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AGENDA

Schedule ISI-NETWORKS workshop on Friday 23 June 2017

11:00-12:00 Rajat Hazra (Indian Statistical Institute, Kolkata)
12:00-13:00 Remco van der Hofstad (Eindhoven University of Technology)
13:00-13:30 lunch
13:30-14:30 Parthanil Roy (Indian Statistical Institute, Bangalore)
14:30-15:30 Nicos Starreveld (University of Amsterdam)
15:30-16:00 coffee/tea
16:00-17:00 Arijit Chakrabarty (Indian Statistical Institute, Delhi)
17:00-18:00 Alessandro Garavaglia (Eindhoven University of Technology)

Abstracts

THE DIVISIBLE SANDPILE MODEL

Rajat Hazra
Indian Statistical Institute, Kolkata, India

The divisible sandpile model was introduced to model the continuum version of the Abelian Sandpile model by Levine and Peres (2009). The stability of such models depends on the behaviour of what is known as an "odometer".
Levine, Murugan, Peres and Ugurcan (2015) conjecture that the scaling limit of the odometer on a torus may be related to the continuum bilaplacian field. In joint work with Alessandra Cipriani (University of Bath) and Wioletta Ruszel (TU Delft) we show that in any dimension the rescaled odometer converges weakly (in an appropriate Sobolev space) to the continuum bilaplacian field on the unit torus. I will also describe some more recent extensions of the result and stability issues to the case when the initial configurations are from distributions which have power law tail behaviour.

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HYPERCUBE PERCOLATION

Remco van der Hofstad
Eindhoven University of Technology, The Netherlands

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Consider bond percolation on the hypercube \{0,1\}^n at the critical probability p_c defined such that the expected cluster size equals 2^{n/3}, where 2^{n/3} acts as the cube root of the number of vertices of the n-cube. Percolation on the Hamming cube was proposed by Erd"os and Spencer (1979), and has proved to be substantially harder than percolation on the complete graph. In this talk, I will describe the percolation phase transition on the hypercube, and show that it shares many features with that on the complete graph.
In previous work with Borgs, Chayes, Slade and Spencer, and with Heydenreich, we have identified the subcritical and critical regimes of percolation on the hypercube. In particular, we know that for p=p_c(1+O(2^{-n/3})), the largest connected component has size roughly 2^{2n/3} and that this quantity is non-concentrated. In work with Asaf Nachmias, we identify the supercritical behavior of percolation on the hypercube, by showing that, for any sequence \epsilon_n tending to zero, but \epsilon_n being much larger than 2^{-n/3}, percolation at p_c(1+\epsilon_n) has, with high probability, a unique giant component of size (2+o(1))\epsilon_n 2^n. This also confirms that the validity of the proposed critical value. Finally, we `unlace' the proof by identifying the scaling of component sizes in the supercritical and critical regimes without relying on the percolation lace expansion. The lace expansion is a beautiful technique that is the major technical tool for high-dimensional percolation, but that is also quite involved and can have a disheartening effect on some.

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STABLE RANDOM FIELDS INDEXED BY FREE GROUPS

Parthanil Roy
Indian Statistical Institute, Bangalore, India

In this work, we investigate the extremal behaviour of left-stationary symmetric α-stable (SαS) random fields indexed by finitely generated free groups or rank strictly larger than one. We begin by studying the rate of growth of a sequence of partial maxima obtained by varying the indexing parameter of the field over balls of increasing size. This leads to a phase-transition that depends on the ergodic properties of the underlying nonsingular action of the free group but is different from what happens in the case of SαS random fields indexed by $\mathbb{Z}^d$. The presence of this new dichotomy is confirmed by the study of a stable random field induced by the canonical action of the free

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group on its Furstenberg-Poisson boundary with the measure being Patterson-Sullivan. This field is generated by a conservative action but its maxima grow as fast as an i.i.d. field contrary to what happens in the lattice case. When the underlying action is dissipative, we have also obtained the weak limit of the corresponding extremal point process. This limit is novel and is termed as randomly thinned cluster Poisson process. This talk is based on joint work with Sourav Sarkar (presently in University of California, Berkeley), who carried out a significant portion of this work in his master's dissertation at Indian Statistical Institute.

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BREAKING OF ENSEMBLE EQUIVALENCE IN DENSE RANDOM GRAPHS

Nicos Starreveld
University of Amsterdam, The Netherlands

In this talk we consider a random graph on which topological restrictions are imposed, such as constraints on the total number of edges, wedges, and triangles. We consider dense graphs, in which the number of edges per vertex scales proportionally to the number of vertices n. The goal is to compare the micro-canonical ensemble (in which the constraints are satisfied for every realisation of the graph) with the canonical ensemble (in which the constraints are satisfied on average), both subject to maximal entropy.

We compute the relative entropy of the two ensembles in the limit as n grows large, where the two ensembles are said to be equivalent in the dense regime if this relative entropy divided by n^2 tends to zero. The main result, whose proof relies on large deviation theory for graphons, is that breaking of ensemble equivalence occurs when the constraints satisfy a certain terseness condition. Examples are provided for three different choices of constraints.

Joint work with Frank den Hollander, Michel Mandjes and Andrea Roccaverde.

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ASYMPTOTIC BEHAVIOUR OF GAUSSIAN MINIMA

Arijit Chakrabarty
Indian Statistical Institute, Kolkata, India

In this work, we investigate what happens when an entire sample path of a smooth Gaussian process on a compact interval lies above a high level. Specifically, we determine the precise asymptotic probability of such an event, the extent to which the high level is exceeded, the conditional shape of the process above the high level, and the location of the minimum of the process given that the sample path is above a high level. Some recently obtained results for non-smooth processes will also be discussed.
Joint work with Gennady Samorodnitsky and Zhixin Wu.

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CITATION NETWORKS: DEFINING A MODEL FROM PARTIAL DATA

Alessandro Caravaglia
Eindhoven University of Technology, The Netherlands

The Journal Impact Factor and the h-index are probably the most famous bibliometrics indicators used to evaluate scientific quality of papers and research groups. Both of them are based on citations counting, ignoring that papers and/or scientists are part of large networks, on which it is possible to define different metrics, based not only on the degree of nodes. In this talk, I will focus on citation networks as directed graphs, where nodes are papers and direct edges are citations from a paper to another. I will identify some main characteristics of such networks using real data from Web of Science, and I will define a basic random tree model that can qualitatively replicate this data. I will also discuss about the limitations we have in analyzing real world data, and the problems arising when we try to go beyond the tree setting.
Joint work with Remco van der Hofstad and Gerhard Woeginger.

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