mathsfest AUSTRALIA 2016

Advances in Ergodic Theory, Hyperbolic Dynamics and Statistical Laws

The Australian National University

28 November – 2 December 2016

Sponsors

AMSI Australian Mathematical Sciences Institute

Australian National University

University of Wollongong

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The University Of Queensland Australia

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MATHSFEST Program
28 November – 2 December 2016

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:30	Registration				
9:00	**Invited Lecture** F. Ledrappier	**Invited Lecture** D. Kelly	**Invited Lecture** C. Liverani	**Invited Lecture** F. Pène	**Invited Lecture** K. Ramanan
10:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:30	**Invited Lecture** B. Goldys	**Invited Lecture** M. Dellnitz	**Invited Lecture** M. Pollicott	**Invited Lecture** K. Burns	T. Dooley
11:00					A. Blumenthal
11:30	S. Balasuriya	J. Wouters	K. Yamamoto	V. Climenhaga	A. Sims
12:00	P. Koltai	C. Kalle	I. Rios	J. F. Alves	E. G. Altmann
12:30	Lunch	Lunch	Lunch	Lunch	Lunch
14:00	**Invited Lecture** A. Hassell	**Invited Lecture** M. J. Pacifico		**Invited Lecture** A. Wilkinson	
15:00	Coffee Break	Coffee Break		Coffee Break	
15:30	D. Dragičević	S. Hittmeyer		T. Schindler	
16:00	H. Osinga	S. V. da Silva		M. Field	
16:30				M. Nicol	
17:00				K. Burns event	
18:00	Posters/Drinks/BBQ				

Practical Information

Venue

Welcome to the Math(s)Fest! The talks for the Advances in Ergodic Theory, Hyperbolic Dynamics and Statistical Laws Workshop will all be held in the main hall of University House on the ANU campus.

This booklet includes a map of campus and University House is in the top right corner of square C2.

Events

On Monday evening from 18:00 to 22:00, the workshop is hosting a welcome barbeque and poster session at University House. If you would like to bring an extra guest to the barbeque, please let us know as soon as possible. The cost per extra guest will be AUD $60.

On Thursday evening at 17:00, the workshop is celebrating the Keith Burns' sixtieth birthday in the Common Room of University House. Light snacks and, of course, cake will be served. There will also be a cash bar.

Free Afternoons

No talks are scheduled for Wednesday and Friday afternoons and there are a number of attractions near the ANU campus. The National Museum of Australia is just south of campus and in easy walking distance. Further south, on the other side of the river, are the National Gallery of Australia and the Old and New Parliament Buildings. We plan to put more information up on the workshop website.

There is also a tourist bus line (Route 81/981) and a free city loop bus (Route 101).

Internet

Eduroam is available throughout the ANU campus. If you cannot access the internet through Eduroam, talk to one of the organisers to get access to the wi-fi at University House.

Accommodation

If the workshop has arranged your accommodation, then you should have received an email from us with details. If you unsure of your check-in details, please talk to one of the organizers or contact us at `dynamics.mathfest.australia@gmail.com`.

Dining

There are a number of restaurants on campus, as noted by the fork and knife logos on the campus map. Most of them are in and around Union Court (square C3 on the map).

East of the ANU Campus are a number of restaurants in and around the large "Canberra Center" shopping complex. This complex also has a supermarket for buying groceries. This area is about a twenty minute walk from University House.

We hope you have a great time in Canberra!

Organising Committee

Gary Froyland
Cecilia González-Tokman
Georg Gottwald
Andy Hammerlindl
Matthew Nicol
Luchezar Stoyanov

List of Registrants

Current as of Thu 10 Nov 2016

Assoc Prof Eduardo G. Altmann	University of Sydney
Prof José F. Alves	University of Porto
Mr Fadi Antown	University of New South Wales
Assoc Prof Sanjeeva Balasuriya	The University of Adelaide
Ms Chantelle Louise Blachut	The University of Queensland
Dr Alex Blumenthal	University of Maryland College Park
Prof Keith Burns	Northwestern University
Mr Timothy Peter Bywaters	University of Sydney
Prof Vaughn Climenhaga	University of Houston
Mr Peter Cudmore	The University of Queensland
Prof Michael Dellnitz	University of Paderborn
Dr Davor Dragičević	University of New South Wales
Dr Nazife Erkursun Ozcan	Hacettepe University
Prof Michael John Field	Imperial College London
Prof Gary Froyland	University of New South Wales
Prof Beniamin Goldys	University of Sydney
Dr Cecilia González-Tokman	The University of Queensland
Prof Georg Gottwald	University of Sydney
Mr Richard Greenhalgh	The University Of Western Australia
Dr Andy Hammerlindl	Monash University
Prof Andrew Hassell	Australian National University
Dr Stefanie Hittmeyer	The University of Auckland
Mr Kieran Jarrett	University of Bath
Dr Charlene Kalle	University of Leiden
Dr David Kelly	New York University
Dr Robert Kenny	The University Of Western Australia
Mr Alexander Khor	The University Of Western Australia
Dr Péter Koltai	Freie Universität Berlin
Dr Bernd Krauskopf	University of Auckland
Mr Eric Kwok	University of New South Wales
Prof François Ledrappier	Université Paris 6
Prof Carlangelo Liverani	Università degli Studi di Roma “Tor Vergata”
Mr Michael Arthur Mampusti	University of Wollongong
Dr Gemma Mason	The University of Auckland
Ms Fakhereh Mohammad esmaeili fakhereh	University of Hyderabad
Mr Jack Murdoch Moore	The University Of Western Australia
Dr Rua Murray	University of Canterbury
Prof Matthew James Nicol	University of Houston
Mr Adam Nie	Australian National University
Mr Daniel Nix	Australian National University
Prof Hinke Osinga	The University of Auckland
Dr Maria Jose Pacifico	Universidade Federal do Rio de Janeiro
Prof Jayantha Pasdunkorale Arachchige	University of Ruhuna
Prof Françoise Pène	Université de Bretagne Occidentale
Prof Mark Pollicott	University of Warwick
Prof Kavita Ramanan	Brown University
Prof Isabel Rios	Universidade Federal Fluminense
Dr Tanja Schindler	Australian National University
Dr Simone Vasconcelos da Silva	Universidade de Brasília

Prof Aidan Sims	University of Wollongong
Prof Luchezar Stoyanov	The University Of Western Australia
Dr Melissa Tacy	Australian National University
Dr Ilknur Tulunay	University of Technology, Sydney
Dr Petrus van Heijster	Queensland University of Technology
Prof Amie Wilkinson	University of Chicago
Mr John Wormell	University of Sydney
Dr Jeroen Wouters	University of Sydney
Dr Kenichiro Yamamoto	Nagaoka University of Technology
Dr Yiwei Zhang	Huazhong Univ of science and technology

1. Talks

1.1. Sampling Rare Trajectories in Chaotic System

Eduardo G. Altmann (University of Sydney)

12:00 Fri 2 December 2016 –
Assoc Prof Eduardo G. Altmann

I will present a general framework to search and sample rare trajectories in chaotic systems. The main result is to show how properties of the system (e.g., Lyapunov exponents, fractality) should be included in the proposal step of Markov Chain Monte Carlo methods. Results are shown for two problems: (i) computing long-lived trajectories in transient-chaos problems; and (ii) sampling trajectories with atypical chaoticity, as measured by an atypically large or small finite-time Lyapunov exponent. We confirm numerically for different classes of (high-dimensional) chaotic systems that our algorithm scales polynomially with the observable, a dramatic improvement over the exponential scaling obtained in traditional uniform-sampling methods.

1.2. Gibbs-Markov-Young structures for partially hyperbolic attractors

José F. Alves (University of Porto)

12:00 Thu 1 December 2016 –
Prof José F. Alves

Gibbs-Markov-Young structures have been frequently used in last decades as an important tool for studying the statistical properties of systems with some hyperbolicity. In articular, the decay of correlations and large deviations can be determined by the tail of recurrence times associated to these structures. In the case of partially hyperbolic attractors, some results have appeared in the literature, depicting the whole scenario in a fairly reasonable way in the mostly expanding case. The mostly contracting case is still far from being completely understood. In this talk we will present some recent results in both directions.

1.3. Hyperbolic neighbourhoods in nonautonomous flows

Sanjeeva Balasuriya (The University of Adelaide)

11:30 Mon 28 November 2016 –
Sanjeeva Balasuriya, Rahul Kalampattel and Nicholas Ouellette

Hyperbolic trajectories in nonautonomous flows have the property that nearby trajectories experience exponential separation in the relevant time direction. Motivated by the stretching of fluid elements in fluid flows, here we analyse the zone of influence of hyperbolic trajectories. We define this to be a Hyperbolic Neighbourhood (HN), a time-varying region anchored to each time-varying hyperbolic trajectory. We establish, using both theoretical arguments and empirical verification from model and experimental data, that the HNs profoundly impact the Lagrangian stretching experienced by fluid elements. In particular, we show that fluid elements traversing a flow experience exponential boosts in stretching while within these time-varying regions, that greater residence time within HNs is directly correlated to larger Finite-Time Lyapunov Exponent (FTLE) values, and that FTLE diagnostics are reliable only when the HNs have a geometrical structure that is regular in a specific sense.

1.4. Lyapunov exponents for small random perturbations of predominantly hyperbolic two-dimensional volume-preserving diffeomorphisms, including the Standard Map

Alex Blumenthal (University of Maryland College Park)

11:00 Fri 2 December 2016 –
Dr Alex Blumenthal

An outstanding problem in smooth ergodic theory is the estimation from below of Lyapunov exponents for maps which exhibit hyperbolicity on a large but non-invariant subset of phase space. It is notoriously difficult to show that Lypaunov exponents actually reflect the predominant hyperbolicity in the system, due to cancellations caused by the 'switching' of stable and unstable directions in those parts of phase space where hyperbolicity is violated.

In this talk I will discuss the inherent difficulties of the above problem, and will discuss recent results when small IID random perturbations are introduced at every time-step. In this case, we are able to show with relative ease that for a large class of volume-preserving predominantly hyperbolic systems in two dimensions, the top Lypaunov exponent actually reflects the predominant hyperbolicity in the system. Our results extend to the well-studied Chirikov Standard Map at large coupling. This work is joint with Lai-Sang Young and Jinxin Xue.

1.5. The Weil Petersson geodesic flow

Keith Burns (Northwestern University)

10:30 Thu 1 December 2016 –
Prof Keith Burns

I will talk about the geodesic flow for the Weil-Petersson metric on the moduli space of a surface that supports hyperbolic metrics. This is a Riemannian metric with negative sectional curvatures. However the classical results of Anosov do not apply because the metric is incomplete and

the sectional curvatures and their derivatives are not uniformly bounded. It was not until the 21st century that this geodesic flow was shown to be mixing (and in fact Bernoulli). I will give some ideas from the proof and also from more recent work directed towards showing that the flow is exponentially mixing in case of the torus with one puncture. This is joint work with Howard Masur, Carlos Matheus, and Amie Wilkinson.

1.6. Specification and Markov properties in shift spaces

Vaughn Climenhaga (University of Houston)

11:30 Thu 1 December 2016 –
Asst Prof Vaughn Climenhaga

Existence, uniqueness, and statistical properties of invariant measures for dynamical systems with hyperbolic behaviour can be studied by constructing a certain "tower" that represents the system as a suspension over the full shift on a countable alphabet. I will discuss recent results that permit this construction to be carried out under relatively weak hypotheses.

1.7. Glimpse of the Infinite - the Approximation of Invariant Sets for Delay and Partial Differential Equations

Michael Dellnitz (University of Paderborn)

10:30 Tue 29 November 2016 –
Prof Michael Dellnitz

In this talk we present a novel numerical framework for the computation of finite dimensional invariant sets for infinite dimensional dynamical systems. With this framework we extend classical *set oriented* numerical schemes (for the computation of such objects in finite dimensions) to the infinite dimensional context. The underlying idea is to utilize appropriate *embedding techniques* for the reconstruction of invariant sets in a certain finite dimensional space. Finally, we illustrate our approach by the computation of attractors both for delay and for partial differential equations.

1.8. Random Group Actions

Anthony Dooley (University of Technology Sydney)

10:30 Fri 2 December 2016 –
Prof Anthony Dooley

A random group action is a generalisation of Arnold's theory of random dynamical systems, where the time dynamics is replaced by a group action G and the noise is non-singular under the action of G.

In particular, with GuoHua Zhang, we showed, for the action of a discrete amenable group, that random actions have the structure of a continuous bundle, realising the structure as a skew product generated by the cocycle. We also developed a theory of local fibre topological pressure, local entropy and a variational principle (maximum local entropy principle).

1.9. Limit theorems for random Lasota-Yorke maps using the spectral method

Davor Dragičević (University of New South Wales)

15:30 Mon 28 November 2016 –
Dr Davor Dragičević

The so-called Nagaev-Guivarc'h spectral method is one of the most powerful tools in establishing limit theorems and has been successfully applied in various situations including Markov chains and dynamical systems. In the standard deterministic setting the method consists of finding an appropriate Banach space on which the transfer operator has a spectral gap and then applying various results from the perturbation theory of linear operators.

In this talk, I will discuss an ongoing research project which aims to extend this method to the random case. We will also explain how the multiplicative ergodic theorem naturally appears in this setting. This is a joint work with G. Froyland, C. González Tokman and S. Vaienti.

1.10. Functional Networks

Mike Field (Imperial College London)

16:00 Thu 1 December 2016 –
Prof Mike Field

We describe a result that yields a functional decomposition for a large class of networks. The result allows us to express the function of a dynamic network in terms of dynamics of individual nodes and constituent subnetworks.

Nonsmooth effects, such as changes in network topology through decoupling of nodes and stopping and restarting of nodes, are one of the crucial ingredients needed for this result. In networks modelled by smooth dynamical systems, all nodes are effectively coupled to each other at all times and information propagates instantly across the entire network. A spatiotemporal decomposition is only possible if the network dynamics is nonsmooth and (subsets of) nodes are allowed to evolve independently of each other for periods of time. This allows the identification of dynamical units, each with its own function, that together comprise the dynamics and function of the entire network. The result highlights a drawback of averaging over a network: the loss of information about the individual functional units, and their temporal relations, that yield network function.

We conclude with questions about how to construct continuum models (smooth or stochastic PDEs) for functional networks that allow us to

regain smoothness in a context where nonsmoothness is an inherent part of the network function.

1.11. Some ergodic problems for stochastic PDEs

Beniamin Goldys (University of Sydney)

10:30 Mon 28 November 2016 –
Prof Beniamin Goldys

I will present some results on long time behaviour of systems evolving randomly in space and time described as solutions to stochastic evolution equations on.

1.12. Dynamical systems theory applied to eigenfunction estimates

Andrew Hassell (Australian National University)

14:00 Mon 28 November 2016 –
Prof Andrew Hassell

In this talk, I will survey how results from dynamical systems have been used to prove estimates for high-energy eigenfunctions on Riemannian manifolds.

1.13. The geometry of blenders in a three-dimensional Hénon-like family

Stefanie Hittmeyer (The University of Auckland)

15:30 Tue 29 November 2016 –
Dr Stefanie Hittmeyer

Blenders are a geometric tool to construct complicated dynamics in a theoretical setting. We consider an explicit family of three-dimensional Hénon-like maps that exhibit blenders in a specific regime in parameter space. Using advanced numerical techniques we compute stable and unstable manifolds in this system and present one of the first numerical pictures of the geometry of blenders.

1.14. Matching for generalised beta-transformations

Charlene Kalle (University of Leiden)

12:00 Tue 29 November 2016 –
Dr Charlene Kalle

The phenomenon of matching (i.e., merging of left/right limits at a discontinuity after some iterates) has been observed in many families with, in some sense, nice algebraic properties. It turn out that also in the family $x \mapsto \beta x + a \mod 1$, matching occurs for many values of β. In this talk I would like to describe the mechanisms behind this. This is based on joint work with Henk Bruin and Carlo Carminati.

1.15. Ergodic theory in data assimilation

David Kelly (New York University)

9:00 Tue 29 November 2016 –
Dr David Kelly

Data assimilation describes the method of blending dynamical models and observational data, with the objective of reducing uncertainty in state estimation and prediction. The procedure has an 'optimal' Bayesian solution, which tends to be computationally intractable for high dimensional models. As a consequence, many approximation procedures, called approximate filters, have been developed in the geoscience and numerical weather prediction communities, where models tend to be very high dimensional, and where state estimation and uncertainty quantification are central tenets. It is important that we judge these approximations on how well they inherit important features from the true Bayesian solution. In this talk, we will investigate ergodicity for several types of filters that are prevalent in numerical weather prediction. Ergodicity is of crucial importance for filters; it implies a robustness with respect to initial perturbations in state approximations, moreover it suggests that the filter, which is a proxy for the true underlying dynamical system, is inheriting important physical statistical properties. Alongside mostly positive results, we will see that approximate filters don't always do a good job of inheriting ergodicity. We define a class of models, which are highly stable (and certainly ergodic) for which well trusted approximate filters exhibit strong sensitivity to initialization. In other words, the filters quickly lose touch with reality. This talk is based on several joint works with Andy Majda, Andrew Stuart, Xin Tong, Eric Vanden-Eijnden and Jonathan Weare.

1.16. Spatio-temporal computational methods for coherent sets

Péter Koltai (Freie Universität Berlin)

12:00 Mon 28 November 2016 –
Dr Péter Koltai

The decomposition of the state space of a dynamical system into metastable sets is important for understanding its essential macroscopic behavior. The concept is quite well understood for autonomous dynamical systems, and recently generalizations appeared for non-autonomous systems: coherent sets. Aiming at a unified theory, in this talk we first present connections between the measure-theoretic autonomous and non-autonomous concepts. We will do this by considering the augmented state space, and our results will be restricted to systems with time-periodic forcing. Second, we introduce a data-based method to compute coherent sets. It uses diffusion maps for spatio-temporal trajectory

data, and it is consistent in the infinite-data limit with the widely-used transfer operator approach for coherent sets.

1.17. Local Limit Theorem in negative curvature

François Ledrappier (Université Paris 6)

9:00 Mon 28 November 2016 –
Prof François Ledrappier

We consider the universal cover of a compact manifold with negative curvature. We give a precise equivalent of the heat kernel $p(t, x, y)$ as t goes to infinity. This is a joint work with Seonhee Lim (Seoul Nat. Univ.).

1.18. Hyperbolic billiards

Carlangelo Liverani (U. Roma "Tor Vergata")

9:00 Wed 30 November 2016 –
Prof Carlangelo Liverani

The rigorous study of hyperbolic billiards was started by Sinai in 1970 and since then it has grown in many directions due to the importance of this seemingly simple model for many branches of mathematics and physics. Today it is still a very active field of research. In fact, in the last years several new results have been obtained and new applications have been proposed. I will present an idiosyncratic selection of results and open problems concerning hyperbolic billiards.

1.19. Intrinsic excitability and the role of saddle slow manifolds

Hinke Osinga (University of Auckland)

16:00 Mon 28 November 2016 –
Prof Hinke Osinga

Excitable cells, such as neurons, exhibit complex oscillations in response to external input, e.g., from other neurons in a network. We consider the effect of a brief stimulation from the rest state of a minimal neuronal model with multiple time scales. The transient dynamics arising from such short current injections brings out the intrinsic bursting capabilities of the system. We focus on transient bursts, that is, the transient generation of one or more spikes, and use a simple polynomial model to illustrate our analysis. We take a geometric approach to explain how spikes arise and how their number changes as parameters are varied. We discuss how the onset of new spikes is controlled by stable manifolds of a slow manifold of saddle type. We give a precise definition of such a stable manifold and use numerical continuation of suitable two-point boundary value problems to approximate them.

1.20. Lagrange and Markov dynamical spectra of Lorenz-like attractors

Maria José Pacifico (Universidade Federal do Rio de Janeiro)

14:00 Tue 29 November 2016 –
Dr Maria José Pacifico

In a joint work with S. Romaño and C. G. Moreira, we prove that the Hausdorff dimension of a geometric Lorenz attractor is strictaly greater than 2. From this, we conclude that the interior of the Lagrange dynamical spectra as well the interior of the Markov dynamical spectra of a geometric Lorenz attractor is non empty.

1.21. Quantitative recurrence for slowly mixing hyperbolic systems

Françoise Pène (Université de Bretagne Occidentale)

9:00 Thu 1 December 2016 –
Prof Françoise Pène

We are interested in the counting process of visits to a small around the origin, and more precisely in its behaviour as the radius of the ball goes to 0. We prove the convergence in distribution of this process (under a suitable time normalization) to the standard Poisson process. This is a joint work with Benoît Saussol.

1.22. Rigorous estimates for the Lanford map

Mark Pollicott (University of Warwick)

10:30 Wed 30 November 2016 –
Prof Mark Pollicott

The Lanford map is a simple example of a map of the interval given by

$$Tx = 2x + 0.5x(1 - x) \pmod 1.$$

We use this as a test case to illustrate how certain natural characteristics (e.g., variance, linear response) can be rigorously estimated (with error estimates) using ideas from thermodynamic formalism. This is joint work with Oliver Jenkinson and Polina Vytnova.

1.23. Decay of Correlations in various Hard-Core models

Kavita Ramanan (Brown University)

9:00 Fri 2 December 2016 –
Prof Kavita Ramanan

Recently a strong connection has been established for certain discrete models between the algorithmic problem of counting on graphs and a certain correlation decay property. In particular, this has been established for the so-called hard-core model that arises in statistical physics, telecommunications and combinatorics, and describes a

one-parameter family of probability measures, indexed by a positive activity parameter, on 0-1 configurations on a graph. We present several results on variants of the standard hard-core model, and show how dynamical systems techniques are useful for establishing the correlation decay property. We especially focus on a continuous version of the model, which is motivated by the algorithmic problem of computing the volume of a polytope. The talk is based on joint work with D. Gamarnik.

1.24. Decreasing entropy in the destruction of horseshoes via internal tangencies

Isabel Rios (Universidade Federal Fluminense)

12:00 Wed 30 November 2016 –
Prof Isabel Rios

We study the variation of the topological entropy for a family of horseshes bifurcating an internal tangency. We prove that, restricted to a set of parameters with total density at the breaking-contact bifurcation, the topological entropy is a non-increasing function. This result formalizes the idea that the loss of transversal homoclinic intersections implies the decreasing of the amount of dynamics. This is a joint work with A. de Carvalho, L. J. Díaz and K. Díaz-Ordaz.

1.25. Generalized strong law for intermediately trimmed Birkhoff sums

Tanja Schindler (Australian National University)

15:30 Thu 1 December 2016 –
Tanja Schindler

By a theorem by Aaronson there is no strong law of large numbers for observables of a dynamical system with infinite expectation. However, for a suitable distribution function, the sum is essentially dominated by the contribution of a finite number of its largest terms and a solution can be obtained from a generalised strong law of large numbers for the lightly trimmed sum, that is, the Birkhoff sum $\sum_{k=1}^{n} \varphi \circ T^{k-1}$ trimmed by a finite number of extremes. More formally, we consider a permutation $\pi \in \mathcal{S}_n$ such that $\varphi \circ T^{\pi(1)-1} \geq \ldots \geq \varphi \circ T^{\pi(n)-1}$ and consider the sum $S_n^r := \sum_{k=r+1}^{n} \varphi \circ T^{\pi(n)-1}$. We say that the system fulfils a *lightly trimmed strong law*, if there exist a real-valued sequence (d_n) and $r \in \mathbb{N}$ such that $\lim_{n\to\infty} S_n^r/d_n = 1$ almost surely.

There is a vast literature covering the case of lightly trimmed strong law for independent as well as for mixing processes, one example in this area is the lightly trimmed strong law for the digits of the continued fractions transformation.

A generalisation, applicable for general distribution functions of a non-negative observable, is to use *intermediate trimming*, that is, consider the trimmed Birkhoff sum $S_n^{b_n} := \sum_{k=b_n+1}^{n} \varphi \circ T^{\pi(k)-1}$ with b_n tending to infinity and $b_n = o(n)$.

The proof is based on a large deviation result for transfer operators with spectral gap.

These results can be applied to observables on subshifts of finite type and on piecewise expanding interval maps. In this talk I will concentrate on the dynamical results.

This is joint work with Marc Kesseböhmer.

1.26. Diffusive - Ballistic phase transition in a Randon Polymer model

Simone Vasconcelos da Silva (Universidade de Brasília)

16:00 Tue 29 November 2016 –
Dr Simone Vasconcelos da Silva

Phase transition issues are addressed for random polymers on the bidimensional lattice with self-repulsive interactions. By comparison with a long range one-dimensional ferromagnetic Ising model, it is shown that in the absence of drift and with power law interactions, the polymer exhibits transition from diffusive to a ballistic behavior. When non-null drifts are added and positive translation invariant interactions are considered, the polymer presents a ballistic behavior. We also derive a Central Limit Theorem for the model.

1.27. Equilibrium states on noncommutative solenoids

Aidan Sims (University of Wollongong)

11:30 Fri 2 December 2016 –
Prof Aidan Sims

KMS equilibrium states for C^*-algebraic dynamical systems were originally motivated by physics, but have recently re-emerged as interesting invariants from a purely mathematical standpoint. For example, the KMS structure of the Toeplitz algebras of irreducible directed graphs is closely tied up with Perron-Frobenius theory for the adjacency matrices of the graphs, and encodes data like the Perron-Frobenius eigenvector, the spectral radius and the period of the matrix.

I'll discuss joint work with Nathan Brownlowe and Mitch Hawkins on the KMS structure of the Toeplitz algebras of "noncommutative solenoids". These are are direct limits of irrational-rotation algebras introduced by Packer and Latrémolière, and are not accessible via standard techniques for KMS theory because of the interplay between the subinvariance relations for the approximating irrational-rotation algebras, and the consistency conditions imposed by the way these subalgebras nest. But a bit of work revealed a pretty picture: the KMS-simplex of a Toeplitz noncommutative solenoid is isomorphic to the simplex of Borel

probability measures on the classical solenoid. I'll try to indicate why.

1.28. Beyond the limit of infinite time-scale separation: Edgeworth approximations and homogenisation

Jeroen Wouters (University of Sydney)

11:30 Tue 29 November 2016 –
Dr Jeroen Wouters

Homogenization has been widely used in stochastic model reduction of slow-fast systems, including geophysical and climate systems. The theory relies on an infinite time scale separation. In this talk we present results for the realistic case of finite time scale separation. In particular, we employ Edgeworth expansions as finite size corrections to the central limit theorem and show improved performance of the reduced stochastic models in numerical simulations.

1.29. Large deviations beyond specification

Kenichiro Yamamoto (Nagaoka University of Technology)

11:30 Wed 30 November 2016 –
Dr Kenichiro Yamamoto

In this talk, we give a criterion to determine the large deviation rate functions for certain dynamical systems without the specification property.

2. Posters

2.1. Optimizing Linear Response for Discrete Time Homogeneous Markov Chains

Fadi Antown (University of New South Wales)

18:00 Mon 28 November 2016 –
Mr Fadi Antown

2.2. Nonlinearly coupled oscillators.

Peter Cudmore (The University of Queensland)

18:00 Mon 28 November 2016 –
Mr Peter Cudmore

2.3. Non-singular group actions: the ergodic theorem and the critical dimension

Kieran Jarrett (University of Bath)

18:00 Mon 28 November 2016 –
Mr Kieran Jarrett

2.4. Fractal trees and the geometry of tilings

Michael Mampusti (University of Wollongong)

18:00 Mon 28 November 2016 –
Mr Michael Mampusti

2.5. TBA

Eric Kwok (University of New South Wales)

18:00 Mon 28 November 2016 –
Mr Eric Kwok

2.6. Fast and accurate approximation techniques for intermittent maps

John Wormell (University of Sydney)

18:00 Mon 28 November 2016 –
John Wormell

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Newsagent
Pharmacy
Post Office
45 Building Number
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Free Bus Stop
BBQ Sites
Emergency Phone
ANU Security
Bicycle Enclosure
Visitor Parking
Multi Storey Parking Station
Surface Car Parking
0 50 100 150m
Lake Burley Griffin
Sullivan's Creek
CLUNIES ROSS STREET
DALEY ROAD
LINNAEUS WAY
UNIVERSITY AVENUE
SCIENCE ROAD
NORTH DRIVE
McCAUGHEY ST
From Fenner Hall
PARKES WAY
GARRAN ROAD
BALMAIN CRESCENT
LIVERSIDGE STREET
FELLOWS ROAD
KINGSLEY CRESCENT
CHILDERS STREET
HUTTON STREET
RIMMER STREET
WATSON STREET
To Fenner Hall
CLARKE AVENUE
ALLSOP CIRCUIT
DARWIN PLACE
KNOWLES PLACE
LONDON CIRCUIT
HOBART PLACE
FARRELL PLACE
WILDEN ST
MURDEN ST
WILLIAM CLEMENS ST
GORDON STREET
CIRC.
HALES ST
EDINBURGH AVE
MARCUS STREET
ALINGA STREET
MOORE STREET
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