Abstracts

Wednesday 8 June, 9am-5pm
Colombo Theatres, UNSW
Welcome!

Welcome to the third annual School Postgraduate Conference!

As last year we have organised talks in a mixture of plenary and parallel sessions – the plenary talks in Colombo C, the parallel sessions in LG01/02. Plenary talks are reserved for students who recently published their research in a top international journal, and for students preparing to present their research overseas. As last year, there will be a poster session over lunch. At 1pm students will present a 60-second lightning talk on their research in Colombo A, then they will answer questions at their posters over the remainder of the lunch break. As last year we will have prizes for especially outstanding talks and posters, which will be announced at the close of proceedings. If you have any thoughts on your favourite talks feel free to put in a good word to Anna Cai or Trevor McDougall (regarding Applied students), Thomas Britz or Denis Potapov (Pure students), Jake Olivier or David Warton (Stats students). Poster judges are John Roberts, Alina Ostafe and Wesley Brooks.

We hope you enjoy the conference!

The organising committee.

Organising committee, left-to-right: Catheryn Gray, David Warton, Huan Lin, Galina Levitina
Our postgraduate research students and their recent achievements

The conference is a chance to celebrate the achievements of our postgraduate students, who have a significant role in progressing research and many other facets of life in the school. Please make the most of this opportunity to meet our postgrad students and find out more about them and their research, whether you are a staff member, a student considering a postgraduate research degree, or just lost and looking for the nearest café.

We had a record enrolment at the start of this year so we now boast 51 enrolled postgraduate research students. They are a diverse group of people, coming from 16 countries across four continents. I am continually impressed by our postgraduate cohort who quickly come across as intelligent and highly motivated students with a lot to contribute, and I expect you will be similarly impressed.

Our postgraduate research students are a high achieving bunch. Publishing research while still enrolled in a PhD is the goal of every student but it is difficult to do, given the time it takes to write a paper (many are writing their first) and the potentially long waiting times for review outcomes. Top journals in particular typically have low acceptance rates so are particularly challenging, but despite this enrolled students manage a swag of publications each year, with several accepted into top journals each year. A big congratulations to the following students:


Thanks

The conference organising committee is: Catheryn Gray, Huan Lin, Galina Levitina and myself, of whom the students did pretty much everything! Including this book. So a special thanks to them.

Thanks to Susannah Waters who helped with advertising, helped students prepare their posters, thanks to Kaye Sedgers who helped organise catering.

Thanks to our poster judging panel: John Roberts, Alina Ostafe and Wesley Brooks.

The Postgraduate Annual Review panel members are Thomas Britz, Anna Cai, Trevor McDougall, Jake Olivier, Denis Potapov, and myself. They will spend the day judging talks and the next couple meeting students to discuss their plans over the coming year. A big thanks for the time and energy they put into this important role.

Prof David Warton
Director of Postgraduate Studies (Research)
School of Mathematics and Statistics, UNSW
### Postgraduate conference 2016, School of Mathematics and Statistics, UNSW, June 8 2016

#### Colombo Theatre C

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**Session AI (chair: Gennady Notowidigdo)**

- Eric Kwok: Dynamic isoperimetric inequality and the detection of Lagrangian coherent structures
- Jeremy William Nugent: Superintegrability in pp-wave spacetimes

**Session BI (chair: Edward McDonald)**

- Bryce Kerr: Sums with multiplicative characters
- Huan Lin: Interval data analysis on estimating species abundance

**Session AII (chair: Dan MacKinlay)**

- Kevin Mandira Limanta: Spherical Harmonics and Hypergroup Structure of $S^3$
- Carlos Rocha: Towards biogeochemical modelling of the EAC system

**Session BII (chair: Eric Kwok)**

- Benoit Pasquier: Exploring iron control on global productivity: “FePSi”, an inverse model of the ocean’s coupled phosphate, silicon and iron cycles.
- Zengyan Fan: Interquantile Shrinkage in Additive Models
- Nina Ribbat: Mean circulation on the continental shelf off South-East Australia 31.5-34.5: The Hawkesbury Bioregion 2012-2013

**Session AIII (chair: Thais Rodrigues)**

- Kylie-Anne Richards: Multivariate Hawkes Processes for the Limit Order Book
- Dan MacKinlay: Noticing people killing each other on the internet
- Wai Hong Tan: Information Propagation in Microblogs

**Session BIII (chair: Anna McGann)**

- Xin Lei: Noise versus movement: Finding the right balance
- Yoshihito Kazashi: Fully discretised filtered approximation for Gaussian random fields on spherical shells
- Timothy Siu: Integrability detection in reversible maps using asymmetric periodic orbits

**Session All (chair: Catheryn Gray)**

- Catheryn Gray: Akt Translocation in Response to Insulin
- Damien Chee Ho Wee: Maximum Likelihood for the COGARCH process using Sequential Monte Carlo.
- Gennady Notowidigdo: Rational trigonometry of a tetrahedron in a general metrical framework
- Carlos Enrique Aya Moreno: Multivariate shape preserving density estimation using wavelets
- Stephanie Clark: Nonlinear manifold representation in exploratory data analysis of natural systems
Abstracts

1. Multivariate shape preserving density estimation using wavelets
   Carlos Enrique Aya Moreno
   *Statistics*

   **Abstract:** In this work we present results of extending a shape preserving density estimation for the multivariate case, with similar asymptotic results for the linear case, along with some numerical experiments.

   **Biography:** I am a mathematician and software engineer, who got interested in wavelets, image analysis and their applications in statistics. I have many years of experience in the IT industry and I am looking forward to be able to apply new findings and algorithms in industry, particularly in what is nowadays called Data Analysis.

2. Nonlinear manifold representation in exploratory data analysis of natural systems
   Stephanie Clark
   *Statistics*

   **Abstract:** Spatial and temporal patterns frequently encountered in nature, such as waves, parabolas, v-shapes, oscillations, spirals, temporal cycles, and helixes are the product of the combination of innumerable complex interactions. This is because countless physical and chemical factors influence the state of environmental, ecological, meteorological, and biological systems at any time or space. The self-organizing map (SOM) is an exploratory data analysis technique that is particularly suitable for finding patterns and producing clusters in data with complex relationships, however currently it is based upon linear principal component analysis and can only see data structures that are a perturbation of this linear approximation. In this work, the SOM technique is expanded to allow the discovery and representation of any highly nonlinear structure inherent in the data. This broadens the applicability of SOMs to the myriad natural data sets undergoing typically nonlinear fluctuations.

   **Biography:** In 3rd year of PhD in Statistics, BSc at Queens University (Canada) in Civil Engineering, MSc at Oxford University (UK) in Applied Mathematics.
3. **Interquantile Shrinkage in Additive Models**

   Zengyan Fan

   *Statistics*

   **Abstract:** In this paper, we investigate the commonality of nonparametric component functions among different quantile levels in additive regression models. We propose two fused adaptive group LASSO penalties to shrink the difference of functions between neighboring quantile levels. The proposed methodology is able to simultaneously estimate the nonparametric functions and identify the quantile regions where functions are unvarying, and thus is expected to perform better than standard additive quantile regression when there exists a region of quantile levels on which the functions are unvarying. Under some regularity conditions, the proposed penalized estimators can theoretically achieve the optimal rate of convergence and identify the true varying/unvarying regions consistently. Simulation studies and a real data application show that the proposed methods yield good numerical results.

   **Biography:** I am an exchange student from Nanyang Technological University, Singapore. This is my third year study. I have been enrolled in UNSW for 9 months.

4. **The Multivariate Decomposition Method applied to a PDE with a random coefficient**

   Alexander Gilbert

   *Applied Mathematics*

   **Abstract:** The Multivariate Decomposition Method is a method for approximating integrals of functions which depend on infinitely many variables. Such integrals arise when studying PDE’s with a random coefficient. Here the coefficient is parametrised by infinitely many stochastic variables and the quantity of interest is the expected value of the solution, with respect to these stochastic parameters. I will briefly introduce the Multivariate Decomposition Method (MDM) and present numerical results for the MDM applied to an elliptic PDE.

   **Biography:** I completed my undergraduate degree in Applied Mathematics in 2013, also at UNSW. After six months skiing in Canada I decided to come back and undertake a PhD.
5. **Akt Translocation in Response to Insulin**
Catheryn Gray

*Applied Mathematics*

**Abstract:** Akt is a key cross-talk node between numerous signal transduction pathways in the mammalian cell. It plays an important role in cellular processes such as proliferation, cell survival, and metabolism. In particular, Akt is a key mediator of glucose transport in response to insulin. The activation of only a small percentage of the Akt pool of insulin-sensitive cells results in maximal translocation of glucose transporter 4 (GLUT4) to the cell membrane, which enables the diffusion of glucose into the cell.

Akt is synthesized in the inactive state, and in unstimulated cells is found predominantly in the cytosol. Upon stimulation by insulin, the Akt translocates to the inside of the plasma membrane (PM) by a process that is currently not well understood. At the PM, the now-activated Akt can signal to downstream substrates and return to the cytosol.

The process of Akt translocation is largely unknown. The arrival of Akt at the PM can be measured using total internal reflection fluorescence (TIRF) microscopy. From the TIRF data, we have developed a compartmental model of Akt translocation. The model embodies the observed behaviour both in the presence and absence of insulin, and forms a key component of a larger signalling cascade that controls the transport of glucose into the cell.

We present some initial results of the analysis of the behaviour of this dynamical system, its optimisation to experimental data, and discuss the biological insights that this gives into the translocation process.

**Biography:** I completed my undergraduate studies at UNSW in Mathematics and Education. After working as a maths teacher for some years I returned to UNSW to study a masters in applied maths, which led on to my current Phd enrollment.
6. Fully discretised filtered approximation for Gaussian random fields on spherical shells
Yoshihito Kazashi
Applied Mathematics

Abstract: Random fields on spherical shells arise naturally in the study of uncertainty quantification of physical phenomenon such as the electrical conductivity of the Earth’s atmosphere. In this talk, we describe key properties of a rotation invariant Gaussian random field on a spherical shell, which is characterised by its covariance function. The smoothness of the covariance function is connected to the continuity, and further to differentiability of the sample paths. We then discuss a fully discretised filtered polynomial approximation scheme used to approximate realisations of the random field. Rate of convergence of the method in terms of the expected squared supremum norms is established. Some properties of the corresponding lognormal Gaussian random fields and an application to a class of elliptic partial differential equations with random coefficients are discussed, if time permits.

Biography: 2nd year

7. Sums with multiplicative characters
Bryce Kerr
Pure Mathematics

Abstract: We discuss general techniques for bounding multiplicative character sums with a particular emphasis on sums mixed with additive characters of polynomials.

Biography: My main area of interest is Number Theory and most of my research is centered around character and exponential sums. I completed my undergraduate at Sydney University and began my PhD at Macquarie under the supervision of Igor Shparlinski and transferred to UNSW about 2 years ago.
8. Dynamic isoperimetric inequality and the detection of Lagrangian coherent structures  
Eric Kwok  
Applied Mathematics  

Abstract: Lagrangian coherent structures (LCSs) are material surfaces that exert the strongest and most consistent action on local trajectories. In the study of transport and mixing in dynamic systems, LCSs have been used as a geometrical approach for finding regions that are persistently well at resisting mixing. I will talk about the dynamic isoperimetric problem: the search of co-dimension 1 subsets of a manifold with persistently small boundary size relative to interior volume, as the geometry of the manifold is deformed under the influence of dynamics. Solutions to the dynamic isoperimetric problem are good candidates for LCSs, as these sets mitigate mixing through the mechanism of lasting small boundary size.

Biography: I started developing a crush with mathematics in high school at Newcastle, I liked maths enough, so I pursued a degree for it at the University of Newcastle. Things got serious, so I started doing a PhD in maths, and I have now committed about 2.5 years.

Xin Lei  
Statistics  

Abstract: Imagine there’s an object in space, and we can take measurements about its location during a period of time. So, our data will consist of a bunch of points in space/time forming some sort of trail, scatter or some other pattern. However, we’re not entirely sure about the measurement error of our equipment nor how the object is moving. If our measurements are very accurate, then we’re confident that the object is moving around according to the trail of points. On the other hand, if our measurements are very inaccurate then it becomes more likely that the object is remaining stationary. Which scenario is more plausible? In this talk, we’ll discuss how to resolve this conundrum.

Biography: I’m currently in my third year. Prior to my PhD I studied Maths at UNSW.
10. **Continuity of spectral shift function with respect to operator parameter**
Galina Levitina  
*Pure Mathematics*

**Abstract:** In this talk we will present recent research on continuity of spectral shift function with respect to operator parameter, which is applicable to differential operators in higher dimension.

**Biography:** I have graduated from the National University of Uzbekistan and got a postgraduate scholarship at UNSW in 2014. My research area is mainly operator theory with a slight incline toward mathematical physics.

11. **Spherical Harmonics and Hypergroup Structure of $S^3$**
Kevin Mandira Limanta  
*Pure Mathematics*

**Abstract:** In this talk I consider random walks on $S^3$ and an associated hypergroup structure on $S^3$. This will allow us to understand the spherical harmonics of the 3-sphere from an algebraic point of view, exploiting the group structure of $S^3$ as unit quaternions.

**Biography:** I am currently enrolled as a second year master by research student. I am doing pure mathematics and the research area I am working on is non-commutative harmonic analysis. I did my undergraduate study in Institut Teknologi Bandung, Indonesia not long time ago.
12. **Interval data analysis on estimating species abundance**

Huan Lin  
*Statistics*

**Abstract:** In classical data analysis, data are represented in an $n \times p$ matrix where $n$ "individuals" take exactly one value for each variable. Unfortunately, this structure is no longer applicable in the situation where an individual on each variable cannot be recorded to a single value without significant loss of information. In this talk, I will present a new approach to account for variability and/or uncertainty associated with each single observation, focusing on interval data. This method is then applied to estimate species abundance and concluded by discussing its pros, cons and potential improvements in the future.

**Biography:** I completed by BA and Bcom conjoint degree at the University of Auckland in NZ and then obtained a Master in Actuarial Statistics at ANU.

13. **Noticing people killing each other on the internet**

Dan MacKinlay  
*Statistics*

**Abstract:** The linear self-excited point ("Hawkes") process is well-studied model for contagious and self-propagating processes and has been recently proposed as a model for online spread of viral memes. A large but partial and noisy dataset of Youtube video views provides an opportunity to test the usefulness of this model for modelling and prediction using this idea, but the noisy and incomplete data raises certain challenges. I explain my progress in overcoming these difficulties using regularisation and explain how the resulting estimator unexpectedly detects Mexican drug cartel assassinations and Polish football riots.

**Biography:** In between being a roving troubadour, I did a BA in geography and a BSc in mathematics at the Australian National University, and an MSc in statistics at the Swiss Federal Institute of Technology. Apart from that I depend upon my animal cunning.
14. Maximal \( r \)-Matching Sequences of Complete Graphs
   Adam Mammoliti  
   Pure Mathematics

Abstract: Alspach (2008) defined the maximal matching sequencibility of a graph \( G \) as the largest integer \( s \) such that there exists a sequence of the edges of \( G \) so that every \( s \) consecutive edges form a matching. In this talk I provide an outline of some of the results know as well as my own generalisations of the condition and the results.

Biography: I did my undergraduate study at UNSW completing my Honours at the end of 2014. I Started my PhD in 2nd semester last year. I study various parts of Combinatorics.

15. Fractional-Order SIR Models Derived from a Stochastic Process
   Anna McGann  
   Applied Mathematics

Abstract: Classic SIR models have been generalised to include fractional derivatives in order to capture a history effect. A large number of papers consider an ad hoc inclusion of fractional derivatives. This regularly leads to a violation of flux-balance and dimension disagreement. This talk addresses these problems in greater depth and considers the derivation of fractional order epidemic model as a stochastic process, solving the outlined problems.

Biography: I completed my undergraduate degree in Advanced Mathematics (Hons I) in 2015 at UNSW and started my PhD mid 2015.
16. **Rational trigonometry of a tetrahedron in a general metrical framework**  
Gennady Notowidigdo  
*Pure Mathematics*

**Abstract:** This paper outlines a generalised trigonometry for a general tetrahedron in a metrical three-dimensional space, using the framework of rational trigonometry. Concepts from two-dimensional affine and projective geometry, with relation to the geometry and trigonometry of an affine triangle and a projective triangle respectively, are built on to obtain three results pertaining to the trigonometric quantities of the tetrahedron, with respect to an arbitrary symmetric bilinear form. Some examples are given.

**Biography:** I am a second-year PhD student studying Pure Maths. I did my undergraduate and honours degree at Monash University, majoring in statistics. My main research interest is in the application of linear algebraic tools to certain problems.

17. **Superintegrability in pp-wave spacetimes**  
Jeremy William Nugent  
*Pure Mathematics*

**Abstract:** Superintegrable systems are Hamiltonian systems with the maximal amount of symmetry. In this talk, superintegrability will be defined and examples will be given that explain the recent interest in this topic. Gravitational waves can be modelled with pp-wave spacetimes. We will introduce pp-wave spacetimes and give an example of a pp-wave spacetime that was recently discovered to be superintegrable.

**Biography:** I completed a Bachelor of Science (Advanced Mathematics) with honours in applied mathematics in 2014 at UNSW. My honours project was on ‘Markov chain models for metastable dynamical systems’ under supervision of Professor Gary Froyland and Dr. Cecilia González-Tokman. I have been enrolled part-time in my PhD under the supervision of Dr. Jonathan Kress since 2015.
Exploring iron control on global productivity: "FePSi", an inverse model of the ocean’s coupled phosphate, silicon and iron cycles.

Benoit Pasquier

Applied Mathematics

Abstract: "FePSi" is the first data-constrained mechanistic inverse model coupling the iron (Fe), phosphorus (P), and silicon (Si) oceanic cycles. The nutrient cycling is embedded in a data-assimilated steady global circulation. Biological nutrient uptake is parameterized in terms of nutrient, light, and temperature limitations on growth for 3 classes of phytoplankton that are not transported explicitly. A sparse matrix formulation of the discretized nutrient tracer equations allows for efficient numerical solutions using Newton’s method, which facilitates the objective optimization of the key biogeochemical parameters. The optimization minimizes the misfit between modeled and observed nutrients and chlorophyll fields. We explore the nonlinear, counterintuitive and asymmetric responses of the biological pump and nutrient cycles to changes in the aeolian iron supply for a variety of scenarios. Specifically, Green-function techniques are employed to quantify in detail the pathways and timescales with which those perturbations are propagated throughout the world oceans, determining the global teleconnections that mediate the response of the global ocean ecosystem.

Biography: After a master in pure mathematics at Ecole Polytechnique (France), a master of mathematics applied to finance at Paris Dauphine (France), I settled for a master of environmental sciences at UNSW, where I met my current supervisor (Mark Holzer) as my lecturer in geophysical fluid dynamics. I now get to apply some beautiful mathematics to oceanic nutrient cycling problems.
Mean circulation on the continental shelf off South-East Australia 31.5–34.5: The Hawkesbury Bioregion 2012–2013

Nina Ribbat

Abstract: Shelf seas are highly dynamic transition zones connecting the open ocean and the coast. Along the southeast coast of Australia, mesoscale eddies are the dominant features of the shelf circulation downstream of the East Australian Current (EAC) separation point. In this region the shelf circulation has been studied through long-term mooring and satellite observations. Despite the observations, the coarse spatial and temporal resolution of the sampling does not provide a complete understanding of dynamics of the shelf circulation. This study investigates the mean circulation and the variability along the continental shelf off southeast Australia over a 2-year period. We use a high resolution circulation model over a region that spans both the shelf and open ocean at high spatial and temporal resolution. Specifically, a 750 m version of the Regional Ocean Modelling System (ROMS) has been configured and validated for the shelf off southeast Australia. The configuration consists of a one-way nested domain inside a coarser (2.5–6 km), eddy resolving, data assimilating ROMS domain. Hindcast simulations have been conducted for 2 years from 2012-2013 capturing the submesoscale dynamics. Good agreements with observations suggest that the model is capable of capturing the major circulation variability in the EAC dominated shelf region. We use the time and space continuous hindcast fields to describe the mean shelf circulation, the mean along and across-shelf transport and the dominant modes of variability on the shelf. Mean along-shelf transport calculations indicate a primarily poleward volume transport on the inner and outer shelf, varying from 0.8 Sv in the northern part of the domain (32.5S) to 0.6 Sv in the southern part of the domain(34S). By defining the 200m isobath as the shelf/slope boundary, most cross-shelf transport is accounted for between 32.5 to 32S (making this the major region for shelf water export). The spatial empirical orthogonal function analysis (EOF) on the 2-year circulation hindcasts identifies three dominant modes accounting for 59 % variance and confirming the impact of the presence/absence of the EAC and the eddy field on the mean circulation on the shelf.

Biography: Bachelor of Applied Maths and Oceanography
20. **Multivariate Hawkes Processes for the Limit Order Book**

Kylie-Anne Richards  
*Statistics*

**Abstract:** Increased activity and clustering in the limit order book can be considered as an increase in intensity of events occurring in the limit order book. This is informative to high frequency trading strategies and minimizing cost for agency based execution. The Hawkes self-exciting process allows for the irregularly spaced time sequences, a multivariate framework with the flexibility to incorporate marks and capture dependence between the marks and to model the dynamic of the intensity function in both a discrete and continuous setting. This research investigates the appropriate model for capturing the dynamics of the limit order book. We apply this methodology to high frequency futures data, specifically SIMEX-Nikkei 225 index futures.

**Biography:** Kylie is enrolled in a PhD (stats) part-time. She completed her undergrad at Melbourne uni and Masters at Hong Kong uni. She runs a private trading company, trading in equities and depository receipts. And her greatest joys are her two young children Thomas and Ella.
Towards biogeochemical modelling of the EAC system

Carlos Rocha

Applied Mathematics

Abstract: The East Australian Current (EAC) is the Western boundary current (WBC) of the South Pacific subtropical gyre and dominates the large scale flow of the Tasman Sea. It advects warm oligotrophic waters poleward, displacing cooler, generally more productive waters, generates mesoscale eddies and induces coastal-upwelling. To better understand how this dynamic oceanographic context exerts its influence on the biogeochemical properties of the EAC System, we have developed a coupled physical-BGC (ROMS+N2PZD2) model of the region. We strive to achieve a realistic simulation of the basis of the region’s marine ecosystem and to assess the spatial and temporal variability of different biogeochemical variables (nitrates, ammonium, phytoplankton and associated chlorophyll concentration, zooplankton, small and large detritus), from synoptic events to seasonal and interannual timescales. We have conducted model performance assessments through comparison of chlorophyll-a model outputs with remote sensing products and verified the model ability to reproduce the expected latitudinal differences in phytoplankton biomass. These advances will act as an initial basis for future work in which eddy BGC dynamics, coastal entrainment and future scenarios are also explored.

Biography: Carlos studied Marine Sciences (Hons.) and Meteorology and Physical Oceanography (MSc.) at the University of Aveiro (Portugal), where he also worked as a research fellow. He started his PhD at UNSW in 2015 on the topic of BGC Modelling of the EAC System.
22. **Functional regression approximate Bayesian computation for Gaussian process density estimation**

Guilherme Souza Rodrigues

*Statistics*

**Abstract:** We propose a novel Bayesian nonparametric method for hierarchical modelling on a set of related density functions, where grouped data in the form of samples from each density function are available. Borrowing strength across the groups is a major challenge in this context. To address this problem, we introduce a hierarchically structured prior, defined over a set of univariate density functions, using convenient transformations of Gaussian processes. Inference is performed through approximate Bayesian computation (ABC), via a novel functional regression adjustment. The performance of the proposed method is illustrated via simulation studies and an analysis of rural high school exam performance in Brazil. This is joint work with David Nott and Scott Sisson.

**Biography:** Guilherme Rodrigues is a PhD student at University of New South Wales under supervision of A/Prof. Scott Sisson, being particularly engaged in the development of Approximate Bayesian Computation (ABC) methods. He obtained his bachelor and master’s degrees in Statistics at the Universidade de Brasília, Brazil. Before pursuing his PhD, Guilherme worked for four years as statistical analyst for the Brazilian government at the Federal District Court of Justice.
Regression Adjustment for Noncrossing Bayesian Quantile Regression
Thais Carvalho Valadares Rodrigues
Statistics

Abstract: A two-stage approach is proposed to overcome the problem in quantile regression, where separately fitted curves for several quantiles may cross. The standard Bayesian quantile regression model is applied in the first stage, followed by a Gaussian process regression adjustment, which monotonizes the quantile function whilst borrowing strength from nearby quantiles. The two stage approach is computationally efficient, and more general than existing techniques. The method is shown to be competitive with alternative approaches via its performance in simulated examples. Quantile regression is widely used in medicine and environmental sciences. In this talk, both applications will be explored through real data examples.

Biography: Thais Rodrigues is a statistics PhD candidate at UNSW under supervision of Prof. Yanan Fan. She is on her third year and her main research area is Bayesian statistics, including quantile and nonparametric regression models. She has a double degree in Statistics and Electrical Engineering and obtained her master’s degree in Statistics at Universidade de Brasilia, Brazil, in 2012. She also held a position of statistician for one year at the Brazilian Disaster and Risk Management National Centre.
24. **Integrability detection in reversible maps using asymmetric periodic orbits**  
   Timothy Siu  
   *Applied Mathematics*

   **Abstract:** We examine the number of asymmetric points and orbits of reversible mappings when reduced to a finite space. We see that there is a strong relationship between the number of asymmetric points and orbits and the number of algebraic integrals that the mapping has. By using these statistics, we develop a test for integrability in reversible mappings.

   **Biography:** I did my undergraduate studies at UNSW, and currently am in the 2nd year of the PhD program.

25. **Information Propagation in Microblogs: Modelling the Temporal Dynamics and Predicting the Popularity**  
   Wai Hong Tan  
   *Statistics*

   **Abstract:** Massive information dissemination and propagation happen in microblogging platforms such as Twitter. Microblogs play an indispensable role by facilitating the rapid spread of content. Consequently, it is essential to analyse the underlying dynamics of information diffusion in such networks. Understanding the mechanisms can expedite social media management, promote advertisement effectively and even stimulate the growth of businesses. In our model, we aim to predict the final popularity of a tweet as soon as it is shared. We capture the sentiments of the post and model the temporal dynamics using the theory of point processes. As new information comes in, we update our model accordingly. The final popularity of an information cascade can then be predicted by allowing the model to observe the history up to some point.

   **Biography:** I completed my Bachelor’s Degree in Universiti Utara Malaysia (UUM) in the Bachelor of Decision Science. Then, I did my Master’s Degree in Universiti Malaya (UM) in Master of Applied Statistics. I enrolled into UNSW since the end of August in 2015.
Abstract: Sequential Monte Carlo (SMC) is a widely applied technique to estimate the otherwise intractable likelihoods for hidden state space models that are driven by two sources of not perfectly correlated noise. The COGARCH model of Kluppelberg [2004] is a state space stochastic volatility model that has a unique feature in that the whole system is driven by only a single source of noise. This work details how SMC can be applied to the COGARCH model driven by a compound Poisson Levy process to construct a smooth likelihood surface for performing maximum likelihood estimation.

Biography: I am a statistics PhD student working under the supervision of Prof. William Dunsmuir and Dr. Feng Chen. I completed my undergraduate at UNSW studying Mathematics and Actuarial Studies. My research interest is in Financial Mathematics.

Xin Zhang
Statistics

Abstract: Dirichlet processes are widely-used in Bayesian nonparametric modelling in statistics and machine learning. Inference for such models typically involves Gibbs sampling approaches. The efficiency of the sampling is critical to the success of the model in practical large scale applications. In this article, we introduce a residual allocation scheme for the Gibbs sampling of Dirichlet process mixture and hierarchical Dirichlet process models, with conjugate priors and discrete observations. It jointly updates latent variables of clustering labels with identical discrete observations. To direct sampling from the full conditional distribution, we derive a collection of normalising constants according to combinatorial identities associated with rising factorials. The proposed scheme can be interpreted as a blocking scheme of the marginal sampler (Neal, 2000; Teh, 2006), which can improve their chain mixing efficiency with a theoretical guarantee.

Biography: Xin is a third year PhD student in statistics. His research interests include symbolic data approaches and Bayesian computation methods. Before doing PhD, he studied mathematics in Xi’an Jiaotong university in China, and statistics in UNSW.