shifted asymmetric Laplace factor analyzers (MC-SALFA). This model will be well suited for the analysis of high-dimensional data; speci?cally, where the number of variables exceeds the number of observations. In addition to providing a classi?cation of similar observations, the MCSALFA will also provide a classi?cation of an observation as being either â€˜goodâ€™ or â€˜badâ€™, unifying the ?elds of model-based clustering and outlier detection. From a methodological standpoint, the MCSALFA will unify the factor analysis model and the contaminated mixture model and it will require the development of a robust parameter estimation scheme, which will be based on a variant of the expectation-maximization (EM) algorithm. The classi?cation performance of the MCSALFAs will be demonstrated using a real data set.

Links:
