Block 1

1) Davide Ravotti, University of Bristol, UK

Title: Mixing for time-changes of nilflows"

Abstract: Abstract: Nilflows on nilmanifolds are classical examples of parabolic homogeneous flows and have been intensively studied also because of their connections with number theory. Their ergodic properties are well-understood: although almost every nilflow is uniquely ergodic, they are never weak mixing.
The absence of mixing is the result of an algebraic obstruction, namely a factor isomorphic to a linear flow on a torus. When the nilflows is perturbed by performing a smooth time-change, we should expect this toral factor to disappear. Indeed, we show that for generic time-changes of any uniquely ergodic nilflow, mixing holds unless the time-change function is measurably trivial. This result confirms some heuristic principles on the ergodic properties of smooth parabolic flows.
This is a joint work with Artur Avila, Giovanni Forni and Corinna Ulcigrai.

2) Alexey Korepanov, University of Warwick, Coventry, UK.

Title: "Statistical stability on short time scale"

Abstract: A parametrized family of dynamical systems is statistically stable if

their physical invariant measures change continuously with the

parameter. The physical invariant measures capture the almost sure limit

of Birkhoff averages, as the time goes to infinity.

I will talk about statistical behavior of Birkhoff averages for

nearby quadratic maps, in a situation where the statistical stability

breaks down in a variety of ways: even the physical invariant

measure

may not exist. This is a joint work with Neil Dobbs.

3) Sina Tureli, Imperial College, London, UK.

Title: "Sub-Riemannian Geometry for a class of non-differentiable bundles and connections to dynamical systems"

Abstract: We will show that the Ball-Box theorem from smooth sub-Riemannian†geometry†can be generalized to a certain class of continuous tangent sub-bundles and talk about some connections to†problems in dynamical systems.

4) Caroline Wormell, The University of Sydney

Title: "Rigorous and accurate numerical computation for intermittent maps"

Abstract:We present a novel algorithm to efficiently estimate statistical

properties of intermittent maps, including in the infinite ergodic case.

Intermittent maps such as the Pomeau-Manneville map form a widely

studied class of non-uniformly hyperbolic dynamics. Their dynamics are

characterised by long laminar periods near a neutral fixed point,

disturbed intermittently by turbulent bursts. These long laminar periods

present a challenge when trying to estimate statistical properties such

as the return time statistics of such systems.

Our novel method avoids long time integrations near the fixed point by formulating the return map explicitly in terms of an Abel function. This allows for very accurate approximation of the return map via an asymptotic expansion of the Abel function. We show that long-time statistical quantities of the full system, such as invariant measures and diffusion coefficients, can be expressed in terms of similar quantities associated with the return map; to calculate these we apply Chebyshev spectral methods to the return map's transfer operator. Our method converges exponentially fast and requires low computational effort: we demonstrate numerically that with our method one can practicably obtain estimates with tens of rigorously validated digits.

Block 2

5) Harry Crimmins, University of New South Wales, Australia.

Title: "Stability and approximation of statistical laws for some dynamical systems"

Abstract:TBA

6) Gary Froyland, University of New South Wales, Australia.

Title: Quenched limit laws and quenched stochastic stability for random dynamics

Abstract: We discuss a recently developed spectral approach for proving quenched limit laws and results for quenched stochastic stability.

7) Peyman Eslami, University of Warwick, Coventry, UK.

Title: "Exponential equidistribution of standard pairs for piecewise expanding maps of metric spaces."

Abstract:For a large class of piecewise expanding maps of a metric space we show the equidistribution of standard pairs at an exponential rate. As a corollary such systems have a unique absolutely continuous invariant probability measure with respect to which they are exponentially mixing. We allow for non-compact spaces and do not assume or use the existence of a Markov structure. Furthermore, we provide explicit estimates on the exponential rate of equidistribution and various constants involved

8) Malo Jezequel, Ecole Normale Superieure

Title: "Distribution of Ruelle resonances for non-analytic hyperbolic diffeomorphisms"

Abstract: Given a smooth uniformly hyperbolic diffeomorphism and a weight, one may define their Ruelle resonances that are the relevant eigenvalues of a transfer operator associated to the weighted dynamics. These resonances describe accurately the rate of mixing of some Gibbs measure. From the work of Ruelle, Rugh and Fried, it is known that real analytic diffeomorphisms have "few" resonances. We shall explain how to construct smooth diffeomorphisms and weights that give rise to many Ruelle resonances and then discuss the case of Gevrey dynamics whose behavior is in a way similar to the real-analytic ones.

Block 3

9) Oscar Bandtlow, Queen Mary University of London.

Title: "Anosov diffeomorphisms with explicitly computable Ruelle resonances"

Abstract:TBA

10) Nasab Yassine, UniversitÈ de Bretagne Occidentale, Brest,

Title: "Quantitative recurrence of hyperbolic flows"

Abstract:TBA

11) Toru Sera Kyoto university

Title: "Multidimensional generalized arcsine laws for intermittent maps"

Abstract:

We present a distributional limit theorem for the occupation ratio measures of interval maps with a finite number of indifferent fixed points. This limit theorem is a multidimensional extension of Thaler (2002)'s generalized arcsine laws for interval maps with two indifferent fixed points. This extension is inspired by studies (e.g., Barlow--Pitman--Yor (1989)) of occupation times of diffusion processes on multiray. This talk is based on a joint work with Kouji Yano (Kyoto University).

12)Mark Holland, University of Exeter, UK

Title: "Record Events in Dynamical Systems."

Abstract: For dynamical systems, there has been much work on the statistics of extremes. We look at the related topic of records.

Namely, given a process $\{X_n\}$ generated by a dynamical system,

we consider record events: namely times where $X_n>\max\{X_1,\ldots, X_{n-1}\}$. For certain dynamical systems, we consider the distribution of times for which records occur, and on the distribution of the corresponding record values. This work is joint with Mike Todd.

Block 4

13) Stefano Luzzatto, ICTP, Trieste, Italy.

Title: "Geometric characterization of SRB measures. "

Abstract: We give some simple necessary and sufficient conditions for the existence of SRB measures for surface diffeomorphisms. As part of your proof we show in particular that the relatively sophisticated and non-trivial structure of Young Towers follows almost automatically from the existence of a recurrent set with local product structure, and show that every hyperbolic measure is liftable to a Young Tower.† This is joint work with V. Climenhaga and Y. Pesin.

14)José Alves, University of Porto, Portugal

Title: "Entropy formula and continuity of entropy for piecewise expanding maps.”

Abstract: Abstract: We consider some classes of piecewise expanding maps in
finite dimensional spaces with invariant probability measures which are absolutely continuous with respect to Lebesgue measure. We derive

an entropy formula for such measures. Using this entropy formula, we present sufficient conditions for the continuity of that entropy with
respect to the parameter in some parametrized families of maps. We apply our results to some families of piecewise expanding maps. Joint
work with Antonio Pumariño.

15) Alex Mitropanov Frederick, MD, USA.

Title: "Connection between the rate of convergence to stationarity and stability to perturbations for stochastic and deterministic systems"

Abstract:

The notion of stability is one of the central notions in modern quantitative sciences. Because there exist different mathematical definitions and types of stability, it is natural and insightful to investigate causal relationships between them. One of the best-studied types of stability is (asymptotic) Lyapunov stability, related to the notion of ergodicity in the stochastic context. In this talk, I will consider exponential ergodicity, that is, convergence to the unique steady state at an exponential rate. We will focus on the connection between this rate and the stability of the system to perturbations in its governing equation. This connection will be quantified using perturbation bounds, and I will use Markov chain theory as the main source of specific examples. This choice is motivated by the ubiquity of Markov chains and by recent progress in their stability analysis. An extra motivation is provided by recent applications of such results in areas ranging from computational statistics to mathematical physics. Yet, the connection between ergodicity and stability to perturbations goes beyond the context of Markov chains, as we will see by discussing an important class of nonlinear dynamical systems. I will conclude the talk by suggesting possible directions for future research, which may shed further light on this topic and may have value for applications.

16) Paolo Giulietti, Centro Ricerche Matematiche Ennio De Giorgi, Pisa.

Title: "Linear response for dynamical systems with random noise."

Abstract:We present some results on dynamical systems with random noise. It is known that linear response does not always hold, for example due to the lack of regularity or of sufficient hyperbolicity. By studying an annealed transfer operator, we show that noise allows for linear response under very mild assumptions on the dynamical system. The key argument revolves around controlling the operator by pairs of norms, such as a Wasserstein-type norm and L1, which take into account both the long-term behavior of the system and the regularization effect of the noise (joint work with S. Galatolo).

Block 5

17) Valerio Lucarini, University of Reading

Title:"Revising and Extending the Linear Response Theory for Statistical Mechanical Systems: Evaluating Observables as Predictors and Predictands"

Abstract: Linear response theory has developed into a formidable set of tools for studying the response of a large variety of systems - including out of equilibrium ones - to perturbations. Mathematically rigorous derivations of linear response theory have been provided for systems obeying stochastic dynamics as well as for deterministic chaotic systems. In this paper we provide a new angle on the problem, by studying under which conditions it is possible to perform predictions on the response of a given observable to perturbations, using one or more other observables as predictors. By taking an approach that breaks the separation between forcing and response, which is key in linear response theory, the surrogate Green functions one constructs have support that is not necessarily limited to the nonnegative time axis. In other terms, we show that not all observables are equally good as predictands when a given forcing is applied, as result of the properties of their corresponding susceptibility. In particular problems emerge from the presence of complex zeros. We propose a new general method for reconstructing the response of an observable to the perturbation due to the application of N independent forcings by using as predictors N other observables by defining a new class of surrogate susceptibilities. We provide a thorough test of the theory and of the possible pathologies by using numerical simulations of the paradigmatic Lorenz '96 model. Our results are potentially relevant for problems like the reconstruction of climatic data from proxy data and provide a possible mathematical basis for the theory of the so-called emergent constraints in climate, as well as, possibly for the study of linear feedbacks in complex systems. It might also serve for reconstructing the response to forcings of a spatially extended system in a given location looking at the response in a

separate location.

18) Fadi Antown University of New South Wales, Australia.

Title: Optimal linear response

Abstract: The linear response of a dynamical system refers to changes to properties of the system when small external perturbations are applied. Much of the theoretical focus on linear response has been on establishing that for various classes of systems, there is a principle of linear response. Our focus in this work is in a much less studied direction, namely, determining those perturbations that lead to 'maximal' response. The practical implication of optimizing response is that it allows the identification of the perturbations that provoke a maximal system response. Under a suitable setting, we consider selecting the perturbations that (i) maximise the linear response of the equilibrium distribution of the system, (ii) maximise the expectation of the linear response with respect to an observable, and (iii) maximise the linear response of the rate of convergence of the system to the equilibrium distribution. Furthermore, application of the theory to various dynamics will be given.

19) Julien Sedro, University of Paris Sud.

Title: "Linear response for non-autonomous systems."

Abstract: Recently, there was a surge of interest for linear response in the context of random dynamical system. We propose to explain a method to study this problem in a quenched setting, where, unlike the annealed case, the dynamically relevant objects are transfer operators cocycles and their associated Oseledets-Lyapunov spectrum. We will explain how one can use cone contraction theory (both in the classical Birkhoff case and the more recent complex one) and the "implicit function approach" to linear response to construct a quenched absolutely continuous invariant measure for random product of expanding maps and study its regularity w.r.t parameters.

20) Z. Zhang, Kungliga Tekniska Hgskolan, Stockholm, Sweden.

Title: "On the smooth dependence of SRB measures for partially hyperbolic systems.

Abstract:TBA

Block 6

21) Matteo Tanzi, University of Victoria, Canada.

Title:"Heterogeneously Coupled Maps: Rigorous Reduction and Dynamics Reconstruction"

22) Jonathan Hoseana, Queen Mary University of London,

Title: "The mean median map"

23)Trevor Clark, Imperial College, London, UK.

Title: ìDynamics of asymptotically holomorphic polynomial-like mappingsî

Abstract: Sufficiently high renormalizations of an analytic mapping of the interval are polynomial-like mappings, and by the Douady-Hubbard Straightening Theorem such mappings are conjugate to polynomials. I will talk about the related problem for smooth

mappings.†Van Strien, Trejo and I proved that a sufficiently high renormalization of an infinitely renormalizable, C^3 mapping of the interval is an asymptotically holomorphic polynomial-like mapping.†Since these mappings are not analytic, tools like the Douady-Hubbard Straightening Theorem do not apply, and†even the topological dynamics of these mappings are difficult understand.†We have proved a Julia-Fatou-Sullivan†theorem for the dynamics of smooth, C^r, r>3, infinitely renormalizable mappings with bounded combinatorics. This is joint work with†Edson de Faria and Sebastian van Strien.

24) Jonathan Fraser, University of Manchester, UK.

Title: Dimensions of limit sets of Kleinian groups

Abstract: Kleinian groups act discretely on hyperbolic space and give rise to†fractal limit sets on the boundary. The dimension†theory of these limit sets is subtle, especially†in the presence of parabolic points.††I will discuss some†recent results in this area.

Block 7

25) Natalia Jurga, University of Warwick, Coventry, UK.

Title: "Thermodynamic formalism and dimension gaps".

26)Stuart Burrell, University of St Andrews

Title: "On the dimension and measure of inhomogeneous attractors."

Abstract: In this talk we will be introducing and discussing recent results on the dimension and measure of inhomogeneous attractors. For notions

of dimension that are countably stable there is a natural relationship between the dimension of inhomogeneous and homogeneous attractors. We extend this†

relationship to the countably unstable upper box dimension. The methodology developed also allows us to investigate the Hausdorff measure of such attractors†

at the critical value. To conclude, we present some applications of our main result to conformal and low dimensional affine iterated function systems.

27) Antti Kaenmaki, University of Helsinki, Finland

Title: "Domination and thermodynamical formalism for planar matrix cocycles"

Abstract: We consider cocycles in the simplest non-commutative setting, namely in the case of planar matrices. A cocycle is dominated if there is a uniform exponential gap between singular values of its iterates. This is equivalent to the existence of a strongly invariant multicone in the projective space. We show that a planar matrix cocycle is dominated if and only if matrices are hyperbolic and the norms in the generated sub-semigroup are almost multiplicative.

Matrix cocycles appear naturally in the study of random matrix products and in thermodynamic formalism for matrix-valued potentials. A norm potential satisfying domination is a prime example of an almost-additive dynamical system. We show that all such systems can be studied with the classical thermodynamic formalism. In fact, we are able to characterize all the properties of equilibrium states for norm potentials by means of the properties of matrices. As a consequence of our results, answering a folklore question, we show the existence of a quasi-Bernoulli equilibrium state which is not a Gibbs measure for any Hˆlder continuous potential.†

The talk is based on a recent work with B. B·r·ny and I. D. Morris.

28) Maja Resman, University of Zagreb

Title: Classifications of Dulac maps and epsilon -neighborhoods.

Abstract:

Classifications of Dulac maps and epsilon-neighborhoods (Maja Resman, University of Zagreb)

We give formal classification results for parabolic Dulac germs in the class of power-logarithm transseries. Parabolic Dulac germs appear as first-return maps around hyperbolic polycycles, and admit a power-logarithm asymptotic expansion. We further construct a Fatou coordinate for a parabolic Dulac germ (formal and sectorially analytic). We describe one application: reading the formal class of a germ from the initial part of the asymptotic expansion of the length of the epsilon-neighborhood of one orbit.

This is a joint work with Pavao Mardeöic, Jean-Philippe Rolin and Vesna éupanovic.

Block 8

29) Damien Thomine, Univ. Paris Sud

Title: "Keplerian shear in ergodic theory"

Abstract: Keplerian shear is a feature of many integrable Hamiltonian systems, from planetary rings to the geodesic flow on a torus.

I will show how to frame this phenomenon in ergodic theory, as a version of mixing which does not require ergodicity.

From there one can discuss the genericity of this phenomenon, give

quantitative estimates on its speed, or give non-Hamiltonian examples.

30) Romain Aiminio University of Porto

Title: "Random Lorentz gas and deterministic walks in random environment"

Abstract: Although one could naively expect that random Lorentz gases are easier to investigate than deterministic periodic ones, this seems not to be the case as essentially no results are available in the non periodic case. In this talk, I will present some general ideas towards studying random Lorentz gases and I will show how to apply them for a class of deterministic walks in random environments with one-dimensional uniformly expanding local dynamics. (joint work with Carlangelo Liverani)

31) M. Maggioni Leiden University

Title: "Absolutely continuous invariant measures for random dynamical systems"

Abstract: For random piecewise linear systems T of the interval that are expanding on average we construct explicitly the density functions of absolutely continuous T-invariant measures. Under the stronger assumption that the system uses only expanding maps, our procedure produces all such invariant densities of the system. The method generalises the one proposed by Kopf for the deterministic setting. We conclude showing examples provided by random ﬂ-transformations and a random L¸roth map with a hole.

32) Niels Langeveld: Leiden University - Universiteit Leiden

Title: "On the bifurcation set arising from Ito α-continued fractions"

Abstract: Using matching we can define intervals on which the entropy of Ito α-continued fractions is monotonic as a function of α. The complement of the union of all these intervals we call the bifurcation set $\mathcal{E}$. We will describe the set $\mathcal{E}$ using an open dynamical system. From this open dynamical system it follows that $\mathcal{E}$ has zero Lebesgue measure while $\dim_H(\mathcal{E})=1$.