NEW FRONTIERS IN PROBABILITY

VENUE

Thursday 28-09:

Morning session: DM 0.09 Gorlaeus Building (9:30-12:15)

Afternoon session: DM 1.09 Gorleaus Building

The dinner will take place on Thursday, September 28 at
Koetshuis De Burcht (address: Burgsteeg 13, 2312 JR Leiden),
starting with drinks at 18:00.

Friday 29-09: DM 1.09 Gorleaus Building (whole day)

PROGRAM

Thursday 28-09

09:30-10:00	**Coffee**
10:00-11:00	Michiel van den Berg, *On some isoperimetric inequalities for the Newtonian capacity*
11:15-12:15	Anton Bovier, *Branching Brownian motion with self repulsion*
12:15-14:00	Lunch
14:00-15:00	Frank Redig, *Large deviations for non-equilibrium steady states.*
15:00-15:30	**Coffee**
15:30-16:30	Michel Mandjes, *A Sample-path large deviation principle for dynamic Erdős-Rényi random graphs*
18:00-22:00	Drinks and Dinner

Friday 29-09

10:00-11:00	Erwin Bolthausen, *On the TAP approach for the perceptron*
11:00-11:30	**Coffee**
11:30-12:30	Luca Avena, *Walking with Frank in various changing landscapes*
12:30-14:00	Lunch
14:00-15:00	Roman Kotecky, *Systems of particles in continuum*
15:00-15:30	**Coffee**
15:30-16:30	Remco van der Hofstad, *Polymers, Oriented Percolation and Networks: The pleasures of working with Frank*
16:30-...	Closing

ABSTRACTS

- LUCA AVENA, University of Florence
Walking with Frank in various changing landscapes

I plan to give a (non-exhaustive) scientific overview about three main topics that I have been exploring with Frank and coauthors in various form along the years:
1. limit theorems and slow-down effects for random walks in dynamic random environments on the integer lattices;
2. mixing time for random walks on evolving random graphs;
3. interacting particle systems on dynamically rewiring networks. All these three topics fit within the framework of dynamic disordered media.
In the spirit of the event, the goal of the talk is to discuss some original maths along with how these ideas and various collaborations have been shaping and evolving...which characterize quite well my personal journey with Frank in various changing scientific landscapes.

- ERWIN BOLTHAUSEN, University of Zurich
On the TAP approach for the perceptron

Abstract: We present the TAP approach for deriving the free energy (i.e. the Gardner formula) for perceptron models. This is based on a joint paper with Shuta Nakajima, Nike Sun, and Changji Xu. We also discuss open problems around the perceptron: For instance the possibility of a Sanov type large deviation theorem for the perceptron. An old joint paper with Nicola Kistler introduced and analyzed a perceptron version of the GREM. This suggested the possibility of a new version of the cavity method, which until now did not materialize. The talk is more about the whole framework and open problems, and not so much about the technicalities of the present proof.

- ANTON BOVIER, University of Bonn
Branching Brownian motion with self repulsion

Polymers have been one of Frank's early hobby-horses. Thus, I will present some results (obtained with Lisa Hartung) recently on a model of branching Brownian motions that are penalised for mutual intersections. Maybe not surprisingly, the main strategy for avoiding the penalty is to delay branching. , and typical configurations look like broomsticks. If the penalty is weak, an interesting non-Markovian limiting branching process emerges. Finally, the spatial process is governed by a F-KPP equation with time dependent reaction term. There are numerous open problems that Frank can take care of after his retirement, should he wish to do that.

- MICHIEL VAN DEN BERG, University of Bristol
On some isoperimetric inequalities for the Newtonian capacity

Abstract: Upper bounds are obtained for the Newtonian capacity for compact sets in $\mathbb{R}^d$, $d \geq 3$. It is shown that for compact, convex sets in $\mathbb{R}^d$, $d \geq 3$ with non-empty interior the Newtonian capacity is bounded from above by $\frac{(d-2)P(K)^2}{d|K|}$ with equality if K is a ball. Here $P(K)$ is the perimeter of K and $|K|$ is its measure.

- REMCO VAN DER HOFSTAD, TU Eindhoven
Polymers, Oriented Percolation and Networks: The pleasures of working with Frank

In this talk, I will review the diverse topics that Frank and I collaborated on. This started with one-dimensional polymers in and after my PhD, followed by high-dimensional results for weakly self-avoiding walks and oriented percolation. Recently, we collaborated on network problems, such as random walks on dynamic random. I hope to

share the joy in these collaborations with you.

- ROMAN KOTECKY, Charles University, Prague.
  Systems of particles in continuum

  Challenges regarding phase transitions will be examined. Current results concerning surface tension and metastability for models of penetrating balls (Widom-Rowlinson model) will be reported and future tasks will be discussed.

- MICHEL MANDJES, Leiden University
  A Sample-path large deviation principle for dynamic Erdős-Rényi random graphs

  In this talk, which may randomly evolve over time, I'll discuss a dynamic Erdös–Rényi random graph on n vertices in which each edge switches on at rate λ and switches off at rate μ, independently of other edges. The focus is on the analysis of the evolution of the associated empirical graphon in the limit as $n \to \infty$. The main result is a large deviation principle (LDP) for the sample path of the empirical graphon observed until a fixed time horizon T. The rate is $\binom{n}{2}$, and the rate function is a specific action integral on the space of graphon trajectories. We apply the LDP to identify (i) the most likely path that starting from a constant graphon creates a graphon with an atypically large density of d-regular subgraphs, and (ii) the mostly likely path between two given graphons. It turns out that bifurcations may occur in the solutions of associated variational problems. This is joint work with, besides Frank, Peter Braunsteins (UNSW, Australia).

- FRANK REDIG, TU Delft

  Large deviations for non-equilibrium steady states.
  Abstract: Starting from a variant of the famous KMP (Kipnis Marchioro Presutti) model, the so-called harmonic model, we provide an explicit structure of its non-equilibrium steady state (NESS) as a random mixture of equilibrium product measures. The mixture is defined in terms of generalized order statistics. As a consequence of this representation, we obtain a large deviation principle for the density profile, and other fluctuation properties of the NESS.
  This provides a rigorous proof of earlier results for large deviations of the KMP model based on the macroscopic fluctuation theory.
  Based on joint work with G. Carinci, C. Giardinà, C. Franceschini, R. Frassek (all from Modena University).

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