RANDOM MEDIA IN ATACAMA

MONDAY

- 9:00-9:30: *Registration*
- 9:30-10:30: Ferrari
- 10:30-11:00: *Break*
- 11:00-12:00: Gantert
- 12:00-13:00: Loukianova
- 13:00-14:30: *Lunch*
- 14:30-15:30: Ramírez
- 15:30-16:00: *Break*
- 16:00-17:00: Simenhaus

TUESDAY

- 9:00-10:00: Fukushima
- 10:00-10:30: *Break*
- 10:30-11:30: Giacomin
- 11:30-12:30: Klein
- 12:30-14:00: *Lunch*
- 14:00-15:00: Popov
- 15:00-15:30: *Break*
- 15:30-16:30: Zeitouni
- 16:30-17:30: Cortines

WEDNESDAY: Free

THURSDAY

- 9:00-10:00: Cranston
- 10:00-10:30: *Break*
- 10:30-11:30: Khanin
- 11:30-12:30: Nguyen
- 12:30-14:30: *Lunch*
- 14:30-15:30: Lacoin
- 15:30-16:00: *Break*
- 16:00-17:00: Ben Arous

FRIDAY

- 9:00-10:00: Menshikov
- 10:00-10:30: *Break*
- 10:30-11:30: Pardoux
- 11:30-12:30: Toninelli
- 12:30-14:30: *Lunch*

Gérard Ben Arous (NYU)

TBA

TBA

Aser Cortines (Technion)

Extremal level sets of the branching Brownian motion

It is well known that the distribution of extreme values of branching Brownian motion can be characterized in the limit as a PPP with i.i.d. decorations. The points of this PPP capture local extreme maxima, while the decorations describe the configuration of particles around them. In this work we give more refined statements about the structure of level sets of such extreme values. Among the results in the paper is the asymptotic density of extreme values at a given distance from the maximum, the height distribution of local maxima whose clusters form a given level set and the upper tail of the distribution of the distance between the two highest particles.

Mike Cranston (UC-Irvine)

A Solvable Homopolymer Model

With the reference measure P^x induced by Brownian motion on $\mathbb{R}^3$ starting at 0 we wish to define, for $\gamma \in \mathbb{R}$, the Gibbs probability measure $\overline{P}^x_{\gamma,t}$ with density with respect to P^0 heuristically given by

$$\frac{d\overline{P}^x_{\gamma,t}}{dP^x} = Z^{-1}_{\gamma,t} e^{\gamma \int_0^t \delta_0(\omega_s) ds}$$

where $Z_{\gamma,t} = E^x[e^{\gamma \int_0^t \delta_0(\omega_s) ds}]$. We achieve this using a one parameter family of self-adjoint extensions of the Laplacian on $C_c(\mathbb{R}^3 - \{0\})$. This Gibbs probability measure provides a simple continuum model for a homopolymer with an attractive potential at the origin. In this talk we give a comprehensive study of the behavior of paths with respect to these Gibbs measures. In particular, there is a phase transition in the behavior of these paths from diffusive behavior for 0 to positive recurrent behavior for $\gamma > 0$. The critical value is determined by means of the spectral properties of the operator H, the self-adjoint extension of the Laplacian on $C_c(\mathbb{R}^3 - \{0\})$ corresponding to the parameter value γ. This corresponds to a transition from a diffusive or stretched out phase to a globular phase for the polymer. We consider various quantities associated to the paths and examine their behavior near the critical point. We also draw comparisons to a similar model on $\mathbb{Z}^3$ previously studied by the authors. The

program can also be carried out for stable processes in low dimensions. This talk is based on joint work with L. Koralov, S. Molchanov, N. Squartini and B. Vainberg.

Pablo Ferrari (Universidad de Buenos Aires)

Ergodic invariant measures for the Box Ball Automaton

The BBA has been introduced by Takahashi and Tatsuma in 1990 as a discrete analog of the KdV differential equation which has many soliton solutions. A carrier with infinite capacity travels from left to right along boxes located at the integers. Each box may contain one ball or be empty. The carrier picks balls from occupied boxes and leaves carried balls at empty sites. If the initial configuration of balls has density less than 1/2, the automaton is well defined in Z. The product measure at any density less than 1/2 is invariant. The automaton has many conserved quantities and (nonproduct) invariant measures. We describe the set of spatially ergodic invariant measures for the BBA. Work in collaboration with Chi Nguyen, Leonardo Rolla and Minmin Wang.

Ryoki Fukushima (University of Kyoto)

Slowdown estimates for the biased random walk in spatially inhomogeneous holding time

We consider a biased random walk on integers whose jump rate varies on its position. The reciprocal of rates (=the mean holding times) are assumed to be independent and identically distributed random variables with stretched exponential tail. One can easily show the law of large numbers with positive speed and also large deviation principle is known as a special case of the result by Dembo-Gantert-Zeitouni 2004. But the rate function is zero between the origin and the asymptotic speed and the behavior of the "slowdown probability" is of interest. We determined the precise decay rate in both quenched and annealed setting. This talk is based on a joint work with Naoki Kubota.

Nina Gantert (Technische Universitt Mnchen)

The velocity of biased Mott random walk

Mott variable range hopping is a fundamental mechanism for low temperature electron conduction in disordered solids in the regime of Anderson localization. In a mean field approximation, it reduces to a random walk (shortly, Mott random walk) on a random marked point process with possible long range

jumps. We consider here the one dimensional Mott random walk and we add an external field (or a bias to the right). We show that the bias makes the walk transient, and investigate its linear speed. Our main results are conditions for ballisticity (positive linear speed) and for subballisticity (zero linear speed). In the ballistic regime, we prove the existence of an invariant distribution for the environment viewed from the walker, which is mutually absolutely continuous with respect to the original law of the environment. If the point process is a renewal process, the aforementioned conditions result in a sharp criterion for ballisticity. Interestingly, the speed is not always continuous as a function of the bias. The talk is based on joint work with Alessandra Faggionato and Michele Salvi.

Giambattista Giacomin (Université Paris Diderot)

Singular behavior of the Lyapunov exponent of a product of random matrices arising in statistical mechanics of disordered systems

The talk will focus on a product of two by two random matrices that comes up in the analysis of certain one and two dimensional disordered systems. I will discuss the origin of this question and the nature of the singularity that appears at a specific value of a natural parameter. I will then present a mathematical analysis of this singularity, providing thus a proof of a sharp prediction set forth B. Derrida and H. J. Hilhorst in 1983. Derrida and Hilhorst approach is based on a two scale analysis that leads to a probability that is expected to be close to the invariant probability of the projective sphere Markov chain associated to the random matrix product. We introduce suitable norms and exploit contractivity properties to show that such a probability is indeed close to the invariant one in a sense which implies the desired control on the Lyapunov exponent.

Konstantin Khanin (University of Toronto)

On renormalization and KPZ problem

We shall discuss two different approaches to the problem of universality of the KPZ phenomenon. These approaches are based on two different renormalization schemes which we shall present in the talk.

Abel Klein (UC-Irvine)

An eigensystem approach to Anderson localization

We introduce a new approach for proving localization (pure point spectrum with exponentially decaying eigenfunctions, dynamical localization) for the Anderson model, the most studied random Schrodinger operator. In contrast to the usual strategy, we do not study finite volume Green's functions. Instead, we perform a multiscale analysis based on finite volume eigensystems (eigenvalues and eigenfunctions). Information about eigensystems at a given scale is used to derive information about eigensystems at larger scales. This eigensystem multiscale analysis treats all energies of the finite volume operator at the same time, establishing level spacing and localization of eigenfunctions in a fixed box with high probability. A new feature is the labeling of the eigenvalues and eigenfunctions by the sites of the box. (Joint work with A. Elgart)

Hubert Lacoin (IMPA)

Disorder relevance without Harris Criterion: the case of pinning model with stable environment

We investigate disorder relevance for the pinning of a renewal whose interarrival law has tail exponent $\alpha > 0$ when the law of the random environmeint in the domain of attraction of a stable law with parameter $\gamma \in (1, 2)$. We prove that in this case, the effect of disorder is not decided by the sign of the specific heat exponent as predicted by Harris criterion but that a new criterion emerges to decide disorder relevance. More precisely we show that when $\alpha > 1\gamma^1$ there is a shift of the critical point at every temperature whereas when $\alpha > 1\gamma^1$ at high temperature the quenched and annealed critical point coincide, and the critical exponents are identical.

Joint work with Julien Sohier (Université Paris-Est, Créteil)

Dasha Loukianova (Université d'Évry)

Statistical Inference for a random walk in a random environment

Statistical Inference for a random walk in a random environment In this talk we present an overview of recent results on Statistical Inference for Random Walks in Random Environment. This subject was motivated by the works of biophysicists about the modeling of the DNA unzipping experiment. We first focus on the parametric estimation of the law of the environment. In the ballistic and sub-ballistic regime we cast the problem into one of the estimation

for a Branching process in random environment [1], [2], and show how this problem is related to the one of parameter estimation in a hidden Markov model (HMM) [3]. In the recurrent regime we insist on the use of results about weak convergence of local times [4]. Finally we mention a very recent work about non parametric estimation for RWRE [5].

References

[1] Comets, F., Falconnet, M., Loukianov, O., Loukianova, D., and Matias, C.; *Maximum likelihood estimator consistency for ballistic random walk in a parametric random environment* Stochastic Processes and Applications, 1, pp.268-288, vol.124, 2014

[2] Falconnet, M., Gloter, A., Loukianova, D.; *Estimation in the context of sub-ballistic random walk in a parametric random environment*; Mathematical Methods of Statistics, Jan.2014, Vol.23, Iss.1, pp1-19

[3] Andreoletti, P., Loukianova, D., Matias, C.; *Hidden Markov model for parameter estimation of a random walk in a Markov environment*; ESAIM:PS, Volume 19, 2015, p.605-625.

[4] Gantert, N., Peres, Y., Shi, Z. ;*The infinite valley for a recurrent random walk in random environment* Annales de l'Institut Henri Poincaré Probabilités et Statistiques, n 2, pp.525–536, vol.46, 2010

[5] Diel, R.,Lerasle, M.; *Non Parametric estimation for random walks in random environment*, preprint.

Mikhail Menshikov (Durham University UK)

Heavy-tailed random walks on complexes of half-lines

We study a random walk on a complex of finitely many half-lines joined at a common origin; jumps are heavy-tailed and of two types, either one-sided (towards the origin) or two-sided (symmetric). Transmission between half- lines via the origin is governed by an irreducible Markov transition matrix, with associated stationary distributions. We give a complete Recurrence classification for this general case. In the case of two half-lines, the model fits naturally on R and is a version of the oscillating random walk of Kemperman. For the general model, we also show existence and non-existence of polynomial moments of return times. Our moments results are sharp (and new) for several cases of the oscillating random walk; they are apparently even new for the case of a homogeneous random walk on R with symmetric increments of tail exponent.

Vu-Lan Nguyen (Harvard)

End point localization in log gamma polymer model

As a general fact, directed polymers in random environment are localized in the socalled strong disorder phase. In this talk, based on a joint work with

Francis Comets, we will consider the exctly solvable model with loggamma environment, introduced recently by Seppalainen. For the stationary model and the pointtoline version, the localization can be expressed as the trapping of the endpoint in a potential given by an independent random walk.

Étienne Pardoux (Université Aix Marseille)

Random evolution of a population in a changing environment

We consider a model of the evolution of a population, whose fitness, in the absence of mutations, degradates continuously, due to a constant modification of the ecological conditions (e.g. global warming). We superimpose mutations, which arise according to a Poisson random measure, and get fixed according to a probability which depends upon how much the proposed mutation will improve the fitness. We neglect the time taken for fixation of mutations, and assume that the population is constantly monomorphic. This leads us to consider an SDE driven by a Poisson Point Process, either in dimension 1 or in dimension 2. We study the large time behaviour of the Markov solution of that equation (i.e. its transience/recurrence property). We also study the asymptotic of small/frequent mutations. This is joint work with Elma Nassar and Michael Kopp.

Sergei Popov (Campinas)

Two-dimensional random interlacements and late points for random walks

We define the model of two-dimensional random interlacements using simple random walk trajectories conditioned on never hitting the origin, and then obtain some properties of this model. Also, for random walk on a large torus conditioned on not hitting the origin up to some time proportional to the mean cover time, we show that the law of the vacant set around the origin is close to that of random interlacements at the corresponding level. Thus, this new model provides a way to understand the structure of the set of late points of the covering process from a microscopic point of view. Also, we briefly discuss a continuous version of the model. This is a joint work with Francis Comets and Marina Vachkovskaia.

Alejandro Ramírez (PUC-Chile)

Asymptotic expansions for ballistic random walk in random environment at low disorder

We consider a random walk whose jump probabilities are i.i.d. perturbations of those of a random walk with deterministic and homogeneous jump probabilities in the hipercubic lattice $\mathbb{Z}^d$ for dimensions $d \geq 2$. We establish an asymptotic expansion in for the invariant measure of the environmental process whenever a ballisticity condition is satisfied, and under the condition that the perturbation is linear in the expansion parameter. We show how to derive Sabots expansion for the velocity and to what extent one can still obtain expansions when the perturbation is not linear in the expansion parameter. This talk is based on joint works with David Campos, Clément Laurent, Christophe Sabot and Santiago Saglietti.

François Simenhaus (Université Paris Dauphine)

Random walk in dynamics random environments (interchange process)

We consider the following dynamics random environment on $\mathbb{Z}^d$:

- we start from an i.i.d. collection of nearest neighbors transition vectors
- on each edge at rate γ we exchange the two vectors that sit on the relative vertices We finally consider a Markovian random walker with law determined by these environment.

Assuming that the annealed drift is non zero, we prove that the walk is ballistic for γ large enough. In the one dimensional case, when the law of the environment is degenerated to the sum of two weighted Dirac we can say more: if the walk in the freezed environment is transient then, for $\gamma > 0$ small enough the walk satisfies a LLN and invariance principle. Joint works with Michele Salvi and François Huveneers

Fabio Toninelli (Université Lyon 1)

Discrete interface dynamics and hydrodynamic limits

Dimer models provide natural models of (2+1)dimensional random discrete interfaces and of stochastic interface dynamics. I will discuss two examples of such dynamics, a reversible and an irreversible one. In both cases we can prove the convergence of the stochastic interface evolution to a deterministic PDE after suitable spacetime rescaling. Joint work with B. Laslier and M. Legras.

Ofer Zeitouni (Weizmann Institute & NYU)

On two dimensional cover time by Wiener sausage

I will describe recent results, obtained in joint work with David Belius and Jay Rosen, concerning the cover time of the two dimensional sphere by the Brownian sausage. I will emphasize those new ideas that allow one to obtained tightness of the squareroot of the cover time, properly centered.