Presentations

Below, you can find the abstract and titles of the presentation, as well as their scheduled start. These will also be available in the meeting's booklet. In case of errors, please contact us.

Presentations are 20 minutes long and are followed by 2½ minutes of question time.

Session 1

The length of self-avoiding walks on the complete graph

Abrahim Nasrawi, Monash University

10:30:00 AM

We study the variable-length ensemble of self-avoiding walks on the complete graph. We obtain the leading order asymptotics of the mean and variance of the walk length, as the number of vertices goes to infinity. Central limit theorems for the walk length are also established, in various regimes of fugacity. Particular attention is given to sequences of fugacities that converge to the critical point, and the effect of the rate of convergence of these fugacity sequences on the limiting walk length is studied in detail. Physically, this corresponds to studying the asymptotic walk length on a general class of pseudocritical points.

Confidence Intervals for Median Absolute Deviations

Chandima N.P.G. Arachchige, La Trobe University

10:52:30 AM

The median absolute deviation (MAD) is a very robust measure of scale that is simple to implement and easy to interpret. Motivated by this, we introduce interval estimators of the MAD to make reliable inferences for dispersion for a single population and ratios and differences of MADs to compare two populations. Our simulation results show that the coverage probabilities of the intervals are very close to the nominal coverage for a variety of distributions. We have used the partial influence functions to investigate the robustness properties of the difference and ratios of independent MADs.

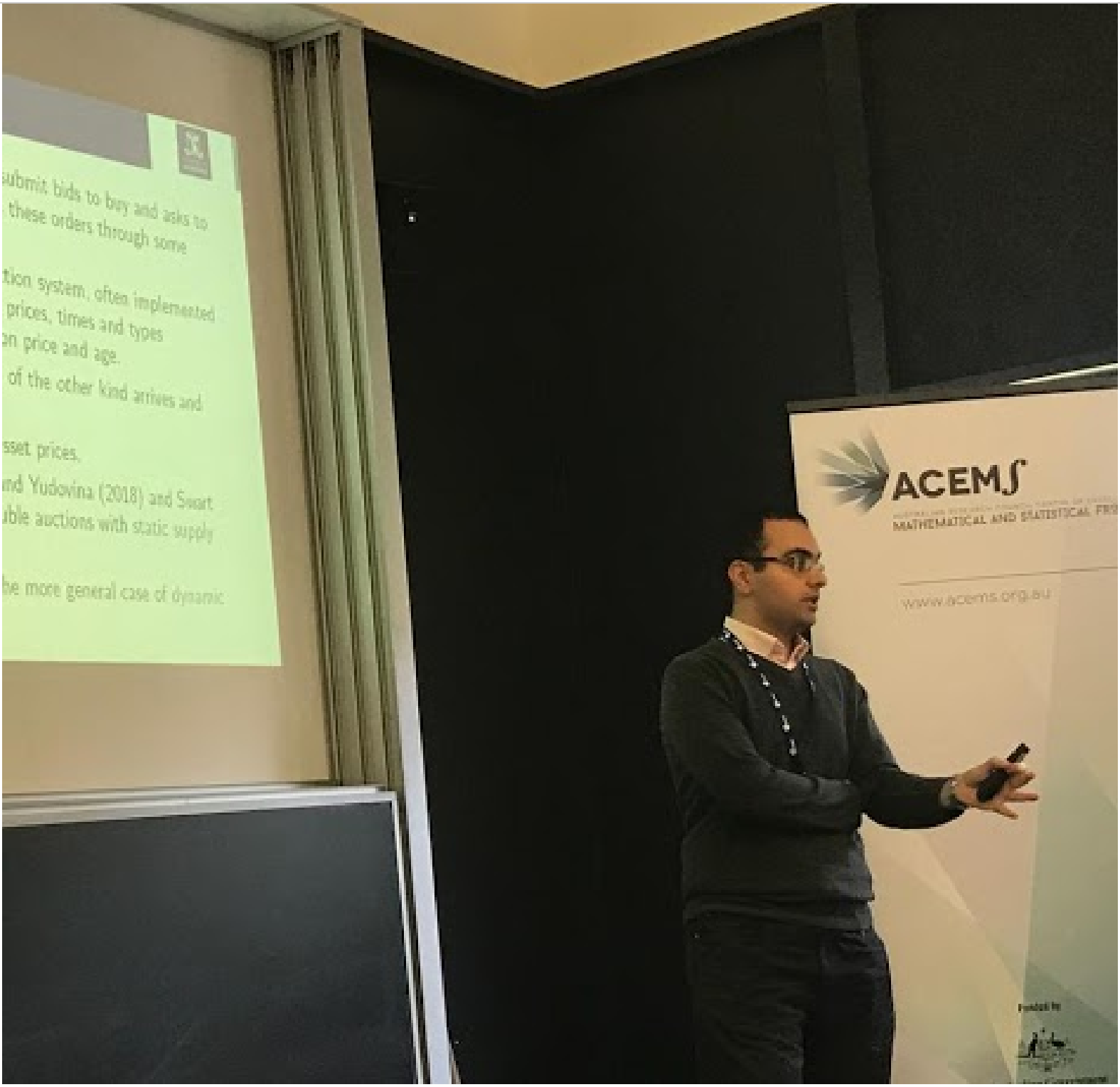
Double Auctions with Dynamic Supply and Demand

Behrooz Niknami, The University of Melbourne

11:15:00 AM

Double auctions are systems used in many financial markets to facilitate the exchange of assets according to predetermined rules. As such, their structures play important roles in price formation and market health. There have been attempts to study simplified versions of these systems in the literature, where modest assumptions are made about the structure of the market. These facilitate the study of equilibrium behaviours for such systems. However, these conjectures are too restrictive for real life; but there have been attempts to generalise the above model in different manners.

We also aim to loosen the above assumptions, initially, to describe cases where the supply and demand functions are not constant. This will pave the way for a more general understanding of double auctions, w ⓘ n could promote future studies of the effects of regulation and trader behaviour on the market.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Tareq Alodat, La Trobe University

11:37:30 AM

We investigate general scaling settings and limit distributions of functionals of filtered random fields. The filters are defined by the convolution of non-random kernels with functions of Gaussian random fields. The case of long-range dependent fields and increasing observation windows is studied. The obtained limit random processes are non-Gaussian. Most known results on this topic give asymptotic processes that always exhibit non-negative auto-correlation structures and have the self-similar parameter $H \in (0.5,1)$ In this work we also obtain convergence for the case $H \in (0.5,1)$ and show how the Hurst parameter H can depend on the shape of the observation windows. Various examples are presented.

Lunch

Session 2

Heavy-Tailed Jump Distributions

Aaron Chong, The University of Melbourne

1:30:00 PM

The area of Large Deviations (LDs) is of great importance in both theoretical and applied Probability Theory. The focus in the area is on finding approximations to probabilities of events characterised by unusually large deviations of the trajectories of random process in question from their "typical behaviour". There are well-developed theories covering two main classes of random walks, the first being the classical Cramér case, when the jump distribution has a finite exponential moment, and the second being various types of "heavy-tailed" distributions; these have qualitatively different asymptotics for the LD probabilities.

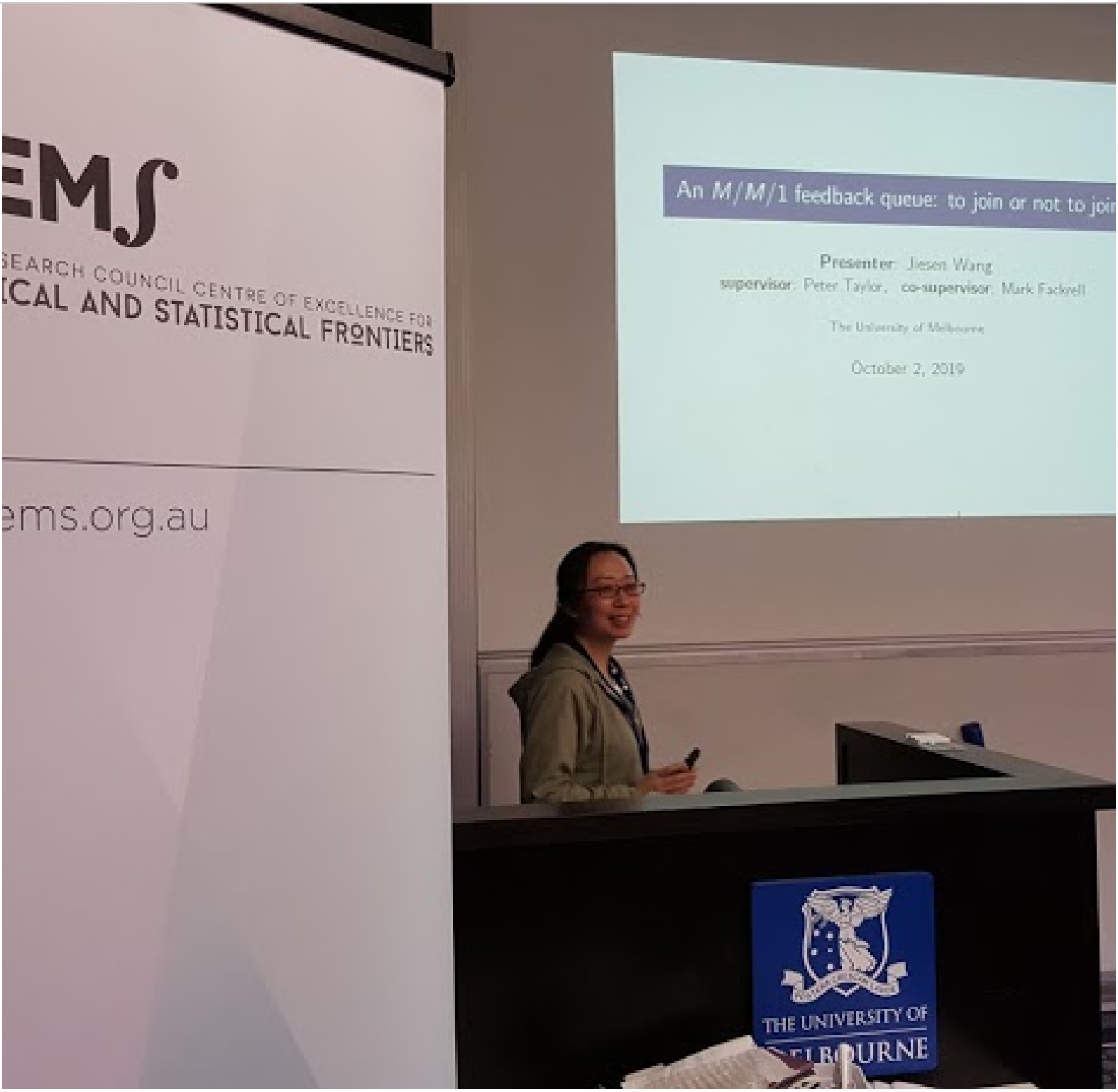
My presentation will discuss my work on the situation in which the tail distribution has been created from a heavy-tailed law by censoring the distribution at a certain level, which results in a unique asymptotic depending on the level of deviation relative to the censoring level.

queue

Jiesen Wang, The University of Melbourne

1:52:30 PM

We consider an M/M/1 feedback queue with linear waiting cost and fixed reward. At their arrival time, customers decide to join or to balk, and are served in order of arrival. After being served, each customer either departs the system and obtains the fixed reward with probability q, or immediately joins the end of the queue otherwise. For a revenue-maximizing server who can choose to increase its service capacity and conceal information on the actual queue length, is it desirable to do so? We also look at this problem from a sociological perspective. Is it socially optimal to encourage service capacity boost and information concealment? In this talk, we present our solution of the revenue and welfare optimization problem, and compare it with Naor's results of an M/M/1 queue to comprehend how the feedback mechanism plays a part.


An M/M/1 feedback queue: to join or not to join
Presenter: Jiesen Wang
supervisor: Peter Taylor, co-supervisor: Mark Fackrell
The University of Melbourne
October 2, 2019
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vector random fields

Dareen Omari, La Trobe University

2:15:00 PM

In various applications researchers often encounter with cases involving dependent observations over time or space. Dependence properties of a random process are usually characterized by the asymptotic behaviour of its covariance function. The available literature, except a few publications, addresses limit theorems and reduction principles for functionals of weakly or strongly dependent random fields separately. For scalar-valued random fields it is sufficient as such fields can exhibit only one type of dependence. However, for vector random fields there are various cases with different dependence structures of components. Such scenarios are important when one aggregates spatial data with different properties. For example, brain images of different patients or GIS data from different regions.

We consider functionals of vector random fields which have both strongly and weakly dependent components. The main results demonstrate that the asymptotic behaviour of such functionals is not necessarily determined by their Hermite ranks. As an application of the new reduction principle we provide some limit theorems for vector random fields. In particular, we show that it is possible to obtain non-Gaussian behaviour for the first Minkowski functional of the Student random field built on different memory type components.

Mornington Peninsula developed using citizen science data

Udani Wijewardhana, Swinburne University

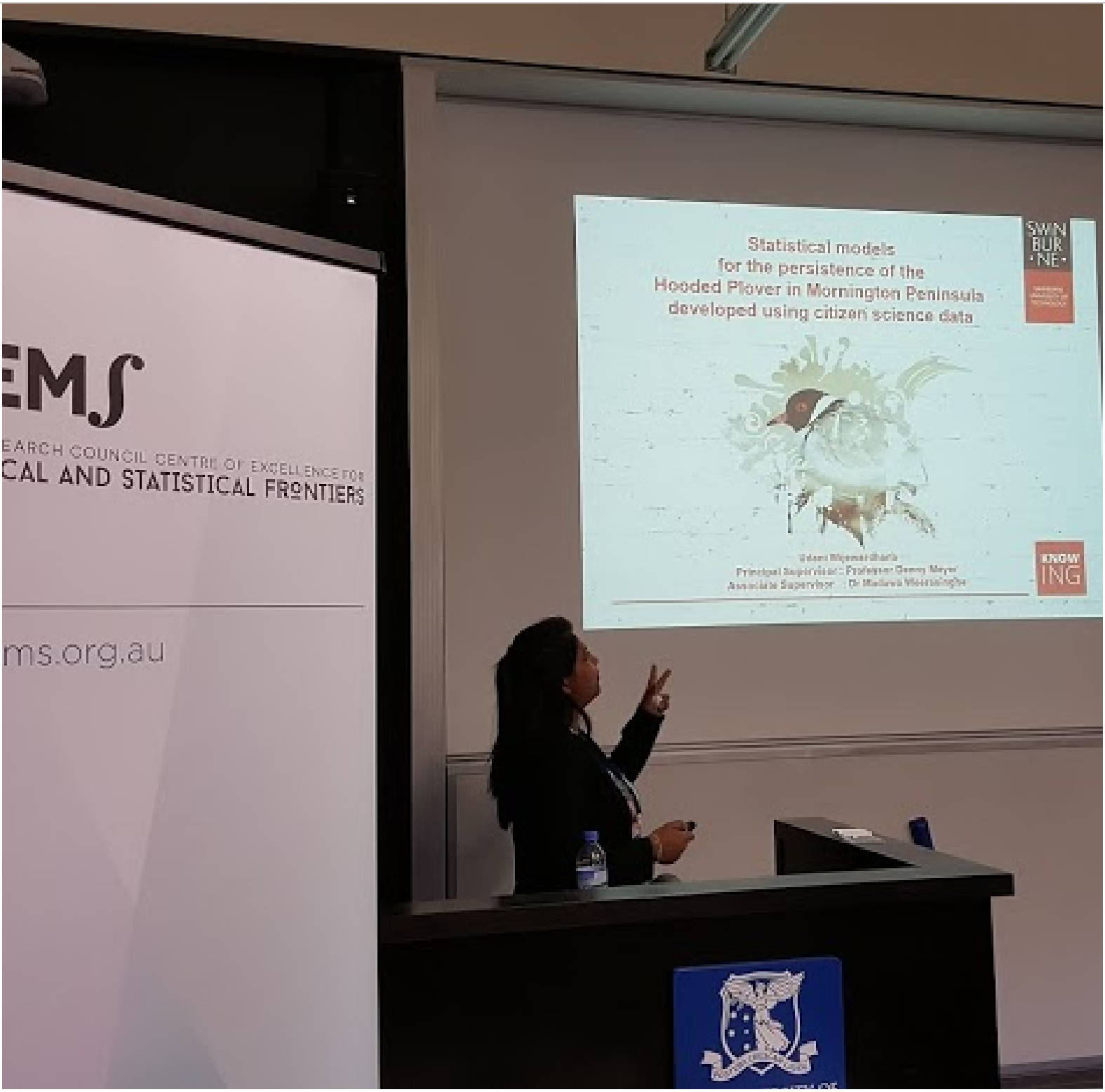
2:37:30 PM

The BirdLife International assessed in 2015, that 13% of bird species are threatened with extinction and extinction of many bird species has become a theme too frequently occurring around the world. Determining whether a bird species has become extinct or extant has become a difficulty exercise due to survey efforts being too costly and sighting data limited. This is especially affecting threatened birds. However, because of citizen science data, the number of sightings has increased over the years (number of sightings in eBird database increased more than 20 million from 2012 to 2018).

The Hooded Plover is listed as a vulnerable bird species under IUCN red list assessment criteria. In this study we compared three different models to identify the effect of climate on extinction risk for the Hooded Plover in Mornington Peninsula in both temporal and spatial-temporal scales, which is a prerequisite for developing effective strategies to conserve them while identifying the factors effect for their persistence like climate change. In order to identify the climate change and citizen science effect for the persistence of Hooded Plover using citizen science data available from eBird which has a large amount of validated observational data for birds. The Hooded Plover is a non-migratory local bird in Australia, so we considered monthly data for our study. Initially probability of persistence models was used as a reference for determining the significant factors. It is useful to know if a forecast model provides better results than any reference model. Then, to identify the climate effect, we consider the mean monthly temperature, and total monthly rainfall in hurdle models. To control for the growth in citizen science data , we consider the human population on the Mornington Peninsula.

The citizen science count data often include excess zeros for rare species like Hooded Plover in specific areas or time periods. Therefore, we compared zero-inflated hurdle models and zero inflated models using Poisson and Negative Binomial distributions and discuss extensions of these models while using count data in temporal and spatial-temporal structures to deal with those excess zeros. In both the temporal and spatial-temporal models the performance of the Negative Binomial distribution was superior while overcoming over-dispersion issue. Similar conclusions can be drawn from both temporal and spatial-temporal models. Temperature has a significant positive effect on the non-zero counts (i.e. higher counts of Hooded Plover are associated with higher temperature). Growth in citizen science effort, linked to population growth, explained the lower probability of a zero count.

This work shows that statistical models can be used to address the challenges associated with the use of citizen science data for monitoring the persistence of rare birds, while identifying factors affecting this persistence such as climate.



Afternoon Tea

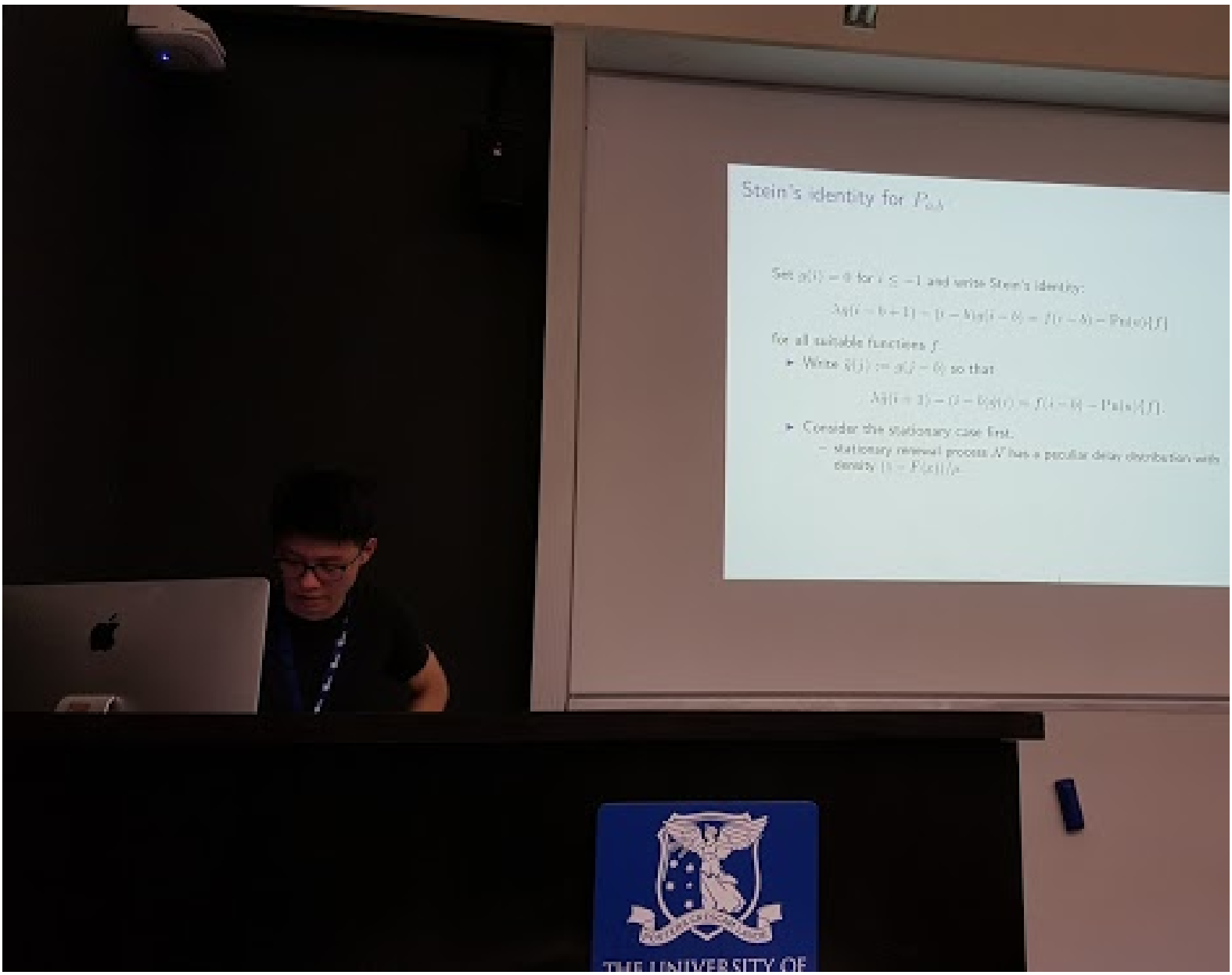
Session 3

translated Poisson

Qingwei Liu, The University of Melbourne

3:30:00 PM

In this note, we establish various error estimates for translated Poisson approximation to the number of renewals in terms of Kolmogorov distance, Wasserstein distance and total variation distance. The note complements the error estimates for normal approximation in Kolmogorov distance established in Englund (1980) and in Reinert & Yang (2018) and improves the bound for compound Poisson approximation in total variation given in Erhardsson (2004).



Tiffany Lo, The University of Melbourne

3:52:30 PM

Preferential attachment random graph models are useful models for studying real networks such as the world wide web and social networks. To construct these models, the basic idea is to sequentially add nodes to the graph, and the newly added node is connected to existing nodes where connection to nodes with higher degrees is more likely. In this talk, we discuss the martingale methods for studying the fixed degree sequence of this family of random graphs. We also discuss some of the limiting results, which were given in Peköz, Röllin and Ross (2017) and James (2015).

Chenchen Xing, The University of Melbourne

4:15:00 PM

In the online video game industry, a significant portion of the revenue generated is from microtransactions, where a small amount of real-world currency is exchanged for virtual items to be used in the game. One popular way to conduct microtransactions is via a loot box, which is a random bundle of virtual items whose contents are not revealed until after purchase.

We review the paper 'Loot Box Pricing and Design' and compare asymptotic analysis of the optimal revenue generated from two loot box selling strategies.

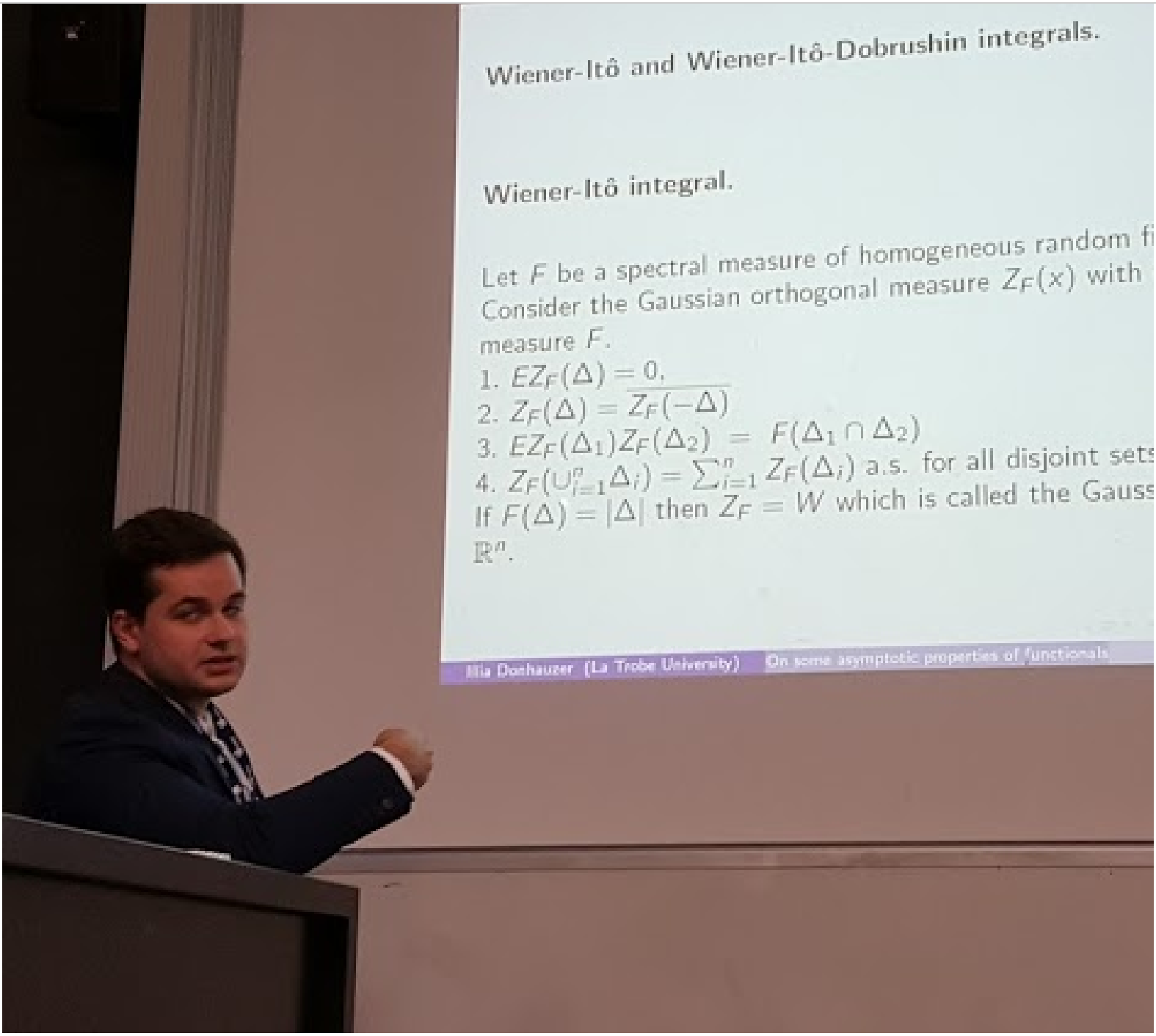
Interlude

On some asymptotic properties of functionals of long-range dependent random fields

Illia Donhauzer, La Trobe University

4:41:00 PM

The talk is about asymptotic properties of random fields possessing long-range dependence. We consider nonlinear integral functionals of the homogeneous isotropic Gaussian random field with long-range dependence. The limit of this functional is a random process represented by the Wiener-Ito integral. It is known that in the one-dimensional case, the limit has the property of stationary increments. However, it is unknown whether the limit process possesses this property in the multidimensional case. Our hypothesis is that in multidimensional case there is no a set of integration such that limit process has stationary increments. We consider increments of the limit process and suggest methods to show that they have different distributions.


Wiener-Itô and Wiener-Itô-Dobrushin integrals.
Wiener-Itô integral.
Let F be a spectral measure of homogeneous random fi
Consider the Gaussian orthogonal measure $Z_F(x)$ with
measure F.
1. $EZ_F(\Delta) = 0$,
2. $Z_F(\Delta) = \overline{Z_F(-\Delta)}$
3. $EZ_F(\Delta_1)Z_F(\Delta_2) = F(\Delta_1 \cap \Delta_2)$
4. $Z_F(\cup_{i=1}^n \Delta_i) = \sum_{i=1}^n Z_F(\Delta_i)$ a.s. for all disjoint sets
If $F(\Delta) = |\Delta|$ then $Z_F = W$ which is called the Gauss
$\mathbb{R}^n$.
Ilia Donhauzer (La Trobe University) On some asymptotic properties of functionals

Process method

Chengyu Li, The University of Melbourne

5:03:30 PM

Approximate Bayesian Computation (ABC) has been used over the last 20 years for model fitting when the likelihood function is intractable, but simulation is attainable. However, ABC has its limitations. Many problems can be solved by ABC theoretically, but it is unrealistic in practice due to computational burden. To this end, Gaussian Process (GP) can be used to model the discrepancy between the observed and simulated data as a function of the parameter, which dramatically decrease the number of simulations required. Currently there is a framework to do ABC inference with GP method, but the result is not accurate enough and fails to capture the correct posterior in some situation. In this talk, we will develop a new ABC method based on GP. We find that our method significantly improves the performance, considering the accuracy under the same computational time.

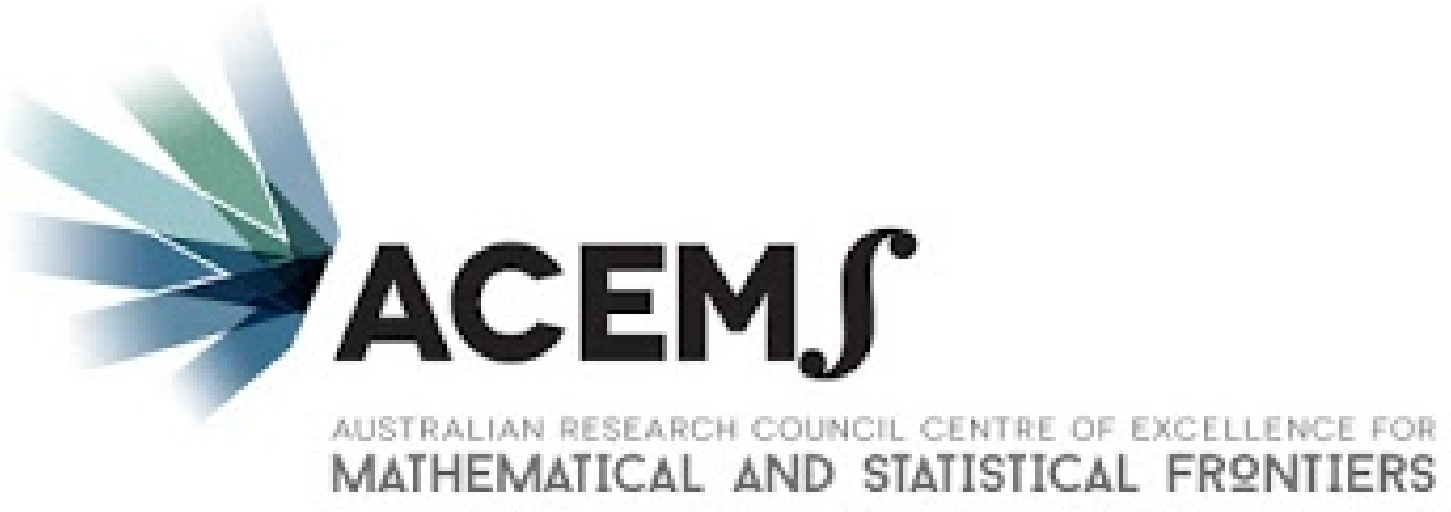

Introduction of ABC
Structure of Presenta
Introduction of A
Gaussian Process
Simulation and R

Wathsala Karunarathne, The University of Melbourne

5:26:00 PM

In many queueing systems, competition for service has increased because of limited resources and increasing demand. A consequence is that, almost everywhere, queues are built. It is important to pay attention to the costs of server availability and customer waiting. We develop a scheduling model for a single server system with exponential service times and an infinite queue. Our objective is to derive scheduled customer arrival times which minimise the weighted sum of total customer waiting times and server availability time. We use the L-BFGS-B algorithm as our optimisation algorithm. The model improves the objective function value over an existing model and is computationally efficient.

Sponsor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