SYDNEY SUMMER STATISTICS WORKSHOP

University of Technology, SYDNEY
Room 34, Building 4, 745 Harris Street, Broadway
http://www.maths.usyd.edu.au/u/rkuli/workshop/workshop.html

Participating institutions

University of Technology, Sydney
Department of Mathematical Sciences

University of Sydney
School of Mathematics and Statistics

Macquarie University
Department of Statistics

University of New South Wales
School of Mathematics and Statistics

Program

9:00 - 9:50	Davy Wong (UTS) *Multiple Period Value at Risk Estimation under Quadratic GARCH Models*
9:50 - 10:40	David Bulger (Macquarie) *Global optimisation in the quantum future*
10:40 - 11:00	Morning tea
11:00 - 11:50	Jennifer Chan (Sydney) *Geometric Process Models for series of events*
11:50 - 13:30	Lunch break
13:30 - 14:20	Ruth Penman (Macquarie) *Modelling IVF Data using the Continuation Ratio Model*
14:20 - 15:10	Scott Sisson (UNSW) *Automating Transdimensional MCMC*
15:10 - 15:30	Afternoon tea
15:30 - 16:20	Rafał Kulik (Sydney) *Sums of extreme values of subordinated long-range dependent sequences*

Abstracts

DAVID BULGER (Macquarie)

Global optimisation in the quantum future

Quantum information theory studies how the counter-intuitive laws of quantum physics could be used to process data in ways fundamentally different to today's computers. This talk gives an overview of quantum computation, looking specifically at implications for optimisation. In particular, recent work by the speaker shows how a quantum computational variant of the Newton-Raphson minimisation method can be implemented much more efficiently than on a modern computer, while largely circumventing the method's stability problems.

JENNIFER S.K. CHAN (Sydney)

Geometric Process Models for series of events

Non-homogeneous Poisson (NHPP) process is widely used to model a series of events with trend. A more direct approach is to model the data with a geometric process (GP), proposed by Lam (1988). A stochastic process $\{X_i\}$ is a GP if there exists a positive real number a called the ratio such that $\{a^{i-1}X_i\}$ generates a renewal process with a mean μ and a variance σ^2. In this research, we extend the GP model to different data types, different functional forms for the mean μ and ratio a and different inference methodologies. The models are demonstrated by data sets of positive, Poisson counts and binary outcomes.

RUTH PENMAN (Macquarie)

Modelling IVF Data using the Continuation Ratio Model

Many couples experience fertility problems making it difficult for them to conceive a child. IVF (in vitro fertilization) offers many of these couples the chance to have a baby. The IVF process consists of a number of consecutive stages. Using the maximum stage reached as an ordinal response, an extended continuation ratio model was used to determine the risk factors that affect the process at any of these stages. In the initial model only the first attempt at IVF was modelled using this method. Many subjects have multiple attempts at IVF so this model was extended to a continuation ratio random effects model to allow for variation between individuals. The random effect was assumed to have a normal distribution. It was found that BMI (body mass index), female age and type of treatment are risk factors at some stages for both single and multiple attempts, although there is some variation in the results between the two models.

SCOTT SISSON (UNSW)

Automating Transdimensional MCMC

Only a small fraction of people who use Bayesian methods actually write their own code to draw samples from the posterior distribution. The rest either get someone else to do it, or use black-box software such as WinBUGS. Accordingly the limits of such software in performing complex analysis will directly affect the utility of Bayesian methods in the natural sciences and beyond.

One current restriction in the types of analysis that may be performed is that generic sampling methods for multi-model posteriors are difficult to automate. For example, the reversible jump algorithm requires specification of a function to map between parameter spaces, which may only be efficiently specified in circumstances when the parameter spaces are geometrically visualised with ease.

In this talk I will review current methods and present work-in-progress which aim to automate moves between models in an MCMC setting. This is based on a novel density estimator that permits estimation of marginal densities. A number of examples will be presented.

(Joint work with Yanan Fan (UNSW) and Gareth Peters (UNSW))

CHI MING DAVY WONG (UTS)

Multiple Period Value at Risk Estimation under Quadratic GARCH Models

We derived the exact conditional second, third and fourth moments of returns and their temporal aggregates under Quadratic GARCH models. Three multiple period Value at Risk estimation methods are proposed. Two methods are based on the exact second to fourth moments and the other adopts a Monte Carlo approach. Some simulations show that the multiple period Value at Risk calculated from an asymmetric t-distribution with the variance, skewness parameter and the degrees of freedom chosen to match the second to fourth moments of the aggregate returns is close to the one obtained by Monte Carlo simulations. Using some market indices for illustration, the proposed Value at Risk estimation methods are found to work well.

RAFAŁ KULIK (University of Sydney)

Sums of extreme values of subordinated long-range dependent sequences

We characterize the limiting behavior of sums of extreme values of long range dependent sequences defined as functionals of linear processes with finite variance. The extremal sums behave completely different by compared to the i.i.d case. In particular, though we still have asymptotic normality, the scaling factor is relatively bigger than in the i.i.d case, meaning that the maximal terms have relatively smaller contribution to the whole sum. Also, the scaling need not depend on the tail index of the underlying marginal distribution, as it is well-known to be so in the i.i.d. situation. Furthermore, subordination may completely change the asymptotic properties of sums of extremes.