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Book of Abstracts

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2. Plenary Lectures

Bálint Tóth, TU Budapest, Hungary
Walks with long memory: diffusive and super-diffusive limits

Monday, 9:00 - 9:45

I will survey recent results on scaling limits for walks and diffusions with long memory arising from path-wise self-interaction. The models considered include random walks in divergence-free random drift field, self-repelling Brownian polymers, myopic self-avoiding walks, and others.

Tomohiro Sasamoto, Tokyo Institute of Technology, Japan
The one-dimensional KPZ equation and its universality

Monday, 16:00 - 16:45

In 1986 Kardar, Parisi, and Zhang introduced a nonlinear stochastic partial differential equation to describe motion of growing interfaces. The one-dimensional version of this KPZ equation and related models are now under intensive studies because of their connections to diverse fields of mathematics and also of physical applications to real experiments. In this talk we explain several striking achievements on the equation and discuss various aspects of its universal nature.

Fabio Toninelli, Universite Lyon 1 and CNRS, France
Dimer models, Glauber dynamics and height fluctuations

Monday, 16:45 - 17:30

Dimer models (random perfect matchings of an infinite bipartite graph) are an exactly solvable 2-d statistical mechanics model, that can be viewed as a random discrete interface. I will present recent developments in two very different directions: 1) the role of the "macroscopic shape" and of interface height fluctuations in the study of the relaxation to equilibrium of Glauber stochastic dynamics for dimer models 2) "universality" of the logarithmic growth of height fluctuations for non-exactly solvable, interacting dimer models at equilibrium. Based on joint works with P. Caputo, B. Laslier, A. Giuliani, F. Martinelli, V. Mastropietro.

Martin Hairer, University of Warwick, UK (Lévy Lecture)
Weak universality of the KPZ equation

Tuesday, 9:00 - 9:45

The KPZ equation is a popular model of one-dimensional interface propagation. From heuristic consideration, it is expected to be "universal" in the sense that any "weakly asymmetric" or "weakly noisy" microscopic model of interface propagation should converge to it if one sends the asymmetry (resp. noise) to zero and simultaneously looks at the interface at a suitable large scale. The only microscopic models for which this has been proven so far all exhibit very particular that allow to perform a microscopic equivalent to the Cole-Hopf transform. The main bottleneck for generalisations to larger classes of models was that until recently it was not even clear what it actually means to solve the equation, other than via the Cole-Hopf transform. In this talk, we will see that there exists a rather large class of continuous models of interface propagation for which convergence to KPZ can be proven rigorously. The main tool for both the proof of convergence and the identification of the limit is the recently developed theory of regularity structures, but with an interesting twist.

Antonio Galves, Universidade de São Paulo, Brazil
Infinite systems of interacting chains with memory of variable length - a stochastic model for biological neural nets

Tuesday, 16:00 - 16:45

We present a new class of non Markovian processes with a countable number of interacting components. At each time unit, each component can take two values, indicating if it has a spike or not at this precise moment. The system evolves as follows. For each component, the probability of having a spike at the next time unit depends on the entire time evolution of the system after the last spike time of the component. This class of systems extends in a non trivial way both the interacting particle systems, which are Markovian, and the stochastic chains with memory of variable length which have finite state space. These features make it suitable to describe the time evolution of biological neural systems. This is a joint work with Eva Loecherbach.

Eyal Lubetzky, Microsoft Research, USA
Information percolation for the Ising model

Tuesday, 16:45 - 17:30

We introduce a new method of obtaining sharp estimates on mixing for Glauber dynamics for the Ising model, which, in particular, establishes cutoff in three dimensions up to criticality. The new framework, which considers "information percolation" clusters in the space-time slab, shows that total-variation mixing exhibits cutoff with an O(1)-window around the time at which the magnetization is the square-root of the volume. Furthermore, this method opens the door to understanding the effect of the initial state on the mixing time, showing that starting from the uniform ("disordered") initial distribution asymptotically halves the mixing time, whereas almost every deterministic starting state is asymptotically as bad as starting from the ("ordered") all-plus state.

Scott Sheffield, MIT, USA
QLE, DLA, KPZ, SLE, LQG and the Brownian map

Wednesday, 9:00 - 9:45

Liouville quantum gravity (LQG) is a random measure-endowed conformal structure constructed from the Gaussian free field. The Brownian map (TBM) is a random measure-endowed metric space constructed from the Brownian snake. This talk will describe a newly established relationship between LQG and TBM. The primary tool used to establish this relationship is the so-called quantum Loewner evolution (QLE), which will turn out to have applications to other subjects as well, including DLA and KPZ. This talk is based on joint work with Jason Miller.

Ivan Corwin, Columbia University, USA
Integrable probability: beyond the gaussian universality class

Wednesday, 10:15 - 11:00

Methods originating in representation theory and integrable systems have led to detailed descriptions of new non-Gaussian statistical universality classes. This talk will focus on some of the probabilistic systems (ASEP, q-TASEP, the O'Connell-Yor polymer, and the KPZ equation) and methods (Schur / Macdonald processes and quantum integrable systems) which have played a prominent role in this story.

Felix Otto, Max Planck Institute for Mathematics in the Sciences, Germany
A quantitative theory of stochastic homogenization

Wednesday, 11:00 - 11:45

The qualitative theory of stochastic homogenization of elliptic equations, or its probabilistic counterpart, namely the quenched invariance principle for random walks in random environments, is classical and by now extends to quite general situations, like (supercritical) percolation. Originally motivated by applications in engineering, like the representative volume method, our goal is to develop a calculus for a quantitative theory, which in its optimal form was unknown until recently even for the simplest cases.

Important elements in this quantification are higher moment bounds on the gradient of the corrector and of the Green function, and ergodicity properties of the process known as the environment as seen from the particle. The two main ingredients to the calculus are 1) notions from statistical mechanics, like the spectral gap or the logarithmic Sobolev inequality for the Glauber dynamics on the ensemble of coefficient fields, which are suitable quantifications of the qualitative assumption of ergodicity and 2) elliptic/parabolic regularity theory, in particular the theories of Nash and de Giorgi. In fact, the randomization also sheds new light on regularity theory, in particular in case of systems, where deterministic results are sparse. This is joint work with A. Gloria, S. Neukamm, D. Marahrens, and JC. Mourrat.

Christophe Garban, ENS Lyon, CNRS, France
Near-critical percolation and minimal spanning tree in the plane

Thursday, 9:00 - 9:45

Sample N points uniformly in a unit square of the plane. Among all the spanning trees which cover these N points, consider the tree with minimal euclidean length, called the Minimal Spanning Tree. In this talk, I will explain how to construct a continuous tree embedded in the plane which should be the scaling limit as N goes to infinity of the above tree. With such a Poissonian way of defining a planar minimal spanning tree, this limiting behaviour still remains conjectural but if one considers instead the analogous model on a well chosen planar graph, much more can be done: in a joint work started long ago with Gabor Pete and Oded Schramm and completed only recently, we prove that this continuous tree of a new kind is the scaling limit of the minimal spanning tree defined on the triangular lattice. Standard universality arguments suggest that the limiting tree should not depend on the microscopic structure of the model.

Sylvie Méléard, Ecole Polytechnique, France
Stochastic dynamics in adaptive biology

Thursday, 16:00 - 16:45

We consider a population process with births and deaths where individuals are characterized by an adaptive trait that influences ecological interactions among individuals, and by a genetic marker that is selectively neutral. The ecological and evolutionary dynamics of the population result from clonal reproduction, mutation and competition between individuals. The main assumption is that the marker mutation process is much faster than the trait mutation process but much slower than the ecological time scale of birth and death events. Therefore, there are three time scales in the model. We study the joint process of trait and marker dynamics on the trait mutation time scale. In a large population limit, we obtain a measure-valued di ffusive process with jumps. From a biological standpoint, we recover the hitch-hiking phenomenon and genetical bottleneck and explain the restoration of diversity.

David Nualart, University of Kansas, USA (IMS Medallion Lecture)
Malliavin calculus and normal approximation

Thursday, 16:45 - 17:30

The Malliavin calculus combined with Stein's method can be used to derive quantitative central limit theorems. In this lecture we will survey some recent developments on this topic including convergence in total variation for random variables in a finite Wiener chaos and uniform convergence of probability densities. We will also discuss how to derive quantitative versions of central limit theorems when the limit is a mixture of Gaussian distributions.

Gady Kozma, Weizmann Institute, Israel
Card shuffling, quantum mechanics and representation theory

Friday, 9:00 - 9:45

Random walk on the symmetric group is an important nexus for various distinct fields. It can be used to probe the structure of the group itself, it appears naturally in card shuffling problems, and some problems of quantum mechanics (e.g. the quantum Heisenberg ferromagnet) can be translated to a random walk problem on the symmetric group. Methods include classical probabilistic tools (coupling, martingales), representation theory, and approaches inspired by additive number theory. The talk will be a survey of recent results.

Milton Jara, IMPA, Brazil
Singular fluctuations of interacting particle systems

Friday, 14:00 - 14:45

We say that an observable of a distribution-valued stochastic process is singular if involves evaluation of the process at a given set, where the process is not well-defined as a function or measure. This is the case if we want to compute a non-linear function of the process, or if we want to evaluate it at a single point or line, depending on the path regularity of the process. We show how to obtain scaling limits of observables of interest for certain interacting particle systems, which are given by singular observables. The way to define these singular observables usually involves some renormalization procedure, which in our cases of interest is accomplished through carefully chosen martingale problems.

Laszlo Erdös, IST Austria, Austria
Spectral universality for a general class of matrices

Friday, 14:45 - 15:30

The celebrated Wigner semicircle law describes the limiting spectrum of Wigner type random matrices with matrix elements having zero expectation and variances summing up to a constant in each row. If this latter condition is dropped, the limiting density is not the semicircle any more but it can be obtained by analyzing a novel self-consistent equation. We present several applications of this general model. This is a joint work with Oskari Ajanki and Torben Krueger.

Anton Bovier, Bonn University, Germany
Extremal processes of branching Brownian motions

Friday, 16:00 - 16:45

I review the construction of the extremal process of branching Brownian motion, obtained with Louis-Pierre Arguin and Nicola Kistler. I emphasise the connection to spin glass theory and in particular the generalised random energy models of Gardener and Derrida. This naturally leads to a class of Gaussian processes indexed by Galton-Watson trees, also called variable speed branching Brownian motion. I present recent results on their extremal processes obtained with Lisa Hartung.

3. Invited Sessions

Sessions 1

Monday, 10:15 - 11:45

3.1 SLE and related topics

Organized by Vincent Beffara, ENS Lyon, France
Room 438

Some partial results on the convergence of loop-erased random walk to SLE(2) in the natural parametrization

Michael Kozdron, University of Regina, Canada

We outline a strategy for showing convergence of loop-erased random walk on the two-dimensional square lattice to SLE(2), in the supremum norm topology that takes the time parametrization of the curves into account. The discrete curves are parametrized so that the walker moves at a constant speed determined by the lattice spacing, and the SLE(2) curve has the recently introduced natural time parametrization. Our strategy can be seen as an extension of the one used by G. Lawler, O. Schramm, and W. Werner to prove convergence modulo time parametrization. The crucial extra step is showing that the expected occupation measure of the discrete curve, properly renormalized by the chosen time parametrization, converges to the occupation density of the SLE(2) curve, the so-called SLE Green's function. Although we do not prove this convergence, we rigorously establish some partial results in this direction including a new loop-erased random walk estimate. Based on joint work with Tom Alberts and Robert Masson.

The conjectural Loewner driving process for massive SLE(6)

Gábor Pete, Rényi Institute & TU Budapest, Hungary

In joint work with Christophe Garban and Oded Schramm, we have proved that the scaling limit of the near-critical percolation interface exists: this is the so-called massive SLE(6). This is a genuinely new object in the sense that it was proved by Nolin and Werner that it is singular with respect to the standard SLE(6). We have made a conjecture for the Loewner driving process of this interface, and the main purpose of this talk is to explain this conjecture.

Percolation on mesoscopic lattices
Vincent Beffara, Lyon

In a celebrated paper, Smirnov proved that critical site-percolation on the regular triangular lattice has a non-trivial, conformally invariant scaling limit and that this can be used to derive for instance the value of critical exponents. The argument is unfortunately very specific to this particular lattice, and so far has not been generalized to any other natural case — in particular, percolation on $\mathbb Z^2$ is much beyond reach of current methods. I will present one direction in which the proof can be extended into a non-trivial class of models that somehow interpolate between the triangular lattice and general planar cases.

3.2 Hydrodynamic limits, free boundary problems, and stochastic models in neurosciences

Organized by Anna De Masi, University of L'Aquila, Italy
Room 432

Nonequilibrium processes for current reservoirs
Dimitrios Tsagkarogiannis, University of Sussex, UK

Stationary non equilibrium states are characterized by the presence of steady currents flowing through the system as a response to external forces. We model this process considering the simple exclusion process in one space dimension with appropriate boundary mechanisms which create particles on the one side and kill particles on the other. The system is designed to model Fick's law which relates the current to the density gradient. In this context we review some results obtained in joint work with Anna De Masi, Errico Presutti and Maria Eulalia Vares. We first prove that the hydrodynamic limit is given by the linear heat equation with Dirichlet boundary conditions obtained by solving a non-linear equation which fixes the values of the density at the boundary. Then we show that the rescaled limiting density profile of the (unique) invariant measure of the process coincides with the unique stationary solution of the hydrodynamic equation. Last, we obtain a spectral gap estimate in the (non equilibrium) stationary process uniformly on the system size.

Free boundary random walkers
Cristian Giardinà, Universita' di Modena e Reggio Emilia, Italy

In the context of interacting particle systems with *current reservoirs*, we study the macroscopic limit of independent random walkers with a moving boundary. The hydrodynamic limit gives rise to a Free Boundary Problem that appears to be new and for which we prove existence and uniqueness of the generalized solution. We also prove that on a longer super-hydrodynamic time scale the system once again becomes random. Joint work with G. Carinci, A. De Masi, E. Presutti.

Hydrodynamic limit for interacting neurons

Eva Locherbach, Université de Cergy-Pontoise, France

We study the hydrodynamic limit of a stochastic process describing the time evolution of a system with N neurons with mean-field interactions produced both by chemical and by electrical synapses. This system can be informally described as follows. Each neuron spikes randomly following a point process with rate depending on its membrane potential. At its spiking time, the membrane potential of the spiking neuron is reset to the value 0 and, simultaneously, the membrane potentials of the other neurons are increased by an amount of energy 1/N. This mimics the effect of chemical synapses. Additionally, the effect of electrical synapses is represented by a deterministic drift of all the membrane potentials towards the average value of the system. We show that, as the size of the system tends to infinity, the distribution of membrane potentials becomes deterministic and is described by a limit density which obeys a non linear PDE which is a conservation law of hyperbolic type. This is joint work with Anna De Masi, Antonio Galves and Errico Presutti.

3.3 Gaussian multiplicative chaos and applications

Organized by Rémi Rhodes, University Paris Dauphine & Vincent Vargas, Ecole Normale Supérieure of Paris, France

Room 430

Extremes of the discrete Gaussian free field - the Z-measure

Oren Louidor, Technion, Israel

It was shown recently that the (space-height) extremal process associated with the discrete Gaussian free field converges weakly after thinning, scaling and centering to a Poisson point process whose intensity measure is random. The spacial component of this random intensity - known as the Z-measure, is an analog of the derivative martingale in the (closely related) branching Brownian motion model and exhibits an intricate structure. Further interest in this object stems from its conjectured equivalence (up to a constant scaling) with the critical Gaussian multiplicative chaos of Kahane for the continuous Gaussian free field, recently constructed by Duplantier, Rhodes, Sheffield and Vargas. In this talk I will discuss various (recently made rigorous) properties of the collection of Z-measures for different domains, such as conformal covariance and the Gibbs-Markov decomposition relation. I will also give more evidence for why the conjectured equivalence with GMC should hold. Joint work with M. Biskup.

On the conformal structure of random planar maps
Nicolas Curien, CNRS and University Paris 6, France

A (planar) triangulation is a graph embedded in the two-dimensional sphere such that all its faces are surrounded by three edges. Consider a random triangulation Tn chosen uniformly over all triangulations of the sphere having n faces. The metric structure of Tn endowed with the graph distance has been studied in depth during recent years. In particular, Le Gall and Miermont recently proved that the metric space obtained from Tn by re-scaling all distances by n^-1/4 converges towards a random compact metric space called "the Brownian map". In this talk, we will focus on another aspect of random triangulations. Indeed, Tn can naturally be considered as a random Riemann surface and one can study its ``conformal structure" which is conjectured to be strongly linked to the Gaussian free field. I will present a path to study the conformal structure of random planar maps based on their Markovian exploration by an independent SLE6 process.

Gaussian multiplicative chaos
Hubert Lacoin, Université Paris Dauphine, France

We will review some recent result concerning the renormalization theory and the limit of the exponential of a complex log-correlated Gaussian field in all dimensions (including Gaussian Free Fields in dimension 2): If X and Y are independent correlated field (which are random Gaussian distribution), gamma and beta we study the formal complex measure exp (gamma X+i beta Y) dx. In our work we have established the existence of unambiguously defined such measures even outside of the well understood L2 zone, and we described several phase transitions when the parameters gamma and beta varies. Joint work with R. Rhodes and V. Vargas.

Sessions 2

Monday, 14:00 - 15:30

3.4 Random graph processes

Organized by Louigi Addario-Berry, McGill University, Canada

Room 438

Planar stochastic hyperbolic infinite triangulations

Nicolas Curien, CNRS and University Paris 6, France

We introduce and study a family of random infinite triangulations of the plane that satisfy a natural spatial Markov property. These new random lattices naturally generalize Angel & Schramm's Uniform Infinite Planar Triangulation (UIPT) and are hyperbolic in flavor. We prove that they exhibit a sharp exponential volume growth, are non-Liouville, and that the simple random walk on them has positive speed almost surely. We conjecture that these infinite triangulations are the local limits of uniform triangulations whose genus is proportional to the size.

Mean field conditions for coalescing random walks

Roberto Imbuzeiro Oliveira, IMPA, Brazil

The main results in this paper are about the full coalescence time C of a system of coalescing random walks over a finite graph G. Letting m(G) denote the mean meeting time of two such walkers, we give sufficient conditions under which $E[C]\approx 2m(G)$ and $C/m(G)$ has approximately the same law as in the "mean field" setting of a large complete graph. One of our theorems is that mean field behavior occurs over all vertex-transitive graphs whose mixing times are much smaller than m(G); this nearly solves an open problem of Aldous and Fill and also generalizes results of Cox for discrete tori in $d\geq 2$ dimensions. Other results apply to nonreversible walks and also generalize previous theorems of Durrett and Cooper et al. Slight extensions of these results apply to voter model consensus times, which are related to coalescing random walks via duality.

Destruction of trees and their Cut-trees

Jean Bertoin, University of Zürich, Switzerland

Imagine a graph which is progressively destroyed by cutting its edges one after the other in a uniform random order. The so-called cut-tree records key informations of this destruction process. It can be viewed as a random metric space equipped with a natural probability mass. In this talk, we will discuss limit theorems for the cut-tree of several families of random trees as the size goes to infinity, and present applications to isolation and disconnection problems.

3.5 Random polymers and related systems

Organized by Rongfeng Sun, National University of Singapore, Singapore
Room 436

On the rate of convergence of the mean passage time in first passage percolation

Antonio Auffinger, University of Chicago, USA

We will discuss a lower bound for the rate of convergence of the mean passage time towards the time constant in first and last passage percolation in Z^d. This lower bound is based and depends only on the growth of the L^p norms of the passage time. Based on a joint work with M. Damron and J. Hanson.

The continuum disordered pinning model

Francesco Caravenna, Università degli Studi di Milano-Bicocca, Italy

Any renewal processes on N with a polynomial tail, with exponent 0 < alpha < 1, has a non-trivial scaling limit, known as the alpha-stable regenerative set. We consider Gibbs transformations of such renewal processes in an i.i.d. random environment, called disordered pinning models. We show that when 1/2 < \alpha < 1 these models have a universal disordered scaling limit: a random probability measure on the space of closed subsets of R, which we call the continuum disordered pinning model (CDPM). This limiting object, which could be heuristically conceived as a "Gibbs transformation" of the alpha-stable regenerative set in a white noise random environment, has subtle and interesting features:
* Any fixed a.s. property of the alpha-stable regenerative set (e.g., its Hausdorff dimension) is also an a.s. property of the CDPM, for almost every realization of the environment.
* Nonetheless, the law of the CDPM is singular with respect to the law of the alpha-stable regenerative set, for almost every realization of the environment. Joint work with Rongfeng Sun and Nikos Zygouras.

Some variational problems in the KPZ universality class

Daniel Remenik, Universidad de Chile, Chile

The Kardar-Parisi-Zhang universality class is a collection of models, including random polymers, random growth models and particle systems, which are loosely characterized by an unusual size and distribution of fluctuations. In this talk I will discuss some variational problems which arise naturally for models belonging to this class. I will focus particularly on the case of the KPZ equation itself, and discuss some results about universality of the fluctuations with respect to the initial condition, which can be interpreted in terms of boundary conditions for the continuum random polymer.

Sessions 3

Tuesday, 10:15 - 11:45

3.6 Random matrix theory

Organized by Charles Bordenave, University of Toulouse, France
Room 430

The eigenvector moment flow and applications

Paul Bourgade, Institute for Advanced Study, USA

For generalized Wigner matrices, I will explain a probabilistic version of quantum unique ergodicity at any scale, and gaussianity of the eigenvectors entries. The proof relies on analyzing the effect of the Dyson Brownian motion on eigenstates. Relaxation to equilibrium of the eigenvectors is related to a new multi-particle random walk in a random environment, the eigenvector moment flow. This is joint work with H.-T. Yau.

A central limit theorem for the Wishart minor process

Ioana Dumitriu, University of Washington, USA

Consider an doubly-infinite array of iid centered variables with fourth moment condition from which one can extract a finite number of rectangular, overlapping submatrices, and form the corresponding Wishart matrices. We show that under basic smoothness assumptions, centered linear functionals of such matrices converge jointly to a Gaussian vector with an interesting covariance structure. This structure can be described in terms of the height function, and leads to a connection with the Gaussian Free Field on the upper half-plane. This is similar to the work of Borodin (2010) on Wigner matrices and Borodin and Gorin (2013) on Jacobi ones. This is joint work with Elliot Paquette.

On the principal components of sample covariance matrices

Antti Knowles, ETH Zurich, Switzerland

I give an overview of recent results on the principal components of sample covariance matrices that arise from a population with nontrivial correlations.

3.7 Stochastic PDEs

Organized by Sandra Cerrai, University of Maryland, USA
Room 436

The generalized KPZ equation
Lorenzo Zambotti, Université Paris 6, France

The generalized KPZ equation is the generic equation that is satisfied by a non-linear function of the solution of the stochastic heat equation with space-time white noise and allows therefore to define a kind of Ito-calculus for this class of processes. We discuss some ongoing work on the resolution of this equation using the recent theory by Martin Hairer on Regularity Structures and the renormalization of SPDEs.

Invariant measures for stochastic conservation laws
Arnaud Debussche, Ecole Normale Supérieure de Rennes, France
We study periodic scalar first-order conservation laws with stochastic forcing. Under an hypothesis of non-degeneracy of the flux, we study the long-time behaviour in any space dimension. For sub-cubic fluxes, we show the existence of an invariant measure. Moreover for sub-quadratic fluxes we show uniqueness and ergodicity of the invariant measure.

Burgers equation with random forcing in noncompact setting
Yuri Bakhtin, New York University, USA

The Burgers equation is one of the basic nonlinear evolutionary PDEs. The study of ergodic properties of the Burgers equation with random forcing began in 1990's. The natural approach is based on the analysis of optimal paths in the random landscape generated by the random force potential. For a long time only compact cases of the Burgers dynamics on a circle or bounded interval were understood well. In this talk I will discuss the Burgers dynamics on the entire real line with no compactness or periodicity assumption on the random forcing. The main result is the description of the ergodic components and existence of a global attracting random solution in each component. The proof is based on ideas from the theory of first or last passage percolation. The kicked forcing case is an extension of the Poissonian forcing case considered in a joint work with Eric Cator and Kostya Khanin.

3.8 Random walks in random environments

Organized by Alejandro Ramírez, Pontificia Universidad Católica de Chile, Chile
Room 434

Biased random walk on supercritical percolation clusters
Alexander Fribergh, Université de Montréal, France

We will present results on biased random walks on supercritical percolation clusters. This a natural model for observing trapping phenomena and anomalous long-term behaviors. We will explain why this model exhibits a phase transition from positive speed to zero speed as the bias increases. Furthermore, we shall discuss a subtle difficulty appearing when trying to rescale such a process to obtain scaling limits. This talk will be based on past and ongoing work of Alexander Fribergh and Alan Hammond.

Positive recurrence of the greedy walk on the circle

Leonardo T. Rolla, Universidad de Buenos Aires, Argentina

Consider a single particle moving on the circle R/Z, which is also populated by a finite set of points representing rewards. The particle seeks the nearest reward and travels in that direction at a finite speed v. Upon arrival, the particle earns the reward and waits for an exponentially-distributed time. Meanwhile, new rewards appear according to a space-time Poissonian rain of intensity m. It was conjectured by Coffman and Gilbert in 1987 that, if $m<1$, then the system is positive recurrent, for any value of v. Since then, a number of particular cases and discrete approximations have been proposed and studied, but the problem of proving or disproving positive recurrence under general conditions remained open. In this talk we show that the conjecture holds true. Based on joint works with Sergey Foss and Vladas Sidoravicius.

Weakly elliptic random walks in random environment

Christophe Sabot, University Lyon 1, France

Weak ellipticity in random walk in random environment (RWRE) is responsible for finite size traps and slowdown of the walk. In this talk I will review several related results with special emphasize on Dirichlet environments and more recent results on directional transient RWRE.

Sessions 4

Tuesday, 14:00 - 15:30

3.9 Rough paths

Organized by Massimiliano Gubinelli, Université Paris Dauphine, France
Room 436

Paracontrolled differential equations

Nicolas Perkowski, Université Paris Dauphine, France

Paracontrolled distributions combine the Fourier techniques of Bony's paradifferential calculus with ideas from the theory of controlled rough paths. This leads to a lightweight calculus for distributions which allows to handle nonlinear operations involving singular objects like white noise, and which allows to give a meaning to and solve singular stochastic (partial) differential equations. I will present the basic ideas and techniques of paracontrolled distributions on a simple model problem. Based on joint work with Massimiliano Gubinelli and Peter Imkeller.

Rotation invariants of two dimensional curves based on iterated integrals

Joscha Diehl, TU Berlin, Germany

We introduce a novel class of rotation invariants of two dimensional curves based on iterated integrals. The invariants we present are in some sense complete and we describe an algorithm to calculate them, giving explicit computations up to order six. We present an application to online (stroke-trajectory based) character recognition. This seems to be the first time in the literature that the use of iterated integrals of a curve is proposed for invariant feature extraction in machine learning applications.

A characteristic function on the space of signatures of geometric rough paths

Ilya Chevyrev, University of Oxford, UK

The expected signature of a probability measure on rough paths naturally generalises the moments of a random variable, and, in some instances, is known to uniquely determine the law of a signature. By studying the unitary representations of the group of signatures, we show how one is able to define a complete characteristic function for the probability measures on geometric rough paths of arbitrary roughness. We furthermore are able to greatly extend the conditions under which the law of a signature is completely determined by its expected value. Based on joint work with Terry Lyons.

3.10 Constrained stochastic dynamics

Organized by Cristina Toninelli, Université Paris Diderot, France
Room 432

East model:mixing time and dynamical heterogeneities

Fabio Martinelli, University Roma Tre, Italy

I will present a review of recent progresses on the low temperature dynamics of the East model and its generalizations.

Relaxation time for kinetically constrained Glauber dynamics at criticality on trees
Nicoletta Cancrini, University of L'Aquila, Italy

On the rooted k-ary tree we consider a 0-1 kinetically constrained spin model in which the occupancy variable at each node is re-sampled with rate one from the Bernoulli(p) measure iff all its children are empty. For this process the following picture was conjectured to hold. As long as p is below the percolation threshold pc = 1/k the process is ergodic with a finite relaxation time while, for p > pc , the process on the infinite tree is no longer ergodic and the relaxation time on a finite regular sub-tree becomes exponentially large in the depth of the tree. At the critical point p = pc the process on the infinite tree is still ergodic but with an infinite relaxation time. Moreover, on finite sub-trees, the relaxation time grows polynomially in the depth of the tree. The conjecture was recently proved by Martinelli and Toninelli. We analyse the critical and quasi-critical case and prove for the relevant time scales: (i) power law behaviour in the depth of the tree at p = pc and (ii) power law scaling in (pc − p)^−1 when p approaches pc from below. Our results represent the first rigorous analysis of a kinetically constrained model at criticality.

Finite size effects in a mean-field kinetically constrained model: dynamical glassiness
Vivien Lecomte, Université Paris Diderot, France

On the example of a mean-field Fredrickson-Andersen kinetically constrained model, we focus on the known property that equilibrium dynamics takes place at a first-order dynamical phase transition point in the space of time-realizations. We investigate the finite-size properties of this first order transition. By discussing and exploiting a mapping of the classical dynamical transition – an argued signature of dynamical heterogeneities – to a first-order quantum transition, we show that the quantum analogy can be exploited to extract finite-size properties, which in many respects are similar to those in genuine mean-field quantum systems with a first-order transition. Results shed light on anomalous features of distributions of history-dependent observables in models of glasses.

Sessions 5

Thursday, 10:15 - 11:45

3.11 Metastability

Organized by Elisabetta Scoppola, University Roma Tre, Italy

Room 436

Wavelets on generic networks or Metastability without asymptotic
Alexandre Gaudillière, CNRS, France

We extend with some degeneracy the reduction procedure developed in metastability studies by Freidlin, Wentzell, Scoppola, Beltrán and Landim, outside any asymptotic regime. This is done by building wavelets basis on generic networks through some filtering and sub-sampling procedure. We use our joint work with Luca Avena as first building block of this approach.

Quasi stationary measures and metastability phenomenon for generic Markov chains
Julien Sohier, TU Eindhoven, Netherlands

We consider a not necessarily reversible Markov chain on a finite state space, and our aim is to characterize metastable behavior as the time of exit from a metastable set A. For this, we introduce a natural extension of conditions due to Aldous, namely the existence of two different time scales: the first one is related to convergence to equilibrium within A, and the second, much larger than the first one, related to the time necessary to exit from A starting from equilibrium. On a large subset of A, we show convergence of the measure conditioned not to exit A towards the invariant measure restricted to A, thus entailing the exponentiality of the exit time.This is joint work with R. Fernandez, F. Manzo, F. Nardi and E. Scoppola.

Zero-temperature limit of the Kawasaki dynamics for the Ising lattice gas in a large two-dimensional torus
Claudio Landim, IMPA, Brazil

We consider the Kawasaki dynamics at inverse temperature beta for the Ising lattice gas on a two-dimensional square of length 2L+1 with periodic boundary conditions. We assume that initially the particles form a square of length n, which may increase, as well as L, with beta. We show that in a proper time scale L^2, theta(beta) particles form almost always a square and that this square evolves as a Brownian motion when the temperature vanishes. Joint work with B. Gois.

3.12 Random media

Organized by Vladas Sidoravicius, IMPA, Brazil
Room 438

Site recurrence for two-type annihilating random walks
Manuel Cabezas, IMPA, Brazil

We consider a particle system where particles can be of two types, A or B. The particles perform independent random walks on Z^d until they meet a particle of opposite type. At that time both particles annihilate and are no longer present in the system. Particles of the same type do not interact. We assume that the initial configuration is independent and identically distributed over x in Z^d. We prove that the system is site-recurrent, that is, we prove that, almost surely, the origin is visited infinitely often by particles. Joint work with L. Rolla And V. Sidoravicius.

Branching Brownian motion with absorption
Julien Beresticky, UPMC - CNRS, France

We consider the branching Brownian motion on the real line with absorption at zero, in which particles move carding to independent Brownian motions with critical drift. I will present results concerning the behavior of this process before the extinction time as the initial position x tends to infinity. We first obtain bounds on the probability of survival until time t that improve upon a classical result of Kesten (1978). We then study how the system behaves during its life-time (number of particles, position of the right-most particle, typical configuration). From Joint works with N. Berestycki and J. Shcweinsberg; and with E. Brunet, S; Harris and P. Milos.

Almost exponential decay for the exit probability from slabs of ballistic RWRE
Alejandro Ramírez, Pontificia Universidad Católica de Chile, Chile

It is conjectured that in dimensions $d \geq 2$ any random walk (Xn) in an i.i.d. uniformly elliptic random environment (RWRE) which is directionally transient ($\lim Xn\cdot l = \infty$ for some direction l) is ballistic ($\lim Xn\cdot l/n > 0$). The ballisticity conditions for RWRE somehow interpolate between directional transience and ballisticity and have served to quantify the gap which would need to be proven in order to answer afirmatively this conjecture. Two important ballisticity conditions introduced by Sznitman in 2001 and 2002 are the so called conditions (T') and (T): given a slab of width L orthogonal to l, condition (T) in direction l is the requirement that the annealed exit probability of the walk through the side of the slab in the half-space $\{x : x \cdot l < 0\}$, decays faster than $\exp\{-CL^\gamma\}$ for all γ in (0,1) and some constant $C > 0$, while condition (T) in direction l is the requirement that the decay is exponential $\exp\{-CL\}$. It is believed that (T') implies (T). Here I will show that (T') implies at least an almost (in a sense to be made precise in the talk) exponential decay. This talk is based on joint work with Enrique Guerra.

Sessions 6

Thursday, 14:00 - 15:30

3.13 Gibbs and non-Gibbs

Organized by Roberto Fernández, Utrecht University, Netherlands

Room 438

Gibbs-non-Gibbs transitions on trees

Aernout van Enter, University of Groningen, Netherlands

I discuss the distinction between Gibbs measures and non-Gibbsian measures and show how Gibbs measures for Ising models on trees can become non-Gibbsian after evolving for some time under an independent spin flip (infinite-temperature Glauber) dynamics. As opposed to what occurs on regular lattices, one can find different properties for different Gibbs measures (for the same interaction). Based on joint work with Victor Ermolaev, Giulio Iacobelli and Christof Kuelske.

Variational description of Gibbs-non-Gibbs dynamical transitions for spin-flip systems with a Kac-type interaction

Julián Martínez, Universidad de Buenos Aires, Argentina

We discuss the concept of Gibbs/ non-Gibbs measure in the mean field context and its extension to a local-mean field model, and the emergence of dynamical Gibbs-non-Gibbs transitions under independent spin-flip ("infinite-temperature") dynamics. We show that these dynamical transitions are equivalent to bifurcations in the set of global minima of the large-deviation rate function describing optimal conditioned trajectories of the empirical density. Possible bifurcation scenarios are fully determined in the mean field case, yielding a full characterization of passages from Gibbs to non-Gibbs -and vice versa- with sharp transition times. Based on joint work with Roberto Fernández and Frank den Hollander.

Nonergodicity of particle systems, synchronization, and Gibbs-non-Gibbs

Christof Külske, Ruhr-University Bochum, Germany

Is there an interacting particle system (IPS) on the 3-dimensional lattice which has a unique time-invariant measure which does not attract all starting measures (non-ergodicity)? We show that the answer to this classical question is yes, via a constructive use of the Gibbs-non-Gibbs properties of local discretization transformations applied to spin systems of continuous rotators. We also present new results on similarities and differences between the continuous-time IPS and related versions of probabilistic cellular automata which have updates in discrete time.

3.14 Stochastic integrable systems

Organized by Patrik Ferrari, Bonn University, Germany
Room 436

Moment formulas for the ASEP from half-flat initial conditions

Janosch Ortmann, University of Toronto, Canada

The Asymmetric Simple Exclusion Process (ASEP) is an interacting particle system which appears as a model in statistical physics and mathematical biology. Its limiting fluctuations are conjectured to fall in the Kardar-Parisi-Zhang (KPZ) universality class. We will describe exact formulas for the exponential moments of the height function associated with ASEP starting from the so-called half-flat initial condition. That is, all sites to the right of the origin and none to the left are occupied. These formulas lead to explicit expressions for certain generating functions of the model. We will also discuss analogous formulas for the delta Bose gas. This is joint work with Jeremy Quastel and Daniel Remenik.

Exact formulas for random growth off a flat interface

Daniel Remenik, Universidad de Chile, Chile

We consider the asymmetric simple exclusion process (ASEP) starting from flat (or periodic) initial data. Starting from formulas obtained in earlier work for the exponential moments of the ASEP height function in the case of half-flat initial data, we will derive similar formulas for the flat case. Based on this we will further derive a formula for a certain generating function of the system, which turns out to be given by a Fredholm Pfaffian. We will also explain how these formulas can be used to provide non-rigorous derivations of the conjectured limiting fluctuations. In the case of half-flat initial data they are given by the marginals of the Airy_{2->1} process, while in the flat case they are given by the Tracy-Widom GOE distribution. This is joint work with Janosch Ortmann and Jeremy Quastel.

High temperature limits of directed polymers with heavy tail disorder

Nikolaos Zygouras, Warwick, UK

The directed polymer model at intermediate disorder regime was introduced by Alberts-Khanin-Quastel. They proved that at inverse temperature β_n = β.n^{−1/4} the partition function, centered appropriately, converges in distribution and the limit is given in terms of the solution of the stochastic heat equation. This result was performed under the assumption that the disorder variables posses exponential moments, but its validity was also conjectured under the assumption of six moments. In a work with Partha Dey, we show that this conjecture is valid and we further extend it by exhibiting the limiting behaviour in the case of less than six moments.

3.15 Scaling limits of stochastic networks

Organized by Kavita Ramanan, Brown University, USA
Room 434

Proportional switching in FIFO networks

Maury Bramson, University of Minnesota, USA

We discuss here a queueing network with proportional switching, where packets are served in the FIFO (first-in, first-out) order. The proportional switching policy is a member of a family of policies where the amount of service at different sites is dependent, with the corresponding service vector being required to lie in a convex region. In the literature, proportional switching is the most employed "fair" policy, with service being weighted appropriately toward longer queues. Past work on the stability of proportional switching networks has focused on networks with elementary routing structure (such as immediate departure after service at a site). Here, we consider the stability problem for general routing structures. The talk is based on joint work with B. D'Auria and N. Walton.

Fluid limits of a multi-node network with multiple servers and vacation

Arnab Ganguly, University of Louisville, USA

We consider a multi-node network in which packets arrive at the nodes following some distribution and are served by the servers according to some service distribution. Each server has a certain random vacation period at the end of which it chooses a non-empty node according to some routing policy, and after the end of its service, the server enters back into a server pool to start its vacation time. The law of large number limit (fluid limit) of the system is studied. We will first consider the case when the arrival, service and vacation period follow exponential distribution. Toward the end, we will briefly consider the case of general distributions where certain measure valued processes play vital roles. The work is motivated by applications to next generation passive optical networks (PON). This is an ongoing joint project with Kavita Ramanan and Philippe Robert.

An infinite dimensional Skorokhod map and continuous parameter priorities
Haya Kaspi, Technion, Israel

We define an operator on the space of r.c.l.l. functions with values in the space of the finite measures on the positive real line. This operator acts as an infinite collection of classical one dimensional Skorokhod maps. The motivation comes from queueing models in which priorities are assigned according to a continuous parameter such as the Earliest Deadline First (EDF) and the Shortest Remaining Processing Time(SRPT) disciplines. We shall apply the tool developed to obtain uniqueness results for the fluid equations that represent the models and prove a new Law of Large Numbers for both of the above models. This is a joint work with Rami Atar and Anup Biswas.

Sessions 7

Friday, 10:15 - 11:45

3.16 Spatial population dynamics

Organized by Matthias Birkner, University of Mainz, Germany
Room 434

The scaling limit of the continuous-space symbiotic branching model
Matthias Hammer, TU Berlin, Germany

The continuous-space symbiotic branching model describes the evolution of two interacting populations on the real line that can reproduce locally only in the simultaneous presence of each other. Formally, the system is described by two interacting stochastic partial differential equations with correlated driving noises. Starting from complementary Heaviside initial conditions, the interface where both populations coexist remains compact. Together with a diffusive scaling property, this suggests the presence of an interesting scaling limit. In this talk, we show weak convergence of the diffusively rescaled populations as measure-valued processes (in suitable topologies and for suitable ranges of the correlation parameter). The limiting process satisfies a `separation-of-types' property and can be characterized in various ways as the unique solution to certain martingale problems. This provides an important step towards the understanding of the scaling limit for the interface. The talk is based on joint work with Jochen Blath and Marcel Ortgiese.

The contact process on finite trees and random regular graphs

Daniel Valesin, University of British Columbia, Canada

The contact process with parameter lambda > 0 on a graph G = (V,E) is a Markov process on {0,1}^V. Vertices of G are individuals, which are healthy if in state 0 and infected if in state 1. Infected individuals heal at rate 1 and transmit the infection to each neighbour at rate lambda. It is known since the 90's that the contact process on an infinite regular tree T exhibits two phase transitions, that is, there exist positive lambda_1(T) < lambda_2(T) such that, for the process started from a single infection, the infection "becomes extinct" if lambda is less than lambda_1, "survives globally but not locally" if lambda is between lambda_1 and lambda_2, and "survives locally" if lambda > lambda_2. In this talk, we discuss the contact process on two classes of finite graphs which approximate T: first, T_h, a rooted tree of height h, and second, G_n, a random regular graph on n vertices. In both cases, the extinction time of the infection changes from being logarithmic to exponential in the number of vertices at some critical value of lambda. Interestingly, this value is lambda_2(T) for T_h and lambda_1(T) for G_n. Talk based on joint work with M. Cranston, T. Mountford and J.C. Mourrat.

Fluctuation versus fixation in the constrained voter model

Nicolas Lanchier, Arizona State University, USA

The constrained voter model describes the dynamics of opinions in a population of individuals located on a connected graph. Each agent is characterized by her opinion, where the set of opinions is represented by a finite sequence of consecutive integers, and each pair of neighbors, as defined by the edge set of the graph, interact at a constant rate. The dynamics depends on two parameters: the number of opinions and a so-called confidence threshold. If the opinion distance between two interacting agents exceeds this threshold then nothing happens, otherwise one of the two agents mimics the other one just as in the standard voter model. The main question about this process is whether the system fluctuates or fixates, i.e., whether the number of opinion changes at each vertex is infinite or finite. In this talk, we prove necessary and/or sufficient conditions for fluctuation and fixation of the one-dimensional system that extend and contradict previous conjectures based on numerical simulations.

3.17 Lévy and related jump processes

Organized by Krzysztof Bogdan, Wroclaw University of Technology, Poland
Room 438

Exit time and survival probability for isotropic unimodal Levy processes
Tomasz Grzywny, Wroclaw University of Technology, Poland

The basic object of interest in this talk is the expected exit time from a bounded smooth domain for arbitrary starting point of an isotropic unimodal Levy process. We present sharp estimates up to the boundary of the set. Next we discuus applications of those to obtain estimates of the survival probability in bounded smooth domains and exteriors sets.

Factorial moments of point processes
Nicolas Privault, Nanyang Technological University, Singapore

We derive joint factorial moment identities for point processes admitting Papangelou intensities. Our proof simplifies previous approaches to related moment identities and includes the setting of Poisson point processes. Applications are given to random transformations of point processes and to their distribution invariance properties. This is a joint work with Jean-Christophe Breton.

Cylindrical Lévy processes
Markus Riedle, King's College London, UK

Based on the classical theory of cylindrical processes and cylindrical measures we introduce cylindrical Lévy processes as a natural generalisation of cylindrical Wiener processes. We illustrate this definition by several examples of cylindrical Lévy processes. In the main part of the talk, we introduce a theory of stochastic integration for operator-valued stochastic processes with respect to cylindrical Lévy processes.

3.18 Nonequilibrium statistical mechanics
Organized by Claudio Landim, IMPA, Brazil
Room 436

The existence of an adsorbed phase for a system of activated random walks
Augusto Teixeira, IMPA, Brazil

On the d-dimensional lattice, we consider a system with two types of particles (A and B), which is governed by the following rules. Particles of type A perform independent, continuous time simple random walks until they turn into B-particles, which happens at rate r. While at state B particles do not move at all, simply waiting to be 'awakened' by some walker of type A. More precisely, whenever two or more particles share a site they all turn into A-type immediately. In this talk we will comment on a recent work, proving that for any dimensions, this system gets adsorbed if the initial configuration has low enough density. We will give a brief overview of the proof, which shows that for such low densities the particles organize themselves into hierarchical cities of B-particles, reaching a stable configuration. This settles the conjectured phase transition for this model. Joint work with Vladas Sidoravicius.

The subleading order of two dimensional cover times

David Belius, McGill University, Canada

The epsilon-cover time of the two dimensional torus by Brownian motion is the time it takes for the process to come within distance epsilon>0 from any point. Its leading order in the small epsilon-regime has been established by Dembo, Peres, Rosen and Zeitouni [Ann. of Math., 160 (2004)]. In this talk I will present a recent result identifying the second order correction. This correction term arises in an interesting way from strong correlations in the field of occupation times, and in particular from an approximate hierarchical structure in this field. Our method draws on ideas from the study of the extremes of branching Brownian motion. Joint work with Nicola Kistler.

On some random forests with determinantal roots

Luca Avena, University of Leiden, Netherlands

Given a finite weighted oriented graph, we study a certain probability measure on the set of spanning rooted oriented forests on the graph. We prove that the set of roots sampled from this measure is a determinantal process, characterized by a possibly non-symmetric kernel with complex eigenvalues. We further derive several results relating this measure to the Markov process associated with the starting graph, to the spectrum of its generator and to hitting times of subsets of the graph. In particular, the mean hitting time of the set of roots turns out to be independent of the starting point, conditioning or not to a given number of roots. Joint work with Alexandre Gaudillière.

4. Contributed Sessions

Sessions 1

Monday, 10:15 - 11:45

4.1 Complex analysis tools for Lévy processes and infinitely-divisible distributions

Organized by Sonia Fourati, INSA de Rouen, France
Room 434

On Bondesson conjecture on positive stable densities

Sonia Fourati, INSA de Rouen, France

We show that alpha-stable positive densities are Hyperbolically Completely Monotone if and only if alpha is smaller than 1/2.That derives from a new integral expression of the density. The methods rely mainly on steepest descent method and Riemann-Hilbert characterization of analysis functions.

Unimodality of the freely selfdecomposable probability laws

Steen Thorbjørnsen, University of Aarhus, Denmark

In 1978 M. Yamazato settled in the positive the long standing conjecture on unimodality of the selfdecomposable probability laws. In doing so Yamasato also gave the first full proof of the unimodality of the stable distributions. In 1999 P.Biane proved that the stable distributions in free probability are unimodal, and in recent joint work with T.Hasebe the speaker established that the same conclusion in fact holds for all selfdecomposable laws in free probability. The talk will present an outline of the proof of the latter result and describe some of the involved techniques based on Stieltjes inversion.

Infinite divisibility of the negative powers of the Beta distributions

Pierre Bosch, Université Lille 1, France

I propose to study the infinite divisibility of the negative powers of the Beta and the Gamma distributions. Let X ~ G(t) and Y ~ B(a,b). We will see that Y^-s has always an infinite divisible distribution which is even self-decomposable or GGC (generalized Gamma convolution) for a large class of the parameters a,b,s. From this we will see that all negative powers of the Gamma distribution are GGC.

4.2 Exact simulation

Organized by Nevena Marić, University of Missouri, United States of America
Room 433

Exact simulation of multivariate distributions with given marginals and correlation

Nevena Marić, University of Missouri, United States of America

I will talk about existence (through an explicit construction) of multivariate distributions when given marginal distributions and correlation matrix only. This problem naturally addresses issue of attainable correlations in different distributions which, in general, is very little known about. I will also discuss our recent results in this direction with special reference to minimum correlations in the bivariate problem.

A fast Bernoulli factory for perfect simulation from regenerative processes

Mark Huber, Claremont McKenna College, United States of America

Suppose I have a coin with an unknown probability p of heads that I can flip independently as many times as I would like. To get a new "coin" with probability p squared of heads, I simply flip the old coin twice: if it comes up heads twice, I treat that as a heads on the new coin. Now suppose that I want a new coin whose probability of heads is exactly 2p. This seemingly simple problem-known as building a Bernoulli factory-turns out to be surprisingly difficult, and previous algorithms required on average hundreds or even thousands of flips of the original coin. In this talk I will present a new recursive method that only uses about twenty flips. Applications of the Bernoulli factory include the ability to generate samples exactly from the stationary distribution of regenerative Markov chains.

4.3 The stochastic brain

Organized by Jonathan Touboul, Collège de France, France
Room 436

Some rigorous results on interspike interval distributions in stochastic neuron models

Nils Berglund, University of Orleans, France

Several conduction-based models for action-potential evolution of neuron membranes are given by irreversible stochastic differential equations. We will review rigorous results for two types of models. The first one is the FitzHugh-Nagumo model, for which we prove that spikes are separated by small oscillations following an asymptotically geometric distribution, with parameters that can be estimated in terms of principal eigenvalue and quasistationary distribution of an embedded Markov chain. The second type are models containing a folded-node singularity creating canard solutions and mixed-mode oscillations. By analyzing a random Poincaré map, we are able to quantify the stochastic oscillation patterns, and to show that in some cases, noise can increase the number of small oscillations separating spikes. Based on joint work with Barbara Gentz, Christian Kuehn, and Damien Landon.

Diffusion parameters of flows in stable queueing networks

Yoni Nazarathy, University of Queensland, Australia

We consider open multi-class queueing networks with general arrival processes, general processing time sequences and Bernoulli routing. The network is assumed to be operating under an arbitrary work-conserving scheduling policy that makes the system stable. An example is a generalized Jackson network with load less than unity and any work conserving policy. We find a simple diffusion limit for the inter-queue flows with an explicit computable expression for the covariance matrix. Specifically, we present a simple computable expression for the asymptotic variance of arrivals (or departures) of each of the individual queues and each of the flows in the network. Joint work with Werner Scheinhardt.

A phase transition in the first passage of a Brownian process through a fluctuating boundary with implications for neural coding

Marcelo Magnasco, Rockefeller University, United States of America

Finding the first time a fluctuating quantity reaches a given bound- ary is a deceptively simple-looking problem of vast practical im- portance in physics, biology, chemistry, neuroscience, economics, and industrial engineering. Problems in which the bound to be traversed is itself a fluctuating function of time include widely studied problems in neural coding, such as neuronal integrators with irregular inputs and internal noise. We show that the prob- ability p(t) that a Gauss–Markov process will first exceed the bound- ary at time t suffers a phase transition as a function of the rough- ness of the boundary, as measured by its Hölder exponent H. The critical value occurs when the roughness of the boundary equals the roughness of the process, so for diffusive processes the critical value is $H_c = 1/2$. For smoother boundaries, $H > 1/2$, the probability density is a continuous function of time. For rougher boundaries, $H < 1/2$, the probability is concentrated on a Cantor-like set of zero measure: the probability density becomes divergent, almost every- where either zero or infinity. The critical point $H_c = 1/2$ corresponds to a widely studied case in the theory of neural coding, in which the external input integrated by a model neuron is a white-noise pro- cess, as in the case of uncorrelated but precisely balanced excitatory and inhibitory inputs. We argue that this transition corresponds to a sharp boundary between rate codes, in which the neural firing probability varies smoothly, and temporal codes, in which the neuron fires at sharply defined times regardless of the intensity of internal noise.

Sessions 2

Monday, 14:00 - 15:30

4.4 Stochastic differential geometry

Organized by Ismaël Bailleul, Université Rennes 1, France
Room 430

A devissage situation for Poisson boundary of diffusion

Camille Tardif, University Pierre et Marie Curie, France

One presents a situation where, knowing the invariant sigma-field of a sub-diffusion, we are able to describe the Poisson boundary of the starting diffusion. One provides applications and recovers the Poisson boundary of Brownian motion in rotationally invariant manifold and the one of relativistic diffusion in Robertson-Walker space-times.

Degenerate semigroups and stochastic flow of mappings in foliated manifolds

Paulo Ruffino, University of Campinas, Brazil

Let (M,F) be a compact Riemannian foliated manifold. We consider a family of compatible Feller semigroups in C(M^n) associated to the laws of the n-point motion. It is known that under some assumptions there exists a stochastic flow of measurable mappings in M. We study the degeneracy of these semigroups such that the flow of mappings is foliated, i.e. each trajectory lays in a single leaf of the foliation a.s, hence creating a geometrical obstruction for coalescence of trajectories in different leaves. As an application, an averaging principle is proved for a first order perturbation transversal to the leaves. Estimates for the rate of convergence are calculated.

Small time fluctuations for bridges of sub-Riemannian diffusions

Ismaël Bailleul, Université Rennes 1, France

We consider the small-time asymptotics of the diffusion process associated to a Riemannian or sub-Riemannian second-order operator, conditioned by its initial and final positions. In the first order, when the two endpoints x, y are joined by a unique path gamma of minimal energy, the distribution of the conditionned diffusion converges weakly to a Dirac mass on the path gamma, under some very mild conditions. When these points lie further outside the cut-locus of the operator, we establish convergence, to a Gaussian limit, of the fluctuations of the process about gamma. The Gaussian limit is characterized in terms of the second variation of the energy functional on paths at a minimum, the formulation of which is new in the sub-elliptic case. In the elliptic case our result extends one derived by Molchanov. The methods of stochastic differential equations and Malliavin calculus allow us to give a complete proof of Molchanov's result and to extend it to sub-Riemannian operators.

4.5 Stochastic control and related topics

Organized by Erik Baurdoux, LSE, UK
Room 434

Games of singular control and stopping driven by spectrally one-sided Lévy processes

Kazutoshi Yamazaki, Kansai University, Japan

We study a zero-sum game where the evolution of a spectrally one-sided Levy process is modified by a singular controller and is terminated by the stopper. The singular controller minimizes the expected values of running, controlling and terminal costs while the stopper maximizes them. Using the fluctuation theory and the scale function, we derive the saddle point and the associated value function when the underlying process is a spectrally negative/positive Levy process. Numerical examples under phase-type Levy processes are also given.

Optimal stopping via expected suprema

Paavo Salminen, Turku

In this talk we consider optimal stopping problems (OSP) for general strong Markov processes. Since the value function of OSP is excessive it is natural to study different representations of excessive functions in the context of optimal stopping. In this talk we focus on the representation via expected suprema. The main body of the talk consists of a new verification theorem for the value function. The result generalizes recent findings for Lévy processes obtained essentially via the Wiener-Hopf factorization. Some examples are discussed.

Optimal stopping on different information levels with applications

Uwe Jensen, University of Hohenheim, Germany

We consider optimal stopping problems with various applications. Among these applications are a change point problem, where at some unobservable time the intensity of a point process has a jump, which is to be detected as well as possible and a replacement problem in reliability, where with respect to a certain reward functional the optimal time for a (preventive) replacement has to be determined. The focus is on solving these stopping problems on different information or observation levels, which are modelled by means of different filtrations. If some type of monotonicity condition holds true the same strategy to solve the stopping problems can be applied to processes adapted to different filtrations. Some examples demonstrate the power of the chosen approach.

4.6 Dispersion in media with interfaces: skew Brownian motion and related processes

Organized by Jorge Ramirez, Universidad Nacional de Colombia, Colombia
Room 433

Skew dispersions and local time continuity

Edward Waymire, Oregon State University, United States of America

Results are provided that highlight the effect of interfacial discontinuities in the diffusion coefficient on the behavior of local times and occupation times. The main goal is to obtain a characterization of large scale parameters and behavior by an analysis at the fine scale of stochastic particle motions. In particular, considering particle concentration modeled by a diffusion equation with piecewise constant diffusion coefficient, it is shown that the continuity of a natural modification of local time is the individual (stochastic) particle scale equivalent to continuity of flux at the scale of the (macroscopic) particle concentrations. Consequences of this involve the determination of a skewness transmission probability in the presence of an interface, as well as corollaries concerning interfacial effects on occupation time of the associated stochastic particles. This is based on joint work with T. Appuhamillage, V. Bokil, E. Thomann, and B. Wood at Oregon State University.

Diffusion processes with discontinuous advection and diffusion coefficients: applications to flow through pipe contractions

Jorge Ramirez, Universidad Nacional de Colombia, Colombia

Consider flow passing from a narrow to a wide pipe through a contraction. Conservation of mass, ensures that the flow velocity will change at the contraction. Taylor-Aris theory predicts that the rate of diffusion of a particle immersed in such flow will also change. In this talk, I will show how this situation can be modeled via a diffusion process with an interface where, both the drift and diffusion coefficient, are discontinuous. The resulting process can be written as a semi-martingale, and characterized in terms of a skew diffusion process. The general form of the transition probabilities can be explicitly calculated. Some

interesting features follow, including the effects of the interface on the expected arrival times.

About the flow of the skew Brownian motion

Miguel Martinez, Université Paris-Est Marne-la-Vallée, France

In this talk we will present a description of the flow of the skew Brownian motion (SBM) in its reference local time scale. We think that this description gives a deeper insight to already known results on the subject. In particular we manage to describe roughly the markovian dependance of the SBM with respect to the skewness parameter. The results are based on a joint work with A. Gloter.

Sessions 3

Tuesday, 10:15 - 11:45

4.7 Lévy processes, fluctuation theory and applications

Organized by María Emilia Caballero, UNAM, Mexico
Room 432

Applications of singular control problems driven by Lévy processes

Daniel Hernández, CIMAT, Mexico

Since the fundamental work of V.E. Benes et al., where the problem of tracking a standard Brownian motion by a finite variation process was explicitly solved, the problems of singular control have found multiple applications in a number of fields, like queues, networks, insurance and mathematical finance. These applications are multiplied when the previous problem is accompanied by another player, which can collaborate or compete, using a discretionary stopping time. In this talk we shall present some recent results for controlled Lévy processes, putting special emphasis in the applications.

The excursion measure away from zero and applications to insurance risk theory

José Luis Pérez, IIMAS, UNAM, Mexico

In this talk we model the surplus of an insurance company as a spectrally Lévy process, where we say that the company is ruined if the surplus of the insurance company is negative. In each period of ruin we allow for a random amount of debt which should not be exceeded, otherwise the company becomes bankrupted and stops working. Our main interest is to compute the Gerber-Shiu penalty function until the time of bankrupcy for this insurance risk model. To this end we will derive explicit identities related to the excursion measure away from zero for a spectrally negative Lévy process in terms of the so-called scale functions.

Affine processes through generalized time-changes

Gerónimo Uribe Bravo, UNAM, Mexico

Affine processes are a class of Markov processes which include multitype continuous-branching processes and processes of the Ornstein-Uhlenbeck type. They were introduced by Duffie, Filipovic and Schachermayer in 2003 in order to unify many existing models in finance. In this talk, we show how to construct affine processes from Lévy processes using the idea of generalized time changes first proposed by W. Doblin in the context of diffusions. We will also discuss stability properties of the construction and its differences with related SDE constructions.

4.8 Infinite and variable range models

Organized by Nancy Garcia, University of Campinas, Brazil & Florencia Leonardi, University of São Paulo, Brazil
Room 433

Perfect simulation of processes with long memory: A "coupling into and from the past" algorithm

Aurélien Garivier, Institut de Mathématiques de Toulouse, CNRS, France

We describe a new algorithm for the perfect simulation of variable length Markov chains and random systems with perfect connections. This algorithm generalizes Propp and Wilson's simulation scheme, and is based on the idea of coupling into and from the past. It improves on existing algorithms by relaxing the conditions required on the kernel and by accelerating convergence, even in the simple case of finite order Markov chains. Chains of variable or infinite order are an old object of consideration that raised considerable interest recently because of its applications in applied probability, from information theory to bio-informatics and linguistics.

Stochastic chains with unbounded variable length memory

Sandro Gallo, UFRJ, Brazil

This talk is a survey of several recent results concerning stochastic chains with (unbounded) variable length memory. This model can be considered as a subclass of the chains of infinite order. We will consider the following basic issues: (non-)existence of the stationary measure and (non-)uniqueness.

Regular non-Markovian processes may not be Gibbsian

Roberto Fernández, Utrecht University, Netherlands

Non-Markovian processes are determined by conditional expectations with respect to the past. In contrast, one-dimensional Gibbs measures are determined by simultaneous conditioning on past and future. For the Markovian and exponentially continuous cases both theories are known to be equivalent. We present an example showing this not to be the case in the non-Markovian setup: some rather regular non-Markovian processes may fail to be Gibbsian. Our example belongs to a well-studied family of processes with rather nice attributes: It is a chain with variable-length memory, characterized by the absence of phase coexistence and the existence of a visible renewal scheme. Work in collaboration with S. Gallo and G. Maillard.

4.9 Phase transitions in interacting particle systems

Organized by Stefan Grosskinsky, University of Warwick, UK & Michail Loulakis, National Technical University of Athens, Greece

Room 438

Dependent Double Branching Annihilating Random Walk (Joint work with Attila László Nagy)

Márton Balázs, University of Bristol, UK

Second class particles are invaluable tools in the investigation of attractive interacting particle systems with a conserved quantity. They trace information propagation in such systems, and their number is non-increasing in time. When attractivity is lost, second class particles start giving birth to other second class particles. They should still be very useful if we could keep their number under control. Simulations suggest that this is indeed the case: starting with one second class particle their number stays stochastically tight. The interaction with the background of first class particles seems to make this problem notoriously difficult. By replacing the complicated background with a constant potential we arrive to a version of parity preserving branching annihilating random walks with configuration-dependent jump rates. We prove that the single particle state is positive recurrent in this setting -- a mean field flavoured simplification of the true problem.

A martingale approach to metastability

Johel Beltrán, Pontificia Universidad Católica del Perú, Perú

Informally, a process is said to exhibit a metastable behavior if it remains for a very long time in a state before undergoing a rapid transition to a stable state. After the transition, the process remains in the stable state for a period of time much longer than the time spent in the first state, called for this reason metastable. In certain cases, there are two or more "metastable wells" of the same depth, a situation called by physicists "competing metastable states". In these cases, the process thermalizes in each well before jumping abruptly to another well where the same qualitative behavior is observed. The interacting particle system called sticky zero range process is an example of this situation. In a joint work with C. Landim, we presented an approach to derive the metastable behavior of continuous-time Markov chains. The main ingredient in this approach is the use of the martingale problem introduced by Stroock and Varadhan. In this talk, we present the main results obtained following this approach and some applications for the sticky zero range process.

Large deviations and metastability in a size-dependent zero-range process

Paul Chleboun, University of Warwick, UK

We discuss a general approach to understand phase separation and metastability in stochastic particle systems that exhibit a condensation transition. Condensation occurs when, above some critical density, a finite fraction of all the particles in the system accumulate on a single lattice site. We present a detailed analysis of a particular size-dependent zero-range process which was introduced as a toy model for clustering in granular media. This model also captures all the relevant details of more generic condensing zero-range process close to the critical point. Results on the equivalence of ensembles and metastability are based on large deviation principles for the maximum of triangular arrays of independent random variables conditioned on their sum. We derive the saddle point structure of the associated free energy landscape, which implies different mechanisms for the dynamics of the condensate depending on the system parameters. These results lead us to an interesting conjecture on the stationary dynamics of the condensate in the thermodynamic limit.

Sessions 4

Tuesday, 14:00 - 15:30

4.10 Random walk in dynamic random environment

Organized by Markus Heydenreich, Leiden University, Netherlands
Room 434

Invariant distributions and scaling limits for some diffusions in time-varying random environments

Yoann Offret, University of Burgundy, France

I will introduce a model of time-inhomogeneous Brox's diffusions, which generalizes the diffusion studied by Brox (1986) in the homogeneous case and those investigated by Gradinaru and Offret (2011) in deterministic media. I will show how these processes are connected, with the help of a suitable scaling transformation, to random perturbations of the Ornstein–Uhlenbeck diffusion process for which I prove quenched and annealed convergences in distribution under weighted total variation norms. I find two kind of stationary probability measures, which are either the standard normal distribution or a quasi-invariant measure, depending on the environment, and which is naturally connected to a underlying random dynamical system.

Random walks in spatially inhomogeneous dynamic environments and application to genealogies

Florian Völlering, University of Göttingen, Germany

In traditional random walks in dynamic random environments one assumes translation invariance of the dynamics of the environment. In contrast to this we will look at spatially inhomogeneous environments. This inhomogeneity can for example be given by another layer of randomness. We will look a the behavior of a random walk in such an environment. This requires methods both from the theory of random walks in dynamic and in static environment. The application in mind are genealogies in spatial population processes, where differences in geography influence reproduction and migration.

Solution of the slow bond problem

Vladas Sidoravicius, IMPA, Brazil

In the present joint work with R. Basu and A. Sly we address to the following question: how can localized microscopic defect, especially if it is small with respect to macroscopic parameters, affect the macroscopic behaviour of a system? Under our consideration are two classical models: 1) Ulam's problem of maximal increasing sequence and 2) the discrete oriented last passage percolation with exponential passage times. For the first model, using its representation as a Poissonian version of directed last passage percolation on the plane, we introduce the defect as the reinforcement along the diagonal line (columnar defect), and for the latter, which corresponds to the totally asymmetric exclusion process with the step initial conditions, the defect is produced by decreasing the jump rate of each particle when it crosses the origin. We show that in both cases presence of arbitrarily small defect affects macroscopic behaviour of the system: in Ulam's problem the time constant increases, and for the exclusion process the flux of particles decreases. In particular, this settles the "slow bond problem".

4.11 Optimal stopping and applications

Organized by Ernesto Mordecki, Universidad de la República, Uruguay & Paavo Salminen, Abo Akademi University, Finland
Room 430

Resolvent techniques for optimal stopping and impulse-control problems

Soren Christensen, Hamburg University, Germany

In this talk, a characterization of the solution of impulse control problems in terms of excessive functions is given. In a general Markovian framework, the value function of the impulse control problem is shown to be the minimal function in a convex set of excessive functions. This characterization also leads to optimal impulse control strategies and can be seen as the corresponding characterization to the description of the value function for optimal stopping problems as a smallest excessive majorant of the reward function. This general point of view gives a unifying framework for many different classes of problems and gains insight into different existing methods based on resolvent techniques. The results are illustrated with examples from different fields, including multiple stopping and optimal switching problems. If the time permits, applications to portfolio optimization are discussed more detailed.

Solving optimal stopping problems for one-dimensional diffusions

Fabián Crocce, UdelaR - KAUST , Saudi Arabia

Considering a real-valued diffusion, a real-valued reward function, and a positive discount rate, an algorithm to solve the optimal stopping problem consisting in finding the optimal expected discounted reward and the optimal stopping time in which it is attained will be presented. Our approach is based on Dynkin's characterization of the value function, and Riesz's representation of α-excessive function. An important aspect of the algorithm we provide is that it always arrives to the solution, thus no verification is needed.

Optimal prediction of the time of the ultimate maximum of a Lévy process
Erik Baurdoux, LSE, UK

Optimal prediction of the ultimate maximum is a non-standard optimal stopping problem in the sense that the pay-off function depends on a process which is not adapted to the given filtration. Our aim is to approximate by stopping times as close as possible the (random) time of the ultimate maximum of a Lévy process. In this work we consider the infinite horizon case for a general Lévy process drifting to minus infinity. Using properties of the all time maximum of a Lévy process and a reformulation of the problem as a standard optimal stopping problem, we find an optimal stopping time as a first passage time of the reflected process. The results are made more explicit in the spectrally one-sided case. This talk is based on joint work with Dr. Kees van Schaik (University of Manchester).

4.12 Percolation theory and related processes

Organized by Pierre Nolin, ETH Zürich, Switzerland
Room 438

Embedding binary sequences into Bernoulli site percolation on Z^3
Marcelo R. Hilário, UFMG, Brazil

We investigate the problem of embedding infinite binary sequences into Bernoulli site percolation on the d-dimensional integer lattice. For d at least equal to 3 and in the regime in which infinite connected components of 0's and 1's coexists we show that there exists a integer M (depending on the value of p) such that every binary sequence, for which every run of consecutive 0's or 1's contain at least M digits can be embedded. Joint with B. de Lima, P. Nolin and V. Sidoravicius.

Some dynamical percolation-like processes
Rob van den Berg, CWI, Netherlands

In this talk I will discuss some `old' and some recent results concerning special processes with a percolation-like flavour. Examples are frozen percolation and forest-fire models. I will also state some (in my opinion) interesting open problems.

A universal behavior for planar civide and color model
Vincent Tassion, UMPA, France

We study the Divide and Color model on a planar lattice G, defined as follows. First, sample a Bernoulli bond percolation, at a subcritical parameter p<pc(G). This yields a random partition of V into finite clusters, and we say that two clusters at distance 1 from each other are adjacent. In a second step, assign one color to each cluster independently of the others. The color is chosen to be black with probability r and white with probability 1-r. For fixed p<pc(G), we observe an infinite path of adjacent black clusters, as soon as the parameter r exceeds a critical density rc(p). We focus on the behavior of rc(p) when p tends to pc(G). Considering that the critical behavior of bond percolation should be universal, Beffara and Camia conjectured that rc(p) should converge 1/2, for any choice of G. We prove it for the square lattice.

4.13 Free probability and random matrices

Organized by Víctor Pérez-Abreu, CIMAT, Mexico
Room 433

Block modified random matrices
Octavio Arizmendi, CIMAT, Mexico

We study the limiting eigenvalue distributions of random matrices which have been transformed by a linear block operation. This approach uses operator valued free probability.

On an operator-valued free probability based model for systems with block dynamics
Mario Díaz-Torres, Queen's University, Canada

In this talk we will present a recent operator-valued free probability based model for correlated multiantenna channels. The derivation of the model emphasizes the potential of operator-valued free probability models to deal with systems that exhibit certain block dynamics. We will end the talk showing some of the advantages of the model in our particular application and also giving some directions to further applications in more general contexts.

A general solution to eigenvalue distributions of Hermitian random matrix models using free probability
Carlos Vargas, Universitaet des Saarlandes, Germany

Deterministic equivalents (DE's) (apparently going back to Girko) for the Cauchy-Stieltjes transforms of eigenvalue distributions of Hermitian RM models have been proved to yield very good approximations of the averaged empirical eigenvalue distribution of the model. In recent years, the more sophisticated RM models (e.g. those coming from electrical engineering) employed such DE's to compute approximations of eigenvalue distributions. However, as the complexity of the model grows, it becomes less clear how to perform such simplifications. In a previous joint work with R. Speicher, we found a conceptual interpretation of DE's in terms of Voiculescu's Free Probability. Instead simplifying the matrix model at the level of equations, we rather proposed a deterministic, operator-algebraic simplification (called "Free Deterministic Equivalent") of the RM model itself, replacing the matrices by suitable deterministic operators. Free Independence (in many of its instances) plays an important role in the definition of the FDE's. The FDE's can be defined quite easily (regardless of the complexity of the model) and we allow the models to contain matrices of different sizes and even rectangular matrices. However, the actual computation of the spectral distribution of these FDE's still depended on the specific choice of the model. Recent developments in Free Probability (specifically, on the operator-valued generalization of the analytic subordination theory of the additive and multiplicative free convolutions) allowed Belinschi et al. to compute spectral distributions of certain operator-algebraic models, related to quite general RM. In this talk (joint work with T. Mai) we show how their method can be generalized to obtain the spectral distribution of any FDE.

Sessions 5

Thursday, 10:15 - 11:45

4.14 The art of the Dirichlet processes and their extensions

Organized by Gérard Letac, University of Toulouse, France & Mauro Piccioni, Sapienza University of Rome, Italy
Room 432

Nonparametric prior specification through random mean functionals

Antonio Lijoi, University of Pavia, Italy

The present talk discusses the determination of the base measure of a random probability measure, which yields a given distribution for the corresponding mean functional. In particular, we focus on the two-parameter Poisson-Dirichlet process. An interesting application is related to hierchical mixture models typically used for clustering and density estimation. We, then, provide an illustration based on specific examples that allow to draw a comparison with known results in the Dirichlet process case.

Perpetuity laws for Dirichlet and quasi-Bernoulli distributions

Pawel Hitczenko, Drexel University, United States of America

In this talk we describe recent advances in the study of perpetuity property of Dirichlet related distributions. In particular, we define new class of distributions on the tetrahedron in the d+1 dimensional Euclidean space, that we call quasi-Bernoulli of order k. These are the distributions concentrated on at most k dimensional faces of the tetrahedron. We establish a perpetuity property for them which, in the case k=1, reduces to the perpetuity property of the classical Dirichlet distribution obtained by Sethuraman in 1996. We will use the perpetuity characterization to establish a representation, similar to that of Sethuraman, of the Dirichlet process in terms of the quasi-Bernoulli variables of order k. This is a joint work with G. Letac.

Filtering via duality for Fleming-Viot and Dawson-Watanabe processes

Matteo Ruggiero, University of Torino, Italy

Filtering hidden Markov models amounts to perform sequential Bayesian inference on some dynamic parameter given observations collected at discrete time points. This usually entails constructing an exact algorithm which sequentially evaluates in closed form the posterior distribution of the evolving parameter. Under certain conditions, one can exploit the time-reversal structure of the model and use dual processes for constructing such algorithm. Here we exploit this result with the aim of filtering classes of infinite-dimensional parameters modelled as Fleming-Viot and Dawson-Watanabe processes, which are measure-valued diffusions related to Dirichlet and gamma random measures. Joint work with Omiros Papaspiliopoulos and Dario Spanò.

4.15 Inverse problems for RWRE, inference and applications

Organized by Dasha Loukianova, Evry University, France
Room 430

Maximum likelihood estimator asymptotic properties for a ballistic random walk in a random environment

Catherine Matias, CNRS- Lab. Statistique et Génome, France

We consider a one dimensional ballistic random walk evolving in an i.i.d. parametric random environment. We provide a maximum likelihood estimation procedure of the parameters based on a single observation of the path till the time it reaches a distant site, and prove that the estimator is consistent as the distant site tends to infinity. Our main tool consists in using the link between random walks and branching processes in random environments and explicitly characterising the limiting distribution of the process that arises. In a second part , we prove an asymptotic normality result for this consistent estimator and establish that it achieves the Cramér -Rao bound. We also explore in a simulation setting the behaviour of the estimation procedure as well as asymptotic confidence regions for the parameter value.

MLE estimator for recurrent RWRE
Oleg Loukianov, Université Paris-Est, France

We study the convergence of MLE for a parameter of the law of the environment of a one-dimensional recurrent RWRE. Our main consists in using the localisation of the RWRE in the main valley of its potential. Unlike most of the classical maximum likelihood approach, the limit of criterion function may not be deterministic and the convergence may not occur in probability. We present different frameworks to illustrate these facts.

Solving the markovian environment via HMM methods
Pierre Andreoletti, Université d'Orléans, France

We study two examples of estimation of the environment of a one dimensional Random Walk in Random Environment. Both examples can be related to theoretical DNA unzipping. The first one concerns with the estimation of the environment itself in a non-asymptotic setting and answers the question of DNA sequencing. This is a common work with R. Diel. In the second one we are interested in the estimation of the parametric law of the environment. Namely, we study the asymptotic properties of MLE for a ballistic RWRE in Markovian environment. We show how HMM methods can be used in this context and how this model can be applied to the detection of DNA binding energies.

4.16 New developments in Malliavin calculus

Organized by Marta Sanz-Solé, University of Barcelona, Spain
Room 434

Convergence in total variation distance in the CLT using Malliavin calculus
Vlad Bally, University of Marne-la-Vallée, France
We consider a sequence of iid random variables with a non singular law. Using the absolute continuous part of the law (which is not null) we are able to settle an integration by parts formula of Malliavin type. We use it in order to obtain convergence in total variation distance in the CLT and to estimate the error.

Hitting probabilities for non-linear systems of stochastic waves

Robert Dalang, Ecole Polytechnique Fédérale de Lausanne, Switzerland

We consider a d-dimensional random field u = {u(t,x)} that solves a non-linear system of stochastic wave equations in spatial dimensions k in {1,2,3}, driven by a spatially homogeneous Gaussian noise that is white in time. We mainly consider the case where the spatial covariance is given by a Riesz kernel with exponent b. Using Malliavin calculus, we establish upper and lower bounds on the probabilities that the random field visits a deterministic subset of R^d, in terms, respectively, of Hausdorff measure and Newtonian capacity of this set. The dimension that appears in the Hausdorff measure is close to optimal, and shows that when d(2-b) > 2(k+1), points are polar for u. Conversely, in low dimensions d, points are not polar. There is however an interval in which the question of polarity of points remains open. This is joint work with Marta Sanz-Solé.

Third moment theorem for functionals of stationary Gaussian sequences

Frederi Viens, Purdue University, United States of America

Bierme, Bonami, Nourdin, and Peccati recently gave sharp general quantitative bounds to complement the well-known fourth moment theorem of Nualart and Peccati, by which a sequence in a fixed Wiener chaos converges to a normal law if and only if its fourth cumulant converges to 0. The bounds show that the speed of convergence is precisely of order the maximum of the fourth cumulant and the absolute value of the third cumulant. Specializing to the case of normalized centered quadratic variations for stationary Gaussian sequences, we show that a third moment theorem holds: convergence occurs if and only if the sequence's third moments tend to 0. This is proved for sequences with general decreasing covariance. We finding exact speeds of convergence as intrinsic functions of the covariance itself, which helps put in perspective the notion of critical Hurst parameters when studying the convergence of fractional Brownian motion's quadratic variation. We also study the speed of convergence when the limit is not Gaussian but rather a second-Wiener-chaos law, recovering a classical result of Dobrushin-Major/Taqqu whereby the limit is a Rosenblatt law, and proving that the price to pay to obtain a Rosenblatt limit despite a slowly varying modulation is a very slow convergence speed, roughly of the same order as the modulation.

Sessions 6

Thursday, 14:00 - 15:30

4.17 Risk analysis, ruin and extremes

Organized by Corina Constantinescu, University of Liverpool, UK
Room 430

On a generalization of some Karamata and standard EVT characterizations

Marie Kratz, ESSEC Business School, France

We define a new class of positive functions in terms of their asymptotic behavior, which includes the class of regularly varying functions. We also characterize it by some transformations, corresponding to generalized moments when these functions are random variables. We study the properties of this new class and discuss their applications to Extreme Value Theory (EVT). Some well-known results of EVT are extended to this class, as for instance Karamata's relations, von Mises' conditions and the Karamata Tauberian Theorem. This is a joint work with M. Cadena.

Risk models for a given risk profile

Kais Hamza, Monash University, Australia

Given a dynamic risk model, one can (at least in theory) obtain the corresponding risk profile; this is the family of risk measures indexed by time. In this talk we focus on the inverse problem of finding dynamic risk models for a given risk profile. From the mathematical point of view, this question is identical to looking for stock price models for a given option profile.

Endowments and risky investments - an analysis point of view

Enrique Thomann, Oregon State University, United States of America

The study of ruin probability for the so called Dual Risk processes continues to attract substantial attention. In this process, better described as ruin for endowments, random sums arriving at random intervals are distributed at a deterministic rate. A survey of current understanding will be given, with a special emphasis on determining integro-differential equations (IDE) for the probability of eventual ruin. In particular, although some of the processes considered are not Markovian (such as the integral of the exponential of Brownian motion with drift), the particular form of the process allows for the determination of an IDE. This is joint work with Sooie-Hoe Loke.

4.18 Bootstrap percolation and related cellular automata

Organized by Robert Morris, IMPA, Brazil

Room 432

Two-dimensional critical bootstrap percolation

Paul Smith, IMPA, Brazil

Bootstrap percolation is a type of discrete time dynamical system on graphs in which vertices have one of two possible states, occupied or unoccupied. Typically the initial states of the vertices are determined according to a percolation measure and the states of the vertices evolve according to an update rule that is homogeneous, local and monotone. The basic so-called r-neighbour model, which has its roots in 1979 in statistical physics, is now extremely well understood. The completely general model, however, was only introduced very recently by Bollob\'as, Smith and Uzzell, who showed that two-dimensional bootstrap percolation models could be naturally partitioned into three classes, which they termed subcritical, critical and supercritical. In this talk we present the latest in this new body of work, showing that the two-dimensional critical models can be partitioned into certain universality classes, inside of which any two models exhibit similar large scale behaviour. In particular, we determine up to a constant factor the critical probability for percolation in the discrete torus for every two-dimensional critical model. Based on joint work with Béla Bollobás, Hugo Duminil-Copin and Rob Morris.

Majority bootstrap percolation on the random graph

Nathan Kettle, IMPA, Brazil

In majority bootstrap percolation, an infection spreads by passing to a vertex at least half of whose neighbours are already infected. We study this process on the Erdős-Renyi random graph, and find tight bounds on the number of initially infected vertices needed for the entire graph to become infected.

Nucleation and growth in two dimensions

Simon Griffiths, University of Oxford, UK

In this talk we discuss the following Nucleation and Growth model on Z^2: let vertices become infected at rate 1/n if they have no infected neighbours, at rate k(n)/n for some function 1≤k(n)≤n if they have exactly one infected neighbour, and at rate 1 otherwise. Note that the large n limit of this model interpolates between bootstrap percolation (k(n)=1) and first passage percolation (k(n)=n/2). Let t=t(k) denote the time at which the origin is infected. In the case k(n)=n^a for some 0<a<1, Dehghanpour and Schonmann proved that t(k)=n^{(1+o(1))f(a)} where f(a)=(a+1)/3 for a ≤ 1/2 and f(a)=a for a ≥ 1/2. However, this result is quite far from determining t(k) even up to a constant (or poly-log) factor. In this talk we discuss recent work which allow us to determine t(k) up to a constant factor across almost the entire range of 1≤ k(n)≤ n. Furthermore, we determine t(k) asymptotically for a large subset of this range, including, for example, the cases k(n)=n^a for some 0<a<1/2. Based on joint work with Bela Bollobas, Leonardo Trivellato Rolla, Robert Morris and Paul Smith.

4.19 Fluctuation of Lévy processes and applications to branching structures and biology

Organized by Víctor Rivero, CIMAT,Mexico
Room 433

Breadth first search codings of continuous multitype trees and applications to population growth

Loïc Chaumont, University of Angers, France

We present two different codings of multitype deterministic trees based on their breadth first search algorithm. When applied to multitype branching trees, the first one allows us to make explicit the law of some functionals such as the total length of the branches of each type or the total population up to extinction. The second coding provides a Lamperti type representation of the process Z^(1)_t,...,Z^(d)_t), t > 0, where Z^(i)_t is the number of individuals in the population of type i, at time t. As an application we can characterise the joint law at fixed times of the number of families of each type.

Continuous state branching processes in a Brownian random environment

Juan Carlos Pardo, CIMAT, Mexico

In this talk, we introduce continuous state branching processes in a Brownian random environment. This type of processes are defined as the unique strong solution of a stochastic differential equation. The case when the CB-process corresponds to a Feller diffusion was recently studied by Boeingoff and Hutzenthaler (MPRF, 2012), and Hutzenthaler (ECP, 2011). Our aim is to study, in the stable case (which also includes the Feller diffusion case), the probability of extinction, some associated martingales and the Q-process (i.e. the process conditioned to be never extinct). In this particular case, the probability of extinction is associated to the asymptotic behaviour of an exponential functional driven by a Brownian motion which is associated to the environment. This is a joint work with Sandra Palau.

Splitting trees with neutral mutations at birth
Mathieu Richard, CMAP-École Polytechnique, France

We consider a population model where individuals behave independently from each other and whose genealogy is described by a random tree called splitting tree. In such trees, the individuals have i.i.d. lifetime durations and give birth at constant rate to clonal or mutant children in an infinitely many alleles model with neutral mutations. The main interest of this work is that the common distribution of the lifelengths can be as general as possible. We are interested in the allelic partition of the population and study its frequency spectrum, which, at a fixed time, describes the number of alleles carried by a given number of individuals and with a given age. We obtain several properties satisfied by this spectrum with the help of tree contour techniques and with the help of the theory of Crump-Mode-Jagers processes.

Sessions 7

Friday, 10:15 - 11:45

4.20 Stability and instability in queueing systems

Organized by Yoni Nazarathy, University of Queensland, Australia
Room 432

Stability of multi-dimensional birth and death processes
Matthieu Jonckheere, Conicet, Argentina

We study the positive recurrence of some Markovian multi-dimensional birth and death processes. We first explain the advantages and limits of renormalization techniques. For specific models, we provide a generic method to construct a Lyapunov function for processes with continuous drifts. We then show how discontinuous drifts change the nature of the stability conditions. We provide generic sufficient stability conditions having a simple geometric interpretation and which turn out to be necessary (outside a negligible set of the parameter space) for piece-wise constant drifts in dimension 2. We finally discuss open problems. Joint work with Seva Shneer Heriot-Watt university.

Asymptotics in directed random graphs
Takis Konstantopoulos, Uppsala University, Sweden

This talk is a survey of current and older work on directed random graphs one various kinds of lattices. The problem is motivated by a number of applications (e.g., in queueing and statistical physics) but also has connections (not well-understood) to random matrix theory. Our results include first and second order limit theorems for longest paths in a large chunk of the graph. For the 2-dimensional case, the Tracy-Widom distribution emerges. We will also discuss possible limits of these graphs and open problems.

Non-existence of stable policies for critical queueing networks with infinite supplies

Tom Salisbury, York University, Canada

Multi-class queuing networks with infinite supplies are networks where servers can either serve jobs from queues or generate new arrivals to the system. The simplest interesting example is known as the push-pull network. For such networks there sometimes exist policies that allow servers to be fully utilized while keeping queue sizes stochastically stable. In contrast, we will use martingale arguments to show that for a variety of critical networks, such stabilizing policies may fail to exist. This is joint work with Yoni Nazarathy and Leonardo Rojas-Nandayapa.

4.21 Noise sensitivity and percolation

Organized by Gábor Pete, Rényi Institute & TU Budapest, Hungary

Room 430

Partially observed Boolean sequences and noise sensitivity

Daniel Ahlberg, IMPA, Brazil

Assign independent [0,1]-uniform random variables to the elements in {1,2,...,n}. Let w_p, for p in [0,1], denote the monotone coupling of an element in {0,1}^n, so that w_p consists of all elements of {1,2,...,n} whose value is at most p. Given a Boolean function f:{0,1}^n \to {0,1}, we aim to quantify how much the observation of w_r affects the outcome of f(w_p), where r>p. In the context of percolation, we find that this is closely related to the near-critical regime, and instrumental in the study of noise sensitivity in continuum percolation.

Exclusion sensitivity of Boolean functions

Erik Broman, Uppsala University, Sweden

Consider a length n string omega_n of zeros and ones, and chose it uniformly among all such strings. Then, create omega_n^epsilon by flipping the bits of the string independently with some small probability epsilon. When studying noise sensitivity of Boolean functions f_n, one (very loosely speaking) compares the values of f_n(omega_n) and f_n(\omega_n^\epsilon). In this talk, we will introduce the concept of Exclusion sensitivity, which is closely related to that of noise sensitivity. Here, instead of flipping bits independently, we perform random permutations of the bits in our string. We will discuss similarities and differences between these two notions of sensitivity, and present some results along these lines.

Influences in gaussian Space

Arnab Sen, University of Minnesota, United States of America

The notion of influences in the Boolean cube has a natural extension to Gaussian space. In this talk, I will explain the how this new definition of influences leads to the analogs of several fundamental results of discrete harmonic analysis including the Kahn–Kalai–Linial bound, the threshold phenomenon for monotone events and the Benjamini–Kalai–Schramm noise sensitivity theorem in the Gaussian setup.

4.22 Markov chains, sequential decisions, and the analysis of algorithms

Organized by Michael Steele, University of Pennsylvania, United States of America
Room 433

QuickSelect tree process convergence, with an application to distributional convergence for the number of symbol comparisons used by worst-case Find

Jim Fill, The Johns Hopkins University, United States of America

We define a sequence of tree-indexed processes closely related to the operation of the QuickSelect search algorithm (also known as Find) for all the various values of n (the number of input keys) and m (the rank of the desired order statistic among the keys). As a "master theorem" we establish convergence of these processes in a certain Banach space, from which known distributional convergence results as n becomes large about (1) the number of key comparisons required are easily recovered (a) when the ratio of m to n converges to alpha in [0, 1], and (b) in the worst case over the choice of m. From the master theorem it is also easy, for distributional convergence of (2) the number of symbol comparisons required, both to recover the known result in the case (a) of fixed quantile alpha and to establish our main new result in the case (b) of worst-case Find. Our techniques allow us to unify the treatment of cases (1) and (2) and indeed to consider many other cost functions as well. Further, all our results provide a stronger mode of convergence (namely, convergence in L^p or almost surely) than convergence in distribution. We briefly discuss extensions to MultipleQuickSelect.

Algorithms and asymptotics in sequential decision problems

Alessandro Arlotto, Duke University, United States of America

The dynamic programming algorithm is often used to calculate the optimal expected total reward in many problems of sequential decisions. In this talk we analyze examples of sequential decision problems in which such algorithm can be studied with enough precision to obtain useful asymptotics for the optimal mean and variance bounds.

Finite horizon dynamic programming: distributional limit theory

Michael Steele, University of Pennsylvania, United States of America

Many problems of sequential decision making can be addressed by the Bellman equation of dynamic programming, and this approach often leaves one with the need to understand a non-homogeneous Markov additive functional with a fixed finite horizon. This talk considers several concrete problems where one can extract informative asymptotic distribution theory in contexts where the general theory is typically intractable. One portable trick is to be alert to the possibility of "spending symmetry" at the right time.

5. Contributed Talks

Sessions 1

Monday, 10:15 - 11:45

5.1 Contributed Talks A

Room 412

Dirk Erhard, Leiden University, Netherlands

Brownian paths homogeneously distributed in space:Percolation phase transition and uniqueness of the unbounded cluster

I will talk about a continuous percolation model on R^d. For fixed t and in dimension at most 3, the occupied set is given by the union of independent Brownian paths running up to time t whose initial points form a Poisson point process with intensity lambda. When the dimension is at least 4, the Brownian paths are replaced by Wiener sausages with radius r > 0.I will explain that in d = 1 for all choices of t, no percolation occurs, whereas for d at least 2, there is a non-trivial percolation transition in t, provided lambda and r are chosen properly. I further discuss the uniqueness of the unbounded cluster and if time permits I may say something about the behaviour of the critical value.

Tertuliano Franco, Bahia

Phase transition in fluctuations of symmetric exclusion with a slow bond

We consider the symmetric one dimensional exclusion with a slow bond in the diffusive scale. Depending on the strength of this slow bond, three regimes are obtained for the density fluctuations of the system, as well as in the current and tagged particle fluctuations, whose correlations are explicitly exhibited. Each regime is related to the heat equation with periodic, mixed or isolated boundary conditions. In the continuum, the Gaussian processes obtained (for current and tagged particle) have a continuous interpolation on some parameter. Joint work with P. Gonçalves and A. Neumann.

Maria Eulalia Vares, UFRJ, Brazil

Dynamic random walk on contact process environment

This talk will be based on a joint work with Thomas Mountford. We consider a random motion in the integers whose rates are determined by an underlying supercritical contact process in equilibrium. A CLT is proven, valid for all supercritical infection rates for the environment.

5.2 Contributed Talks B

Room 413

Nicos Georgiou, University of Sussex, UK
Variational formulas (and their solutions) for last passage percolation

We present variational formulas recently obtained for the limiting time constant of directed last passage percolation and directed polymer models. Minimizers to these formulas come from cocycles appropriately adapted to the potential. Such cocycles can be obtained from the so-called Busemann functions that microscopic gradients of the last passage time/partition function. The results will be demonstrated through 1+1 dimensional exactly solvable examples, polymers in weak disorder and periodic examples.

Arjun Krishnan, New York University, USA
Variational formula for the time-constant of first-passage percolation

We consider first-passage percolation with positive, stationary-ergodic weights on the square lattice Z^d. Let T(x) be the first-passage time from the origin to x in Z^d. The convergence of the scaled first-passage time T([nx])/n as n goes to infinity to the so-called time constant is a classical result. We view this convergence as a homogenization problem for a discrete Hamilton-Jacobi-Bellman (HJB) equation. By borrowing several tools from the continuum theory of stochastic homogenization for HJB equations, we derive an exact variational formula for the time-constant. The variational formula may also be seen as a duality principle, and we discuss some aspects of this. As an application, we construct an explicit iteration that produces the minimizer of the variational formula.

Leandro Pimentel, UFRJ, Brazil
Scaling coalescence times last-passage percolation

We consider last-passage percolation models with exponential weights and prove lower bounds for coalescence times with scaling exponent 3/2. We also relate its distribution with variational problems involving the Brownian motion the Airy processes. The proof is based on a duality formula between coalescence times and exit points.

Sessions 2

Monday, 14:00 - 15:30

5.3 Contributed Talks C

Room 432

Maik Döring, University of Hohenheim, Germany
Empirical process theory applied to smooth change point estimation in regression models

We consider the problem of estimating the location of a change point in a regression model. Most change point models studied in the literature so far were based on regression functions with a jump. In this paper, however, we focus on smooth regression functions, which are continuous or even differentiable at the change point. The degree of smoothness has to be estimated as well. We investigate the asymptotic behavior of the least square estimates using the theory of empirical processes and M-estimators. It turns out that the rates of convergence of the change point estimator depend on the order of smoothness of the regression function at the change point. By rescaling the corresponding empirical process we show that our estimators converge in distribution to a maximizer of a Gaussian process. In particular for small degrees of smoothness the change point estimator has not the asymptotic normality property.

Frédéric Lavancier, University of Nantes, France
Determinantal point process models and statistical inference

Statistical models and methods for determinantal point processes (DPPs) seem largely unexplored, though they possess a number of appealing properties and have been studied in mathematical physics, combinatorics, and random matrix theory. We demonstrate that DPPs provide useful models for the description of repulsive spatial point processes. In particular, we investigate the range of repulsiveness that DPPs can cover, and we characterize the most repulsive DPP, showing that DPPs are particularly adapted to 'soft-core' repulsive data. Such data are usually modelled by Gibbs point processes, where the likelihood and moment expressions are intractable and simulations are time consuming. We develop parametric models of DPPs, where the likelihood and moment expressions can be easily evaluated and realizations can be quickly simulated. We discuss how statistical inference is conducted using the likelihood or moment properties of DPP models. This work has been carried out in collaboration with Jesper Møller and Ege Rubak (the paper is available at arXiv:1205.4818). The study of the repulsiveness of DPPs is part of a joint work with Christophe Biscio.

Jamal Najim, CNRS & Université Paris Est, France
Gaussian fluctuations for large random covariance matrices

Consider a series of multivariate independent and identically distributed observations where the dimension of each observation is of the same order as the dimension of the sample. The purpose of the talk is to study the fluctuations of linear statistics of the spectral measure of the associated large random covariance matrix. Main improvements with respect to Bai and Silverstein's CLT are twofold: (a) we consider entries whose moments may differ from the moments of gaussian random variables; this fact substantially modifies the nature of the convergence (b) we consider functions with essentially three bounded derivatives instead of analytic functions considered by Bai and Silverstein. The techniques developed here are based on Helffer-Sjöstrand's formula and also apply to other models such as 'large signal plus noise' matrices.

5.4 Contributed Talks D

Room 412

Jean-Baptiste Bardet, Université de Rouen, France
Long time behavior of switched diffusion processes

This talk is concerned with switched diffusion processes, which are diffusion processes whose coefficients vary over time, depending on another (finite state) Markov process. We will present on some examples how coupling methods and functional inequalities approaches can be adapted to this setup, characterized by the fact that we have to deal with the discrete component and the continuous component simultaneously. In one-dimensional examples, we get explicit estimates on the tail of the invariant measure, the speed of convergence in Wasserstein distance, and the range of validity of a partially integrated curvature criterion. Some of these results can also be extended to multi-dimensional examples. This talk is based on joint works with Hélène Guérin, Arnaud Guillin and Florent Malrieu.

Iddo Ben-Ari, University of Connecticut, USA
Diffusion with Redistribution

We consider a diffusion process on a bounded domain with random redistribution, and study the nature of the resulting process. By redistribution we mean ``jumping'' to new location according to some probability distribution on the domain, which may depend on the position of the path immediately prior to the redistribution. We consider two different trigger mechanisms for the redistribution. The first, redistribution from the boundary, occurs when the process hits the boundary of the domain, and the second, instantaneous redistribution, occurs at jump times of a Poisson process, time-changed by the diffusion. Diffusion with redistribution appear in several applications, and we believe are theoretically interesting because of the non-trivial interaction between the "fast" (unbounded variation) "local" (continuous paths) and diffusive diffusion with the "slow", "nonlocal" yet non-diffusive (keeps process in domain) redistribution. I will present recent results, work in progress and open problems for both mechanisms. For redistribution from the boundary, I will discuss ergodicity, spectral gap, but I will mostly focus on the problem of efficient coupling in one dimension. For the instantaneous redistribution model, I will discuss the asymptotic behavior of the model when the rate of the Poisson process tends to infinity, and the phase transition it exhibits.

Wilfrid Kendall, University of Warwick, UK
Coupling, local times, and immersions

This will be a case study of a coupling problem, namely how simultaneously to couple both scalar Brownian motion and its local time at zero. The coupling in question is required to be co-adapted or Markovian; a case is made for such couplings to be called immersion couplings, because there is a succinct characterisation relating to the notion of immersion of filtrations of sigma-algebras. A particular simple coupling discussed in detail, and it is shown that this is the optimal immersion coupling even though it cannot be maximal. An application to filtration theory will be sketched.

5.5 Contributed Talks E

Room 413

Florin Ciucu, University of Warwick, UK
Scheduling with martingales

We propose a new characterization of queueing systems by bounding a suitable exponential transform with a martingale. The constructed martingale-envelope is quite versatile in the sense that it captures queueing systems with Markovian and autoregressive arrivals in a unified manner; the second class is particularly relevant due to Wold's decomposition of stationary processes. Moreover, using the framework of stochastic network calculus, the martingale-envelopes allow for a simple handling of typical queueing operations: 1) flows' multiplexing translates into multiplying the corresponding martingales, and 2) scheduling translates into time-shifting the martingales. The emerging calculus is applied to estimate the per-flow delay for FIFO, SP, and EDF scheduling. Besides their remarkable numerical accuracy, the obtained bounds are the first to capture a fundamental exponential leading constant.

Isaac Meilijson, Tel Aviv University, Hod Hasharon, Israel
Placing a bet on more than one hole at the roulette table

Optimal betting in roulette by a gambler with fixed goal was studied by Dubins & Savage 1965 and their school without considering betting simultaneously on different holes of the roulette, once it was proved (Smith's theorem - Smith 1967, Dubins 1972 and Gilat & Weiss 1976) that diversification of this type doesn't increase the probability of reaching the goal. We question the scope of this finding, that was based on the assumption that the holes on which gamblers can bet are disjoint, such as 1 and BLACK in regular roulette. A counterexample is provided in which holes are nested, such as 1 and RED. Thus, it may be rational for gamblers with fixed goal to place chips on more than one hole at the table. "The Reopening of the Dubins & Savage casino in the era of diversification" appears in PEIS 2014. The subject is related to joint work with Michele Cohen on the preference for safety in the Choquet Expected Utility model.

Mark Podolskij, Aarhus University, Denmark
Infill asymptotics for Levy moving average processes

We present some new asymptotic results for power variation of continuous Levy moving average processes. We will see that the mode and type of convergence strongly depend on the driving Levy motion, the kernel function and the considered power. Apart from two critical cases there appear three different types of limits. We will show the idea behind the proofs and shortly discuss statistical applications. This talk is based on the joint work with A. Basse-O'Connor and R. Lachieze-Rey.

Sessions 3

Tuesday, 10:15 - 11:45

5.6 Contributed Talks F

Room 412

Paola Bermolen, Universidad de la República, Uruguay
The Jamming Constant of Random Graphs
Using a configuration approach, it is possible to define the dynamics of the ``parking process" on random graphs as a measure-valued Markov process. This allows us to establish a functional law of large numbers when the number of vertices grows to infinity and to characterize the jamming constant of various random graphs. Joint work with Matthieu Jonckheere and Pascal Moyal

Harry Crane, Rutgers University, USA
Markov processes on complex networks

We characterize the class of exchangeable Feller processes on the space of undirected graphs. These processes comprise a natural class of statistical models for time-varying complex networks, which appeal to physical, biological, and sociological applications. Our main theorem provides a Levy-Ito-type characterization for processes in this class and also ties to the Aldous-Hoover theory of partially exchangeable arrays and the Lovasz-Szegedy notion of graph limits.

Tobias Muller, Utrecht University, Netherlands
The connectivity of hyperbolic random graphs

As noted recently in the work of Krioukov et al., it is possible to define a version of the random geometric graph (also sometimes called the Gilbert random graph) on the hyperbolic plane in such a way that it has a power-law degree sequence, clustering and a small diameter. (These features are usually associated with so-called "complex networks" and traditional, euclidean random geometric graphs are very far from having the first property.) Here we consider the "connectivity transition" of this new hyperbolic random graph model. We show that probability that the graph is undergoes a strange phase change that is dissimilar to the behaviour of all other random graph models in the literature, as far as we are aware.

5.7 Contributed Talks G

Room 413

Elisabetta Candellero, University of Warwick, UK
The number of ends of critical branching random walks

In this talk we will introduce the concepts of "end" of a graph and "trace" of a branching random walk (BRW). We will discuss examples showing that, on some one-ended Cayley graphs, the trace of a transient (symmetric) BRW has infinitely many ends almost surely. (Joint work with Matthew Roberts.)

Joaquin Fontbona, University of Chile, Chile
Ray-Knight theorem for Lévy-driven branching processes with logistic growth

We establish a Ray-Knight representation for general logistic continuous state branching processes (LBP) with (sub)critical branching mechanisms, generalizing the representation theorem for CSBP of Duquesne and LeGall in terms of exploration local times, and a representation of Le, Pardoux and Wakolbinger for the logistic Feller diffusion through a local time drifted reflected Brownian motion. To that end, we introduce a generalized pruning procedure for a Lévy forest, allowing us to "mark" the exploration process that codes it at random rates, chosen progressively with respect to the exploration and marks filtration. By an iterative procedure we are able to mark individuals at a rate proportional to the non-marked local time cumulated to their left at each level, and thus define the "logistically pruned local times" of the height process corresponding to individuals with non-marked ancestors. Then, we prove that the process of cumulated pruned local times at each level has, when read at increase times of the local time at level 0, the law of an LBP with the given branching mecahism. This is done by embedding a suitable grid-approximation of this object into a stochastic flow of continuous state branching processes of the type of Dawson and Li, but with "frozen" variable drifts, and proving then that in the limit of the grid approximation, the SDE characterizing the LBP is obtained. This is a joint work with Julien Berestycki and María Clara Fittipaldi.

Federico Polito, University of Torino, Italy
Continuous limit of time-changed branching processes

We present a large-population limit process for sequences of suitably normalized branching processes characterized by heavy-tails waiting times. We proved that the non-Markov limit process is a continuous-state branching process time-changed with an independent right-inverse process of a stable subordinator. Properties and relations to fractional calculus are derived and discussed in general or in specific cases. Extensions considering constructions with different random changes of time are also considered. Connection to networks models are suggested.Joint work with L. Andreis and L. Sacerdote.

Sessions 4

Tuesday, 14:00 - 15:30

5.8 Contributed Talks H

Room 412

Adriana Neumann de Oliveira, UFRGS, Brazil
Large deviations for the exclusion process with slow bond

We studied the asymptotic behavior of the simple exclusion process with a slow bond. While an usual bond has conductance equal to one, the slow bond has a lower conductance. We proved that the empirical measure, which characterizes the time-evolution of the spatial density of particles, converges under diffusive scaling to a weak solution of the heat equation with Robin's boundary conditions. This is known as hydrodynamic limit and it corresponds to a law of large numbers for the empirical measure. Weak solutions of the equation mentioned above are called hydrodynamic profiles. Since the empirical measure is random, there is some deviation of this convergence to the hydrodynamic profile. In other words, the empirical measure can converge to another profile, with small probability. The large deviations principle is the characterization of this probability, that is exponentially small as a function of that profile. The large deviation will be the focus of this talk, which is a joint work with Tertuliano Franco.

Krishnamurthi Ravishankar, SUNY - New Paltz, USA
Asymmetric zero range process with site-wise disorder

We consider asymmetric zero range process with ergodic site-wise disorder supported in (c,1], with c>0 and the jump rate g bounded above by one. We show that any initial configuration with supercritical lower empirical density converges in distribution to the maximal invariant measure.

Bálint Vetö,Budapest University of Technology, Hungary
Tracy-Widom asymptotics for q-TASEP

We consider the q-TASEP that is a q-deformation of the totally asymmetric simple exclusion process (TASEP) on Z for q between 0 and 1 where the jump rates depend on the gap to the next particle. For step initial condition, we show that the current fluctuation of q-TASEP at time t is of order 1/3rd power of t and asymptotically distributed as the GUE Tracy-Widom distribution, which confirms the KPZ scaling theory conjecture.

5.9 Contributed Talks I

Room 413

Michail Loulakis, National Technical University of Athens, Greece
Scaling limit of the condensate dynamics in a reversible zero-range process

Zero range processes with decreasing jump rates can equilibrate in a condensed phase when the particle density exceeds a critical value. In this phase a non-trivial fraction of the mass in the system concentrates on a single site, the condensate. At suitably long time scales, the location of this site changes. Beltrán and Landim have studied the motion of the condensate for zero range processes on finite sets and have shown that - observed at the right time scale - it converges to a random walk on this set. In this work we consider a supercritical nearest neighbor symmetric zero range process on the discrete torus (1/L)Z/Z. We show that the scaling limit of the condensate dynamics is a Lévy process on the unit torus with jump rates inversely proportional to the jump length. Joint work with Inés Armendáriz and Stefan Grosskinsky.

Ricardo Misturini, IMPA, Brazil
Evolution of the ABC model in the zero-temperature limit

We consider the ABC model on a ring in a strongly asymmetric regime. Our main result asserts that the particles almost always form three pure domains (one of each species) and that this segregated shape evolves, in a proper time scale, as a Brownian motion on the circle, which may have a drift.

Santiago Saglietti, Universidad de Buenos Aires, Argentina
Metastability for small random perturbations of a PDE with blowup

We consider the stochastic PDE u_t = u_xx + u^p + e dW with Dirichlet boundary conditions, where p is strictly larger than one, e is a small fixed parameter and dW stands for space-time white noise. It is well known that the associated deterministic PDE (i.e. e= 0 above) admits exactly one asymptotically stable equilibrium and a countable family of unstable equilibria with increasing energy. Furthermore, for certain initial conditions it can be shown that the solution of the deterministic PDE explodes in finite time. We show that, for initial conditions in the domain of attraction of the asymptotically stable equilibrium, the solution X_e of the SPDE satisfies in the limit as e tends to zero the description of metastability as proposed by Galves, Olivieri and Vares: the averages of X_e remain stable and close to the equilibrium up until the explosion time which, when suitably rescaled, converges in distribution to an exponential random variable.

Sessions 5

Thursday, 10:15 - 11:45

5.10 Contributed Talks J

Room 433

Amine Asselah, Université Paris-Est - Créteil, France

Models of depositions

We discuss properties of a two models of stochastic deposition: ballistic and diffusive limited deposition. This is joint work with E. & B. Scoppola, and E.Cirillo.

Ioannis Papageorgiou, Uppsala

Log-Sobolev inequalities for infinite dimensional Gibbs measures

We focus on the infinite dimensional Log-Sobolev inequality for spin systems on the d-dimensional Lattice (d>1) with interactions of higher power than quadratic. We show that when the one dimensional single-site measure with boundaries satisfies the Log-Sobolev inequality uniformly on the boundary conditions then the infinite dimensional Gibbs measure also satisfies the inequality if the phase dominates over the interactions.

Tim van de Brug, VU University of Amsterdam, Netherlands

Convergence of the outer boundaries of random walk loop soup clusters to CLE

Lawler and Trujillo Ferreras (2007) introduced the random walk loop soup and showed that it converges to the Brownian loop soup, in the sense that with probability tending to 1, there is a one-to-one correspondence between macroscopic random walk loops and macroscopic Brownian loops such that corresponding loops are close. We prove that for subcritical intensities, the collection of outer boundaries of outermost clusters of macroscopic random walk loops converges in distribution to CLE, with respect to the induced Hausdorff distance on collections of compact subsets of the plane. In the course of the proof, we show that the outer boundary of random walk converges in the Hausdorff distance to the outer boundary of Brownian motion. This is joint work with Federico Camia and Marcin Lis.

5.11 Contributed Talks K

Room 412

Loren Coquille, HCM Bonn, Germany

On the Gibbs states of the non-critical Potts model on Z^2

All Gibbs states of the supercritical q-state Potts model on Z^2 are convex combinations of the q pure phases; in particular, they are all translation invariant. I will explain the basic concepts underlying this result and present the heuristics of the proof, which consists of considering the model in large finite boxes with arbitrary boundary condition, and proving that the center of the box lies deeply inside a pure phase with high probability. Our estimate of the finite-volume error term is of essentially optimal order, which stems from the

Brownian scaling of fluctuating interfaces. The results hold at any supercritical value of the inverse temperature beta > beta_c(q)=log(1+sqrt(q)). Joint work with Hugo Duminil-Copin, Dima Ioffe and Yvan Velenik.

Nahuel Soprano Loto, Universidad de Buenos Aires, Argentina
Phase transition for the clock model via random-cluster percolation

We show that, for temperature sufficiently low, the Edwards-Sokal random-cluster measure associated to the q-state clock model with constant boundary conditions, stochastically dominates a supercritical Bernoulli bond percolation measure. This provides an lower bound for the critical temperature, for every value of q and every dimension. We present possible extensions of the method.

Willem van Zuijlen, Leiden University, Netherlands
Gibbs-non-Gibbs dynamical transitions for mean-field interacting Brownian motions

In this talk I discuss the phenomenon of dynamical Gibbs-non-Gibbs transitions for a mean-field spin system subjected to a stochastic dynamics where the spins perform independent one-dimensional Brownian motions. I explain the relation between Gibbsianness at time t and properties of the large deviation function for the magnetisation at time zero given the magnetisation at time t. Conditions on the potential are given under which the system is Gibbs at time t. From this it follows that once the system has become non-Gibbs it cannot become Gibbs again, i.e., there is a unique crossover time. I discuss different scenarios: immediate loss of Gibbsianness (the crossover time is zero), short-time conservation and large-time loss of Gibbsianness (the crossover time is finite and positive), and preservation of Gibbsianness (the crossover time is infinite). Depending on the potential, the system can be Gibbs or non-Gibbs at the cross-over time. This is joint work with Frank den Hollander and Frank Redig.

5.12 Contributed Talks L

Room 413

Stella Brassesco, Instituto Venezolano de Investigaciones Cientificas, Venezuela
Front fluctuations for the stochastic Cahn--Hilliard equation

We consider the Cahn-Hilliard equation in one space dimension, perturbed by the derivative of a space and time white noise, and we investigate the effect of the noise on the solutions when the initial condition is a front that separates the two stable phases, in the limit as the intensity of the noise goes to zero. We prove that, in a suitable time scaling, the solution remains close to a front and we study the fluctuations of the front in this time scaling. They are given by a one dimensional continuous process, self similar of order one quarter and non Markovian, related to a fractional Brownian motion and for which a couple of representations are given.

Ludger Overbeck, University of Giessen, Germany
Differentiability of backward stochastic volterra integral equation and applications

We introduce a classical differentiability result for backward stochastic Volterra integral equations which depend on a parameter. Stochastic Volterra integral equations were recently introduced as an extension of backward stochastic differential equation. They are mainly used for the construction of dynamic risk measures but also in some areas of mathematical biology in population theory. We will exhibit some application for dynamic capital allocation problems in mathematical finance. This is joint work with Eduard Kromer.

Jacek Wesolowski, Politechnika Warszawska, Poland
Evolutions of polynomials generated by quadratic harnesses

We study infinitesimal generators of evolutions of polynomials that correspond to a special class of Markov processes with polynomial regressions. We relate the infinitesimal generator to the unique solution of a certain commutation equation, and we use the commutation equation to find explicit formula for the infinitesimal generators corresponding to a class of processes called free quadratic harnesses. This is a joint work with Wlodek Bryc.

Sessions 6

Thursday, 14:00 - 15:30

5.13 Contributed Talks M

Room 412

Tal Orenshtein, Technical University of Munich, Germany
Excited random walk with periodic cookies

We consider an excited random walk on the integers in an identically piled periodic environment. This is a discrete time process on the integers defined by parameters p(1),...,p(M) in [0,1] for some positive integer M, where the walker upon the i-th visit to an integer z moves to z+1 with probability p(i mod M), and moves to z-1 with probability 1-

p_(i mod M). We give an explicit formula in terms of p(1),…,p(M) for determining whether the walk is recurrent, transient to the left, or transient to the right. In particular, when the average drift per period is zero all behaviors are possible, and depend also on the order of the p(i)'s. This is a joint work with Gady Kozma and Igor Shinkar.

Jonathon Peterson, Purdue University, USA
Extreme slowdowns for excited random walks

Excited random walks (also called cookie random walks) are a model for self-interacting motion where the transition probabilities are governed by the local time of the random walk at the current site. If the excited random walk has a positive limiting speed, then the event that the random walk moves at some slower linear rate is considered a "slowdown event." In a previous study of the large deviations for excited random walks, it was shown that the probabilities of these slowdown events decay polynomialy at a rate that can be explicitly calculated. In this talk we consider the asymptotics of the probabilities of the "extreme slowdown" events where the random walk at a sublinear rate rather than linear rate. We compute precise estimates on the polynomial rate of decay for these events and show that an interesting transition occurs when the sublinear rate changes from being superdiffusive to subdiffusive.

Nicolas Pétrélis, Université de Nantes, France
Collapse transition and geometry of a self-interacting partially directed random walk

In this talk, we will consider a model for a 1+1 dimensional self-interacting and partially directed self-avoiding walk, usually referred to as IPDSAW. The IPDSAW is known to undergo a collapse transition at some critical temperature and had been studied until recently with combinatorics techniques exclusively. We will present here a new method that provides a probabilistic representation of the partition function and allows us to push forward the investigation of the model. For instance, we will provide the precise asymptotic of the free energy close to criticality and we will establish some path properties of the random walk inside the collapsed phase, that is we will show that the geometric conformation adopted by the polymer is made of a succession of long vertical stretches that attract each other to form a unique macroscopic bead, whose upper and lower envelopes, once properly rescalled, converge to a deterministice Wulff shape.

5.14 Contributed Talks N

Room 413

Marco Aymone, IMPA, Brazil

Partial sums of the random Möbius function

The Möbius function is the multiplicative function which at each prime equals to -1 and has support on the square free numbers. The asymptotic of the partial sums of the Möbius function is of extreme importance for the analytic number theory. For example, the Prime Number Theorem is equivalent to the fact that the asymptotic arithmetic mean value of the Möbius function equals to zero. Moreover, J.E. Littlewood provided a criterium for the validity of the Riemann hypothesis in terms of these partial sums. The random Möbius function is defined as follows: Its values at the primes are given by {-1,1} valued independent random variables and on the natural numbers is defined accordingly to the multiplicative rule of the Möbius function. In 1944 A. Wintner proved a theorem concerning the asymptotics of the partial sums of the random Möbius function in the case where the values on the primes are i.i.d. random variables with zero expectation. Later A. Wintner's theorem has received improvements by P. Erdos in 1961, by G. Halász in 1982. Y. Lau, G. Tenenbaum and J. Wu in 2013 showed that these partial sums have an asymptotics which resembles the law of iterated logarithm for sums of independent random variables. In 2012 K.Soundararajan and S.Chatterjee proved a Gaussian approximation to these partial sums restricted to short intervals. In my lecture I will present a series of new results for cases in which the values of the random Möbius function at the primes have negative expectation. Intuitively one would expect to maintain the J.E. Littlewood criterium for the validity of the Riemann hypothesis when these expectations are close to -1 and to extend A. Wintner's theorem when these expectations are close to zero. Our results show that this is almost correct guess. This is a joint work with Vladas Sidoravicius.

Nicholas Cook, UCLA, USA
Random regular digraphs: Singularity and discrepancy

We show that the adjacency matrix of a uniform random regular directed graph is invertible with high probability, assuming that the graph is dense. This is an important step toward proving that this random matrix ensemble lies in the circular law universality class. The main challenge is to overcome the dependencies among the matrix entries. Our approach makes use of local symmetries of the matrix distribution to ``inject" independent random variables into the problem. We also prove some discrepancy properties for the distribution of edges in the graph, which may be of independent interest.

Piotr Milos, University of Warsaw, Poland
Delocalisation of two-dimensional random surfaces with hard-core constraints

We study the fluctuations of random surfaces on a two-dimensional discrete torus. The random surfaces we consider are defined via a nearest-neighbour pair potential which we require to be twice continuously differentiable on an interval and infinity outside of this interval. No convexity assumption is made and we include the case of the so-called hammock potential, when the random surface is uniformly chosen from the set of all surfaces satisfying a Lipschitz constraint. Our main result is that these surfaces delocalise, having fluctuations whose variance is at least of order log n, where n is the side length of the torus. We also show that the expected maximum of such surfaces is of order at least log n. The main tool in our analysis is an adaptation to the lattice setting of an algorithm of Richthammer, who developed a variant of the Mermin-Wagner-type argument applicable to hard-core constraints. We rely also on the reflection positivity of the random surface model. The result answers a question mentioned by in a paper of Brascamp, Lieb and Lebowitz 1975 on the hammock potential.

Session 7

Friday, 10:15 - 11:45

5.15 Contributed Talks O

Room 412

Elena Pulvirenti, Leiden University, Netherlands
Phase transitions and coarse graining for a system of particles in the continuum

We consider a system of particles in R^d interacting via a reasonable potential with both long and short range contributions and prove rigorously the existence of a liquid-vapor branch in the phase diagram of fluids. The model we consider is a variant of the model introduced by Lebowitz, Mazel and Presutti (1999), obtained by adding a hard core interaction to the original Kac potential interaction, the first acting on a scale of order 1 with respect to the Kac parameter. We prove perturbatively that if the hard core radius R is sufficiently small, then the liquid-vapor phase transition proved for the LMP model is essentially unaffected. Hence, we prove existence of two different Gibbs measures corresponding to the two phases. This is a joint work with Errico Presutti and Dimitrios Tsagkarogiannis.

Benedetto Scoppola, Universita di Roma Tor Vergata, Italy
Sampling Gibbs measure with reversible and irreversible probabilistic cellular automata

In this talk we discuss a class of probabilistic cellular automata with the following features: 1) The stationary measure is close to the Gibbs Measure of the standard lattice spin systems 2) The resulting dynamics can be fully parallelized 3) The mixing time of such dynamics is under control, and it is polynomial in the volume also in the low temperature case. Joint work with Elisabetta Scoppola and Paolo Dai Pra.

Marielle Simon, Ecole Normale Superieure de Lyon, France
Macroscopic behavior for a chain of harmonic oscillators, perturbed by a degenerate stochastic noise

One unachieved goal of statistical mechanics is to derive the macroscopic evolution of energy from a microscopic dynamics given by a chain of coupled oscillators. This is expected to hold through a diffusive space-time scaling limit. Here we study the energy diffusion in the disordered harmonic chain of oscillators: the usual Hamiltonian dynamics is provided with random masses and perturbed by a degenerate energy conserving noise. After rescaling space and time diffusively, we prove that energy fluctuations evolve following an infinite dimensional linear stochastic differential equation driven by the linearized heat equation. We also give variational expressions for the thermal diffusivity and an equivalent definition through the Green-Kubo formula. Since the model is of non-gradient type, and the stochastic perturbation is very degenerate, the standard Varadhan's approach is reviewed under new perspectives.

5.16 Contributed Talks P

Room 413

Heinrich Matzinger, Georgia Tech, Atlanta, USA
Order of the fluctuation for the LCS and optimal alignments of binary sequences when the re-scaled expectation is not constant

We consider two independent binary random i.i.d. strings X = X1X2 . . .Xn and Y = Y1Y2Y3 . . . Yn both of length n. Let p denote the probability of the symbol 1 in the strings: p = P(X1 = 1) = P(Y1 = 1). Assume that for two values p1, p2 in (0,1), the limit of the rescaled optimal alignment score is not the same. For that situation we show that the order of the variance of the optimal alignment score of X and Y is linear in n for a subsequence of n and all p in a set of strictly positive measure. This disproves the Conjecture of Chvatal Sankoff that the variance of the LCS should be o(n^{2/3}). If we assume that a unique order which in linear in a power of n exists for the variance of the optimal alignment score, then our result implies that the order is linear in n. For Longest Common Subsequences (LCS) of random strings the same theorem holds.

Pierre-Yves Louis, University of Poitiers, France
Synchronization via interacting reinforcement

We consider a system of urns of Polya-type, with balls of two colors; the reinforce- ment of each urn depends both on the content of the same urn and on the average content of all urns. We show that the urns synchronize almost surely, in the sense that the fraction of balls of a given color converges almost surely, as the time goes to infinity, to the same limit for all urns. A normal approximation for a large number of urns is also obtained. Generalisations to other systems of interacting stochastic processes will be presented.

Vladislav Vysotsky, Arizona State University& St. Petersburg State University, USA
Statistics of gaps within the range of a one-dimensional random walk

Consider a one-dimensional centred random walk with a finite variance. We are interested in sparseness of its range, which we describe by the size of the largest gap (maximal spacing) within the range by the time n. Our main result is a limit theorem for this quantity. In addition, for integer-valued walks we obtain a similar statement on the number of non-visited sited within the convex hull of the range. The proofs are based on our results on the tail asymptotic for the hitting times of bounded intervals by random walks.

6. Posters

Ryosuke Ando, Toyota Transportation Research Institute, Japan
Possibility analysis of intelligent speed adaptation based on drivers' consciousness

Intelligent Speed Adaptation (ISA) is considered to be an effective measure to reduce the number of traffic accidents in the field of ITS (Intelligent Transportation Systems). There are three types ISA approaches: mandatory, voluntary and advisory. The mandatory type is the most effective one but is difficult to introduce because of too many obstacles. Comparatively, the advisory type seems to be the easiest one to introduce. On the other hand, its effects for the traffic safety are still doubted by many people. To make the possibility analysis, an experiment is conducted by using the driving simulator. 47 participants including 30 elder and 17 younger people are recruited. The experiment consists of four steps: without ISA, ISA using pictures, ISA using voices and again without ISA. The outputs obtained from the driving simulator are analyzed combined with the consciousness of the participants. The experiment shows that the ISA can improve recognition to speed limitation especially for people who have random rambling or look aside tendency. Furthermore, the ISA especially when using voices can contribute in changing the consciousness of people who are aggressive in driving. Their driving speeds can be reduced so that positive effects to traffic safety can be concluded. This result will be further analyzed and linked to make a proposal for introducing the ISA in Japan.

Corina Averbuj, Universidad Nacional de San Martín, Argentina
An optimal stopping jump diffusion problem with singular policies arising on option pricing when including transaction costs.

We consider the problem of pricing an option where the underlying asset price is represented by a jump diffusion process. It is assumed that we must pay transaction costs, which depends on the trading stocks. It is well know, that the market driven by Lévy processes with jump are typically incomplete, and perfect replication is no longer possible. We give a definition of option price by computing the maximum price at which a utility-maximizing investor would include the option in her potfolio. Computing the price involves solving a combination of stochastic control problems with singular policies and optimal stopping.

Gerardo Barrera Vargas, IMPA, Brazil
Cut-off phenomenon in diffusions Markov processes

We study the cut-off phenomenon for a family of an stochastic small perturbations of dynamical systems.We will focus in a semi-flow of a deterministic differential equation which is pertubed by an small pertubations of a Brownian motion. Under weaker hypothesis on the vector field we will prove that the family of the perturbed stochastic differential equations has cut-off phenomenon.

Karina Bindandi Emboaba de Oliveira, University of Sao Paulo, Brazil
An interacting particle system model for information diffusion on Zd

We consider an interacting particle system representing the spread of information by agents on the d-dimensional integer lattice. Each agent may be in any of the three states belonging to the set {0,1,2}. Here, 0 stands for ignorants, 1 for spreaders and 2 for stiflers. Moreover, the model that is considered has various contact interactions and we study what effect such interactions have on the spread of information. We discuss survival and coexistence results. This work is part of the Master dissertation of the author under the supervision of Prof. Dr. Pablo M. Rodríguez.

Rodrigo Bissacot, University of São Paulo, Brazil
Phase transitions in Ferromagnetic Ising models with magnetic fields

We study the nearest neighbor Ising model with ferromagnetic interactions in the presence of a space dependent magnetic field of type 1/|x|^{a}. We prove that in dimensions d = 2 for all ß large enough if a > 1 there is a phase transition while if a < 1 there is a unique DLR state. Jointly with Marzio Cassandro, Errico Presutti and Leandro Cioletti.

Tanguy Cabana, Collège de France, France
Large deviations and dynamics of large stochastic heterogeneous networks

We analyze the large deviations of randomly coupled neuronal networks for multi-populations networks with interaction delays. We show that the sequences of population empirical measures satisfy a large deviation principle, and converge towards a self-consistent non-Markovian process. We further show that these limit equations have Gaussian solutions whose mean and covariance satisfy a closed set of deterministic equations, and use this characterization to analyze the role of connectivity, delays and heterogeneities in neuronal networks, in particular in the emergence of synchronized oscillations.Joint work with Jonathan Touboul.

María Valeria Calandra, Universidad Nacional de La Plata, Argentina
Change-point model application to turbulent structures detection

The present work shows the application of a change-point model (CPM), based on the Cramer von Mises test, for the detection of turbulent structures in an airflow. Specifically it is the occurrence of vortices in the wake of an airfoil having a flow control device in its trailing edge. It seeks to compare the results obtained with conventional statistical methodologies employed in this type of analysis and the application of the wavelet transform with the change-point model. The main objective is to detect the characteristic frequencies of the turbulent structures immersed in the airflow. The results show good response of the CPM methodology in the analysis of these flows, comparatively we observed the same values obtained by the above methods. This work shows a new application of change-point models for detecting changes in a time-dependent random signal which has an unknown distribution a priori.

Carlos Alberto Cardozo Delgado, University of São Paulo, Brazil

The Feynmann integral: from heuristics ideas to rigorous definitions

The purpose in this poster is to indicate one of the approaches to the mathematically rigorous theory of the Feynmann integral which have arisen from the seminal paper, Spacetime approach to non relativistic quantum mechanics. Feynmann´s integral is defined with respect to pseudomeasure on the space of paths. Pseudomeasure are discussed, several integrals with respect to pseudomeasures are computed.

Alexis Carmona, Universidad de General Sarmiento, Argentina

Speed of convergence to fixation in two type population drift processes

We consider a variant of the Wright-Fisher process in which a sample of a population with two types of individuals is drawn at random without replacement. Another part of the population dies and the rest remains untouched. The sampled ones reproduce by clonation to replace the dead ones, thus restoring the population size. This scheme repeats defining a sequence of generations. In our biological application one type represents female cells that have their maternal X chromosome inactivated and the other type corresponds to paternal X inactivated. We deduce formulas for the equivalent of heterozygosity in this setting and for the expected time to fixation for the case of renewal of one cell at each step. Conclusions are drawn about the significance of drift in determining the skewness of the X inactivation pattern along a women’s life, which is of interest in haemophilia and other X-linked disorders. Joint work with Ana Laura Maffei and Tomás Tetzlaff.

Bruno Castro, University of São Paulo, Brazil

A model selection criterion for the segmentation of symbolic sequences using penalized maximum likelihood

The sequence segmentation problem aims to partition a sequence or a set of sequences into a finite number of segments as homogeneous as possible. In this work we consider the problem of segmenting a set of random sequences with values in a finite alphabet A into a finite number of independent blocks. We suppose also that we have m independent sequences of length n, constructed by the concatenation of s segments of lengthl. Besides we denote the real cut points by the vector and these points represent the change of segment. We propose to use a penalized maximum likelihood criterion to infer simultaneously the number of cut points and the position of each one those points. We also present a algorithm to sequence segmentation and we present some simulations to show how it works and its convergence speed. Our principal result is the proof of strong consistency of this estimators when m grows to infinity.

José Javier Cerda Hernández, University of São Paulo, Brazil
Critical region for an Ising model coupled to causal dynamical triangulations

We use the Fortuin-Kasteleyn (FK) representation of quantum Ising models via path integrals for determining a region in the quadrant of parameters ß, μ > 0 where the critical curve for the classical model can be located. This is done by outlining a region where the infinite- volume Gibbs measure exists and is unique and a region where the finite-volume Gibbs measure has no weak limit (in fact, does not exist if the volume is large enough).

Alejandra Christen, Pontificia Universidad Católica de Valparaiso, Chile
A stochastic disease transmission in an epidemic model with a linear incidence rate

A stochastic SI epidemic model is analyzed, which is based on the model proposed by Roberts and Saha (1999), considering a linear incidence rate. Assuming the proportion of population infected varies with time, a new model described by an ordinary differential equation is presented. Then, the asymptotic behavior of a stochastic fluctuation due to the environmental variation in the coefficient of disease transmission is studied. So, a stochastic differential equation is obtained, which is analysed through the associated Fokker- Planck equation to obtain the probability density function (its invariant probability distribution) when the proportion of the infected population reaches steady state. According to our knowledge this incidence rate has not been previously used for this type of epidemic models.

Jorge Clarke, Universidad del Bío-Bío, Chile
Wiener integrals with respect to the Hermite random field and applications to the wave equation.

The Hermite random field has been introduced as a limit of some weighted Hermite variations of the fractional Brownian sheet. In this work we define it as a multiple integral with respect to the standard Brownian sheet and introduce Wiener integrals with respect to it. As an application we study the wave equation driven by the Hermite sheet. We prove the existence of the solution and we study the regularity of its sample paths, the existence of the density and of its local times.

Cristina Costantini, Universita' di Chieti-Pescara, Italy

Viscosity solutions and uniqueness for martingale problems and martingale problems with boundary conditions

We intend to present two main results. The first result is that, in any complete and separable metric space, uniqueness of the solution of the martingale problem for a general operator A follows from the comparison principle between viscosity sub and supersolutions of the resolvent equation for A. Main applications of this result are to infinite dimensional martingale problems. The second result concerns stochastic processes that must satisfy some boundary conditions, typically reflecting diffusions. It turns out that in this case the appropriate martingale problem is the constrained martingale problem (a definition of martingale problem that includes local times on the boundary). Then it still holds that uniqueness of the solution of the constrained martingale problem follows from the comparison principle between viscosity sub and supersolutions of the resolvent equation with the corresponding boundary conditions. An example of application of this result is to diffusions with possibly tangential direction of reflection.

Hugo de la Cruz, Fundação Getulio Vargas, Brazil

A computational method for the simulation of first order semilinear stochastic partial differential equations

In this work we propose a method for the computer simulation of first order semilinear stochastic partial differential equations. Based on the stochastic characteristic method and the Local Linearization technique, we construct an efficient and stable method for integrating this equation. For this, a suitable exponential-based approximation to the solution of an associated auxiliary random integral equation, together with a Padé method with scaling and squaring strategy are conveniently combined. Results on the convergence and stability of the suggested method and details on its efficient implementation are discussed.(Joint work with C. Olivera, J. Zubelli).

Susana Frometa Fernandez, IMPA, Brazil

Scaling Limit for a truncated alpha-stable sandpile

We study the scaling limit of a truncated alpha-stable divisible sandpile, in which each site distributes its excess mass among the lattice with a truncated alpha-stable distribution.

Jan Martin Gairing, Humboldt Universität zu Berlin, Germany

Exponential growth rates and stability of Lévy systems: a Furstenberg-Khasminskii-type formula

Lyapunov exponents. In the case of a linear Stratonovich SDE driven by an m-dimensional Brownian motion the celebrated Furstenberg-Khasminskii formula relates the "time average" that describe the Lyapunov exponents to a "space average" over the unit sphere with respect to the ergodic measure of the dynamics of the projection. We derive a Furstenberg- Khasminskii-type formula in a linear Markovian context. The main object of study are linear SDE driven by a Lévy process. Solutions are discontinuous semi-martingales generalizing the Brownian SDE to jump process. We will consider the special case of the linear "Marcus" equation, which has the advantage that its solutions can be defined on manifolds and that it satisfies the Leibniz rule. We interpret the solutions as the linearization of a in general non-linear flow diffeomorphisms, generated by Marcus equations similar to the Brownian case. In particular stability properties with respect to initial conditions can be addressed via the method.

Máté Gerencsér, University of Edinburgh , UK

Accelerated finite difference schemes for SPDEs in Sobolev spaces

We consider parabolic, possibly degenerate stochastic partial differential equations in Sobolev spaces. We establish existence and uniqueness of solutions, and investigate the convergence of finite difference approximations. Expansion of the error up to arbitrary high order is obtained under some regularity conditions. The smoothness requirements become dimension-free for data satisfying certain growth conditions.

Victoria Halstensen, European University Institute, New York, USA

Dispersed information in FX trading - a martingale representation

Informational heterogeneity is an important feature of foreign exchange markets. Introducing dispersed information into a monetary exchange rate model results in price dynamics described by a jump diffusion. The presence of dispersed information in conjunction with news releases on macroeconomic conditions leads to time-coordinated expectation revisions that produce jumps in the exchange rate path. Employing newly developed statistical methods for disentangling jumps, I illustrate that jump activity is closely linked to news releases. This supports the notion that exchange rate jump activity arises as a consequence of expectation revisions from the arrival of new price relevant information.

Jeremie Houssineau, Heriot Watt University, UK
Representation of stochastic populations

The probabilistic representation of multiple individuals is usually achieved through collections of random variables or through point processes; the latter being related to indistinguishable populations while the former models distinct individuals. However, there is no consensus on the representation of partially indistinguishable populations, and yet, they are of considerable interest for the many applications that require the estimation of stochastic populations, such as bio-imaging, astronomy or defence. In this talk, we will take a constructive approach: starting from the definition of the concept of individual, we will go through the different kinds of indistinguishability that appear when considering populations and stochastic populations. Then, we will consider the issue of their probabilistic representation, for which a specific class of stochastic processes will be proved suitable. This class of stochastic processes is found to encompass both point processes and collections of random variables in a natural way. Finally, the impact of this work on the estimation of stochastic populations will be explained.

Lorick Huang, Paris Diderot, France
Density Bounds for some Degenerate Stable Driven SDEs

We consider a system of linear differential equations whose first entry is perturbed by an anisotropic non degenerate Stable noise. Assuming some continuity on the noise coefficient, and a Hörmander like condition that allows the propagation of the noise through the system, we prove the uniqueness to the martingale problem for the associated generator. Also, in the scalar case we establish density bounds reflecting the multi-scale behavior of the process.

Jose Islas, University of North Texas, USA
Stopping near the top of a random walk

This talk discusses the problem of maximizing the probability of stopping with one of the two highest values in a Bernoulli random walk with arbitrary parameter p and finite time horizon n. The optimal strategy (continue or stop) depends on a sequence of threshold values (critical probabilities p_n) which has an intriguing oscillating pattern. Several properties of this sequence were proven and others conjectured in a 2010 paper by P. Allaart. This talk will discuss recent progress toward proving the conjectures.

Georgy Ivanov,University of Bergen, Norway
Stochastic flows of SLE type

We use general Loewner theory to define general slit Loewner chains in the unit disk, which in the stochastic case lead to slit holomorphic stochastic flows. Radial, chordal and dipolar SLE are classical examples of such flows. Our approach, however, allows to construct new processes of SLE type, for which a version of conformal invariance and the domain Markov property can be formulated. The local behavior of these processes is similar to that of classical SLE.

Jean-François Jabir, CIMFAV, Chile

Langevin models with specular boundary conditions

We present recent studies on the existence and uniqueness of a class of Langevin models endowing a nonlinear (in the sense of McKean) drift component and submitted to a specular boundary condition. This boundary condition, introduced in the fields of gas dynamics, models the interaction between the particle driven by the Langevin model and a totally elastic wall. The resulting Langevin dynamics yield to a singular stochastic differential equation for which existence of solutions is subject to a-priori estimates on the attaining time of the particle at the wall or a-priori estimates on the law of the solution. After a brief exposition of the particular interest for this type of model in the field of fluid mechanics, we will present wellposedness results obtained in the particular situation where the particle are confined within the upper-half plane and the situation of more general manifolds (the latter situation requiring a strong combination stochastic analysis and pde point of view). This is a joint with Mireille BOSSY, EPI TOSCA, INRIA Sophia-Antipolis Méditérrannée.

Kai Li, Uppsala University, Sweden

Gaussian mixture approximations to nonlinear stochastic filtering problem

Stochastic filtering is defined as the estimation of a dynamical system whose trajectory is modelled by a stochastic process (called the signal), given the information accumulated from its partial observation. The applications of stochastic filtering are numerous and include the control of engineering systems, data assimilation, volatility estimation in financial markets, computer vision and vehicle tracking. The solution of the filtering problem is a measure-valued stochastic process, which satisfies a certain type of stochastic partial differential equation (the Kushner-Stratonovich equation). A massive scientific and computational effort has been dedicated for the development of numerical methods for approximating the solution of the nonlinear filtering problem. Gaussian mixture approximations can be viewed as a generalisation of the standard particle filtering method in the sense that the Dirac measures are replaced by Gaussian measures in the construction of the approximation. Approximating with Gaussian mixtures has been very popular since the 1970s, however the existing work is only based on the success of the numerical implementation and is not theoretically justified. We fill this gap and conduct a rigorous analysis of the approximation of the solution of the filtering problem using mixtures of weighted Gaussian measures. In particular, we construct the corresponding approximating algorithm, deduce the L2-convergence rate and prove a central limit type theorem for the approximating system. In addition, we show a numerical example to illustrate some advantages of this algorithm. This is joint work with Dan Crisan.

Sooie-Hoe Loke, Oregon State University, USA
Dual risk model with risky investment

We consider the surplus process of a company which incurs expenses at a constant rate and earns random positive gains at random times. We assume that surplus is invested in a risky asset following a Geometric Brownian motion. We show that the ruin probability satisfies an integro-differential equation. When the volatility is large, the ruin probability is equal to one. In the case of exponentially-sized gains, the ruin probability has an algebraic decay when the volatility is small.

Sergio Lopez, UFRJ, Brazil
Large deviations for proportional fairness allocations

We study the large deviations behavior of the stationary measure of bandwidth-sharing networks functioning under the Proportional fair allocation. We prove that Proportional fair and an associated reversible allocation are geometrically ergodic and have the same large deviations characteristics using Lyapunov functions and martingale arguments. These results comfort the intuition that Proportional fairness is 'close' to allocations of service being insensitive to the service time requirement.

James MacLaurin, INRIA, Sophia Antipolis, France
Large Deviations of a spatially-ergodic neural network with Hebbian learning

In the modeling of neural networks, there is a great need to bridge scales from the scale of individual neurons and synapses to the scale of large networks of interacting neurons, particularly with the current emphasis on large-scale simulation. The efficacy of large-scale 'neural-field' or 'mean-field' models has been demonstrated empirically through their success in explaining phenomena such as geometric visual hallucinations, wave propagation in cortical slices or motion perception. Such large-scale models are usually derived by assuming that the neurons are subject to independent external stochastic noise, and that they interact only through the empirical measure (that is uniformly - also known as 'weak' interaction). In this work we derive the large-scale model and obtain a Large Deviations principle under a more general set of assumptions: by assuming that the stochastic noise is correlated and spatially ergodic, that the neurons interact ergodically, and that the strength of the connections evolves in response to the past-history of the neuronal activity (known as Hebbian learning). We consider the neurons to be indexed by Z^d (for some positive integer d). The stochastic noise (W^j) (j in Z^d) satisfies an infinite-dimensional stochastic differential equation (in the manner of the text by Da Prato and Zabczyk). It is spatially-ergodic, meaning that the probability law governing the noise is invariant under shifts of the lattice. We define an 'ergodic empirical measure' (mu^n) generated by (W^j), for j in the cube [-n,n]^d, and denote the probability law governing mu^n by P^n. We determine a Large Deviations Principle governing the (P^n) as n asymptotes to infinity. Next we prove a Large Deviations Principle for the neuronal model, as governed by variables (X^j), j in Z^d. The neurons interact in a Hebbian-manner, which is to say that the connection strength between two neurons evolves over time in response to both of their internal dynamics. We let Lambda_0(j,k) be the initial connection strength between the neurons and assume initial shift-invariance, that is for any l in Z^d, Lambda_0(j+l,k+l) = Lambda_0(j,k). The neurons then satisfy an infinite-dimensional stochastic differential equation: containing a term due to the internal dynamics, a nonlinear interaction term of the above form, and a stochastic integral due to the external noise. We prove a Large Deviations Principle for the law governing the ergodic empirical measure of the neuronal state variables. We note finally that this work would be of use in other areas containing models of interacting particle systems, such as mathematical finance.

Hilmar Mai, WIAS Berlin, Germany
Pathwise stability of likelihood estimators for diffusions via rough paths

We consider the estimation problem of an unknown drift parameter within classes of non-degenerate diffusion processes. The Maximum Likelihood Estimator (MLE) is analyzed with regard to its pathwise stability properties and robustness towards misspecification in volatility and even the very nature of noise. We construct a version of the estimator based on rough integrals (in the sense of T. Lyons) and present strong evidence that this construction resolves a number of stability issues inherent to the standard MLEs. We will also discuss some numerical examples to demonstrate the relevance of our results in a finite sample setting.

Raimondas Malukas, Vilnius University Institute of Mathematics and Informatics, Lithuania
A clt for a weighted power variation of a Gaussian process

We introduce a class of Gaussian processes over time interval [0,T] which need not have stationary increments but their incremental variance is close to the values of some single variable function f uniformly in some region. For a Gaussian processes G from this class we consider a power variation corresponding to a regular partition of [0,T] and weighted by values of f. Under suitable hypotheses on G it is proved that a central limit theorem holds for the weighted power variation as the mesh of the partition approaches zero. The proof is based on a general central limit theorem for random variables which admit a Wiener chaos representation. The present result extends the central limit theorem for a power variation of a class of Gaussian processes with stationary increments as well as for a bifractional Gaussian process and a subfractional Gaussian process. Joint work with R. Norvaisa.

Shuhei Mano, Institute of Statistical Mathematics, Japan
Ordered sizes in the Gibbs-type exchangeable random partitions

Gibbs-type exchangeable random partitions, which is a class of multiplicative measures on the set of positive integer partitions, appear in various contexts including statistics, random combinatorial structures, and stochastic modeling of diversity in many phenomena. Some explicit distributional results on the ordered sizes in the Gibbs partition are established by introducing associated partial Bell polynomials and analysis of the generating functions. The analytic combinatorial approach is general enough to apply any Gibbs partitions. As an example, the approach is applyied to derive explicit results on asymptotic behavior of extreme sizes in the Ewens-Pitman partition, which has been discussed from rather model-specific viewpoints, or the Poisson-Dirichlet process.

Rafael Mazzei, University of São Paulo, Brazil
Smile Effect in a Stochastic Volatility Model

One of the hypothesis of the Black-Scholes model is to assume that the volatility of the underlying asset is constant. However, deviations were observed between market prices and the prices provided by the B-S formula. One of these deviations iscalled smile effect, which is obtained from the empirical observation that the implied volatility of a number of options with the same maturity and different strike prices, ranges, describing an U-shape form. In order to minimize deviations, some authors have proposed models where volatility has a stochastic dynamics, in particular, in this work we study the classical Hull-White model. The aim of this work is to use the Hull-White model to get the smile effect generated by Vale PNA call options, as well as analyze and adjust the parameters of the model. For this, we first study the theory of stochastic processes, Ito's integral and stochastic differential equations.

Takuya Ohwa, National Institute of Informatics, Japan
Exact computation for cover times and infected times of random walks on graphs

We consider a single random walk or multiple random walks on graphs. The cover time is the first time that a particle visits every vertex of a graph. The infected time is the first time that infected one particle meets any other particles. We give a representation theorem for the cover time and infected time and obtain exact distributions and expectations by using the theorem.

Takashi Owada,Technion, Israel

Maxima of long memory stationary α-stable processes

We derive a functional limit theorem for the partial maxima process based on a long memory stationary α-stable process. The length of memory in the stable process is parametrized by a certain ergodic-theoretical parameter in an integral representation of the process. The limiting process is no longer a classical extremal Frechet process. It is a self-similar process with α-Frechet marginals, and it has stationary max-increments, a property which we introduce in this paper. The functional limit theorem is established in the space D[0, infty) equipped with the Skorohod M1-topology; in certain special cases the topology can be strengthened to the Skorohod J_1-topology.

Douglas Pinto,University of São Paulo, Brazil

Stochastic jump process with memory of variable length

Stochastic chains with memory of variable length were introduced by Rissanen (1983) and are currently an important subject of research due to its applications in various fields such as linguistics, genetics and neuroscience, for example. Let a jump process with memory of variable length, our main objective is to study the behavior of the process and propose estimators for the process parameters such as the rate of jump and the contexts tree associated with the process.

Gianpaolo Pulcini, National Research Council (CNR), Italy

Optimal burn-in based on process history

In this paper, we study an application of stochastic process theory to a technological problem. Burn-in is a method of preventing initial failures of technological items in field usage by eliminating weak items in the population. In this paper, we propose a new burn-in procedure which utilizes the information on 'partial' or 'full' history of a stochastic process. The wear process of the technological items is modelled by a continuous stochastic process. The population is assumed to be the mixture of weak and strong subpopulations. The wear process is observed for a fixed time and, based on this observation, the items which are believed to be weak items are eliminated.

Rodrigo Ribeiro, Universidad Federal de Minas Gerais, Brazil

The power of choice combined with preferential attachment

We present an almost sure convergence of the maximum degree in an random graph model that combines local choice and preferential attachment. The proof is based in showing the random tree has a persistent hub and can be found in "The power of choice combined with preferential attachment" of Yuri Malishkin and Elliot Paquette.

Laura Sacerdote, University of Torino, Italy
Detachment in the Yule model for network growth

Popular models of network growth include Simon, Yule and Barabási-Albert models. Their relationships are clarified here in order to generalize their definitions including the possibility of detachment. The scale free property of their characterizing distributions is investigated and compared with analogous results for the original models. Our intention is to justify network features through closed form formulas.Joint work with P. Lansky, F. Polito

Reni Sagayaraj, Sacred Heart College, Tirupattur, India
A Study On Random Evolutionary Approach in Jump -Diffusion Models of Financial Market

Trading is a continuous time and to examine the situation where asset price motions are driven by a Wiener process rather than by a discrete time model. The idea is that at each instant we can look at the Wiener process Wt and study its change dWt at that instant, which intuitively can be thought of as moving slightly up or down with equal probability. One of the momentous equations in financial mathematics is the Black-Scholes equation, a partial differential equation that governs the value of financial derivatives, such as options. In this paper, we attempt to show the application of Stochastic Process. We have shown how geometric Brownian motion and Ito’s Lemma overlaps on Option Pricing.

Raul Salgado-Garcia, Universidad Autónoma del Estado de Morelos, Mexico
Symbolic Complexity for Nucleotide Sequences: A Sign of the Genome Structure

We introduce a method to estimate the complexity function of symbolic dynamical systems from a finite sequence of symbols. We test such complexity estimator on several symbolic dynamical systems whose complexity functions are known exactly. We use this technique to estimate the complexity function for genomes of several organisms under the assumption that a genome is a sequence produced by a (unknown) dynamical system. We show that the genome of several organisms share the property that their complexity functions behaves exponentially for small words ($0 = l = 10$) and linearly (for words-lengths in the range $10 < l = 50$). It is also found that the species which are phylogenetically close each other have similar complexity functions calculated from a sample of their corresponding coding regions.

David Sanders, UNAM, Mexico

Efficient algorithms for the Lorentz mirror model

The Lorentz mirror model (or Lorentz lattice gas) is one of the simplest models of dynamics in a random environment: mirrors are placed at the vertices of a square lattice with random orientations at 45 degrees (left or right), giving a fixed (quenched) random environment. A particle or laser is projected from an initial site with an initial direction, and the question is if the particle's trajectory is periodic or if it leaves any finite set and reaches infinity. We present some efficient algorithms, numerical results and heuristic arguments.

Istoni Sant'Ana, University of Granada, Spain

A doble-Hubbert diffusion process

A problem of great current interest is to chart accurately the progress of oil production. It is well known that oil exploration is conducted in cycle and, in fact, after the oil production reaches its peak in a specific system, a decline will begin. In this work, we propose a stochastic model, based on the theory of diffusion process, associated with a doble-Hubbert curve. With this model in mind, we intend to give a probabilistic treatment to the doble cycle oil production, including the forecasting of its peak and peak-time. After building the model, comprehensive study is presented, including its main characteristics and a simulation of sample paths. With the aim of applying this model to real-life situations, and given its possibilities in forecasting via the mean function, discrete sampling based inference is developed. The possibilities of the new process are illustrated by means of an application to real data.

Dialid Santiago, University of Warwick, USA

Non-linear Markov processes: existence, uniqueness and properties

Roughly speaking, a non-linear stochastic processes is a stochastic process whose evolution depends on at least one expectation value of the process. This class of stochastic processes can be found in many applications in finance, economics, physics, life sciences, among other areas. They were introduced by H. P. McKean in two seminal papers in the late 60’s. In these papers he made the fruitful observation that the familiar connection between linear parabolic equations and Markov processes with constant transition mechanisms could be extended to nonlinear parabolic equations and a wider class of Markov processes. After that, non-linear Markov processes have been studied in different contexts and using different approaches. The aim of this poster is to present an introduction to this class of processes focusing on different methods to prove their existence. Finally, we present a new result on the existence of a certain family of non-linear diffusions with unbounded coefficients.

Illia Simonov, University of Leoben, Austria
SPDE's with infinity copula

Our motivation to investigate high dimensional copulas comes from the aim to simulate the solution process of a Stochastic Partial Differential equation. This is usually done by projecting the infinite dimensional solution of an SPDE to a finite, but high dimensional subspace. The result is a finite, but high dimensional problem, which has to be solved. In particular, a finite, but high dimensional, random variable described by the corresponding copula and the marginal distributions has to be generated.High dimensional copulas may appear also in other setting. Let us consider a financial model with n traders dealing with shares, where each trader is communicating with the others. These traders discuss their plans within the whole community, their decisions depend on the decisions of the others. E.g. if one decides to sell a huge amount of shares, other will follow him. This herd behavior can be modeled by an n-dimensional multivariate Gumbel copula. As a result one has a high dimensional random variable given by a n-copula, where n may be quite high.Now, imagine that some of this traders are close friends. Moreover, these traders can be spread over a larger region, such that communication is not that simple. Here, the dependence is not fully symmetric, some traders will have a larger influence, the decisions of some close friends will have a stronger impact on their friends than on other traders. This can be modeled by vine copula, where the pairs are modeled by a Gumbel copula. The parameter depends on the relationship - for close friends will be high, traders who do not know each other will be modeled acting independently.To treat models with high n, one needs bounds on estimates independent on n. One way of treating this type of problems is to introduce infinity dimensional copulas and treat the n-dimensional copulas as projection of the infinite dimensional copula on a finite dimensional basis.

Emilie Soret, Inria Lille Nord Europe- Université Lille1, France
High energy particle in a time-dependent random potential

The aim of this work is to study the behavior of a Markov chain which describe the kinetic energy of a particle evolving in random force field. This random force field is induced by a potential smooth in time and space and compact support in space. The randomness come from the center of the scattering events and from coupling constants and initial phase associated to each scattering event. This is a joint work with Stephan De Bièvre, (University Lille 1, France).

Peter Spreij, Universiteit van Amsterdam, Netherlands
Limit theorems for reflected Ornstein–Uhlenbeck processes

This paper studies one-dimensional Ornstein–Uhlenbeck (OU) processes, with the distinguishing feature that they are reflected on a single boundary (put at level 0) or two boundaries (put at levels 0 and $d > 0$). They are referred to as reflected OU (ROU) and doubly reflected OU (DROU), respectively. For both cases, we explicitly determine the decay rates of the (transient) probability to reach a given extreme level. The methodology relies on sample-path large deviations, so that we also identify the associated most likely paths. For DROU, we also consider the ‘idleness process’ L and the ‘loss process’ U, which are the minimal non-decreasing processes, which make the OU process remain nonnegative and not exceeding d, respectively. We derive central limit theorems for U and L, using techniques from stochastic integration and the martingale CLT. (joint work with Gang Huang and Michel Mandjes)

Lucas Martins Stolerman, IMPA, Brazil

The spreading of an epidemic over a city : A model on networks

We present the SIRNetwork to describe the dinamics of an epidemic in a city divided into different neighborhoods. The equations are inspired by the famous SIR model, by Kermack and Mc Kendric (1927). More especically the dierent vertex of the network corresponds to the neighbourhoods of a city. People move between any two of these neigbourhoods, going from home to work and them backing home. The edges represent the flux of people between these two vertex. Some analitical properties are derived for the SIRNetwork model in order to establish conditions for occurrence of an epidemic due to the introduction of an infected individuals in a disease free population. As an application, we try to estimate the epidemiological parameters of Dengue Fever in dierent neigbourhoods of Rio de Janeiro by modelling the epidemic outbreak of Dengue in the city in 2008.This work is joint with Stefanella Boatto and Daniel Coombs.

Kenkichi Tsunoda, University of Tokyo, Japan

Large deviation principle from a hydrodynamic limit for an asymptotically degenerate particle system

Goncalves et al. considered a certain class of particle systems which derive the porous medium equation as a consequence of a hydrodynamic limit. Since the porous medium equation is degenerate, the equation looses its parabolic character. From this fact, the analysis of the macroscopic equation and the microscopic particle system becomes difficult. In this poster, we report on the large deviation principle from the hydrodynamic limit derived in their paper.

Cristel Ecaterin Vera Tapia, USP, Brazil

Binary branching processes with applications in biology

In this work we discuss three recent applications of binary branching processes to the study of biological problems. The first one by Schinazi (2006), evaluate the risk of drug resistance during a induced treatment, the interest is to compute the probability of pathogen eradication before drug resistance appears. The second model by Bozic et al. (2010) calcule the number of passenger mutations in a tumor that has accumulate a certain number of driver mutations. Finally, we consider a model also by Bozic et al. (2013), which describes the dynamics of cancer progression in response to a specific combination therapy. We review the mathematical formulation of these models, the main results and further modifications. This work is part of the Master dissertation of the author under the supervision of Prof. Pablo Rodriguez.

Roberto Vila Gabriel, University ofBrasília, Brazil

Duplicate Ising model

In this work we use a graphical representation of the Ising model with non-uniform field to obtain a characterization of percolation and the uniqueness of DLR measures. As is already known for Ising models with non-zero uniform field, by an application of the Lee - Yang theorem, one can prove the non- existence of phase transition. In contrast, for Ising models with zero field it is known that phase transition exists, by an argument due to Peierls. In one of references, dating from 2009, first order phase transition is characterized for Ising models with non- uniform summable fields, as well as the absence of phase transition for the Ising model with uniformly bounded fields. Already in the recent literature we find a characterization of Ising models with spatially dependent magnetic fields, which guarantees phase transition for certain values depending on the the field. Our study is useful in the sense that one can characterize the uniqueness of DLR measures at lower temperatures, using graphical representations of the Ising model associated with spatially dependent magnetic fields, following the approaches of L. Chayes, J. Matcha and O. Redner.

Javier Villarroel, University of Salamanca, Spain

Levy processes with resets

We consider a general Levy process on which an independent reset mechanism operates. At reset times the process is restarted to a fixed given state. When resets follow a renewal process we show how to determine the main statistics of the Levy process with resets.