Frontiers in Analysis and Probability
7th Strasbourg / Zurich - Meeting
Université de Strasbourg and University of Zurich

Abstracts

Place: Université de Strasbourg,
Conference room, Ground floor of the IRMA building

October 25 - October 26, 2018

Thursday, October 25, 2018, 14:00 - 14:50 h

Quenched CLT for random walk in divergence-free random drift field
by Bálint Tóth, University of Bristol

Abstract: We prove the quenched version of the central limit theorem for the displacement of a random walk in doubly stochastic random environment, under the H_{-1}-condition, with slightly stronger, $L^{2+\epsilon}$ (rather than L^2) integrability condition on the stream tensor. The proof relies on a functional analytic approach to solving the corrector equation in this non-reversible (non self-adjoint) case and extending Nash's moment bound.

Thursday, October 25, 2018, 15:00 - 15:50 h

Limits of multiplicative inhomogeneous random graphs and Lévy trees
by Thomas Duquesne, Sorbonne Université

Abstract: We consider a model of inhomogeneous random graphs that extend Erdős–Rényi graphs and that shares a close connection with the multiplicative coalescence, as pointed out by Aldous [*Ann. Probab.*, vol. 25, pp. 812–854, 1997]. These models have been studied first by Aldous and Limic [*Electron. J. Probab.*, vol. 3, pp. 1–59, 1998] and their connected components evolve as a multiplicative coalescent: namely, let N be the number of vertices and let $w_1, \ldots, w_N$ be a set of positive weights; we independently put an edge between vertices i and j with probability $p_{i,j} = 1-e^{-w_i w_j/s}$ (in our case, we consider, $s = w_1+\ldots+w_N$).

Our results are the following: we first generate such graphs by an exploration that reduces to a LIFO queue. This point of view allows to code an appropriate spanning tree of the graph thanks to a contour process (and a modified Lukasiewicz path) and to get a simple control on the surplus edges. The spanning tree encompasses most of the metric structure. This construction also allows to embed such graphs into Galton-Watson trees.

This embedding transfers asymptotically into an embedding of the limit objects into a forest of Lévy trees, which allows us to prove a limit theorem and an explicit construction of the limit objects from the excursions of a Lévy-type process. As a consequence of our construction, we give an explicit condition for the compactness of the limit objects and determine their fractal dimensions. These results extend and complement several previous results that had obtained via model- or regime-specific proofs, for instance: the case of Erdos-Renyi random graphs obtained by Addario-Berry, Goldschmidt and B. [*Probab. Theory Rel. Fields*, vol. 153, pp. 367–406, 2012], the *asymptotic homogeneous* case as studied by Bhamidi, Sen and Wang [*Probab Theory Rel. Fields*, vol. 169, pp. 565–641, 2017], or the *power-law* case as considered by Bhamidi, Sen and van der Hofstad [*Probab. Theory Rel. Fields*, vol. 170, pp. 387–474, 2018]. Joint work with: N. Broutin Sorbonne Université, Pierre and Marie Curie Sciences Faculty (Paris 6, Jussieu), E-mail: nicolas.broutin@upmc.fr, and M. Wang University of Bath, Probability Laboratory at Bath, United Kingdom, E-mail: wangminmin03@gmail.com

Thursday, October 25, 2018, 16:30 - 17:20 h

Critical parking on a random tree ...and random planar maps!
by Nicolas Curien, Université Paris-Sud Orsay

Abstract: Imagine a finite tree together with a configuration of particles (cars) at each vertex. Each car tries to park on its node, and if the latter is occupied, it moves downward towards the root trying to find an empty slot.

This model has been studied recently by Lackner and Panholzer as well as Goldschmidt and Przykucki where is it shown that parking of all cars obeys a phase transition ruled by the density of cars. We study the scaling limit of the configuration of cars at the critical density when the underlying tree is a uniform plane tree conditioned to be large. Surprisingly this fractal object is connected to stable looptree of parameter $3/2$ and to processes encountered in the theory of random planar maps!

The talk is based on ongoing work with Olivier Hénard.

Friday, October 26, 2018, 09:00 - 09:50 h

On porous interfaces and disconnection for the Gaussian free field
by Alain-Sol Sznitman, ETH Zürich

Abstract: In this talk I will present some results obtained in collaboration with Maximilian Nitzschner concerning uniform estimates for the absorption by porous interfaces surrounding a compact set of Brownian motion starting in this compact set. Such estimates are in

particular useful in conjunction with coarse graining procedures. I will discuss some applications to large deviation asymptotics for the probability of disconnection by level sets of the Gaussian free field, and some recent related results of Alberto Chiarini and Maximilian Nitzschner.

Friday, October 26, 2018, 10:30 - 11:20 h

The geometry of random minimal factorizations of a long cycle
by Igor Kortchemski, École polytechnique, Université Paris-Saclay

Abstract: We will be interested in the structure of random typical minimal factorizations of the n-cycle into transpositions, which are factorizations of (1,...,n) as a product of n-1 transpositions. We shall establish a phase transition when a certain amount of transpositions have been read one after the other. One of the main tools is a limit theorem for two-type Bienaymé-Galton-Watson trees conditioned on having given numbers of vertices of both types, which is of independent interest. This is joint work with Valentin Féray.

Friday, October 26, 2018, 11:30 - 12:20 h

Branching Brownian Motion, Mean Curvature Flow and the Motion of Hybrid Zones
Alison Etheridge, University of Oxford

Abstract: We outline a probabilistic proof of a well known connection between a special case of the Allen-Cahn equation and mean curvature flow. This proof is sufficiently flexible that it can be extended to capture a similar result for a model which captures the motion of what are known in population genetics as hybrid zones. As time permits we'll outline some extensions of this work. Joint work with Nic Freeman and Sarah Penington.

Friday, October 26, 2018, 14:30 - 15:20 h

A Feynman-Kac approach to growth-fragmentation equations
by Jean Bertoin, University of Zurich

Abstract: This talk is partly based on a joint work with Alex Watson, Manchester University The growth-fragmentation equation describes a system of growing and dividing particles which arises notably in models of cell division. Important questions about the asymptotic behaviour of its solutions at large times have traditionally been studied via spectral analysis of operators. In this talk, we present a probabilistic approach based on a Feynman-Kac formula, which relates the solution of the growth-fragmentation equation to the semigroup of a Markov process. We identify the Malthus exponent and the asymptotic profile in terms of a related Markov process, and further provide a simple criterion to ensure exponential speed of convergence.

Friday, October 26, 2018, 15:30 - 16:20 h

On optimal matching of random samples
by Michel Ledoux, Université Toulouse III

Abstract: Optimal matching problems are random variational problems widely investigated in the mathematics and physics literature. Two-dimensional matching of uniform samples gave rise to deep results investigated from various view points (combinatorial, generic chaining). After a short review of known results, we investigate in particular the case of Gaussian samples, first in dimension one on the basis of explicit representations of Kantorovich metrics and a sharp analysis of more general log-concave distributions in terms of their isoperimetric profile (joint work with S. Bobkov), and then in dimension two (and higher) following the PDE and transportation approach recently put forward by L. Ambrosio, F. Stra and D. Trevisan.

October 12, 2018