Statistical Theory and Applications II

Chair: Mary Lesperance (University of Victoria)

OKSANA CHKREBTII, Simon Fraser University
Transdimensional ABC for Inferring Introduction and Spread Rates of Invasive Species

We develop a new transdimensional Monte Carlo sampler for approximate Bayesian inference when the likelihood consists of intractable variable-dimension integrals. For example, estimating individual parameters for complex, partially-observed germ grain models precludes the use of standard posterior sampling techniques because the likelihood typically cannot be evaluated. Approximate Bayesian Computation (ABC) methods provide an alternative, but can be slow when relying on inefficient conditional simulation. We show that a transdimensional approach overcomes this problem, and use it to estimate rates of introduction and spread for the invasive earthworms species Dendrobaena octaedra (Savigny) along roads in the boreal forest of northern Alberta.

CAMILA DE SOUZA, University of British Columbia
Switching Nonparametric Regression Models

We analyze functional data arising from a curve that, over its domain, changes between J states. We consider a sequence of response variables, $y_1, \ldots, y_n$, where y_i depends on a covariate x_i according to an unobserved state z_i. The z_i's form a stochastic process with the possible values of z_i being $j = 1, \ldots, J$. If $z_i = j$ the expected response of y_i is $f_j(x_i)$. We modify the EM algorithm to estimate the parameters from the state process and the functions $f_1, \ldots, f_J$. We obtain standard errors for the parameter estimators of the state process. We conduct simulation studies and an application to a data set.

SHIRIN GOLCHI, Simon Fraser University
A Decision Theoretic Approach for Hypothesis Testing in Particle Physics

The statistical procedure used in a family of problems in particle physics, similar in nature to the discovery of Higgs Boson, is investigated in this presentation. The problem is considered from a decision theoretic point of view. We introduce a loss function that mimics the features of the current procedure and obtain the Bayes rule. Comparisons are made between the existing and proposed methods in terms of frequentist properties of statistical testing procedures. The comparison results are interpreted as the approximate equivalence of the currently used method with the Bayes rule with certain choice of loss values and/or priors.

JONATHAN LEE, University of Western Ontario
Parallelization of Single Chain MCMC with Applications in Spatial Statistics

Markov Chain Monte Carlo methods are a popular way to sample from complex distributions. Parallel computing is often used to run multiple chains to get samples faster. However, in spatial statistics, we occasionally have chains with long burn-in and poor mixing, so parallelizing a single chain might be better. When there are a large number of dependent parameters, this is non-trivial. We will explore possible ways of using a message passing interface (MPI) framework to do this parallelization.

JOSEPH FRANCOIS TAGNE TATSINKOU, Université de Montréal
Smooth Test of Goodness-of-Fit of Normality for the Errors of an ARMA Process with Unknown Mean

Neyman (1937) derived a goodness-of-fit test for the uniform distribution. This test has been generalized to any distribution by Rayner and Best(1989). Ducharme and Lafaye de Micheaux combined this approach to the Ledwina (1994) data driven principle to find a test for the errors of an ARMA process with known mean. In this work, we generalize the results of Ducharme

and Lafaye de Micheaux (2004) for the case of an ARMA process with unknown mean. Some simulations and an application to real data are provided.

KASRA YOUSEFI, Simon Fraser University
Advanced Putting Metrics in Golf

Using ShotLink data that records information on every stroke taken on the PGA Tour, we introduce a new metric to assess putting. The methodology is based on ideas from spatial statistics where a spatial map of each green is constructed. The spatial map provides estimates of the expected number of putts from various green locations. The difficulty of a putt is a function of both its distance to the hole and its direction. A golfer's actual performance can then be assessed against the expected number of putts.