Peter's Network

November 1, 2017

All talks held in 4W1.7 with catering in 4W atrium

9:00-9:30 Welcome

9:30-9:40 Informal talk
Prof Andreas Kyprianou

9:40-10:30 Intersections of Brownian motions
Prof Wolfgang König

10:30-11:20 A Hamilton-Jacobi theory to large deviation
Prof Jin Feng

11:20-11:50 Coffee Break

11:50-12:40 Metastability of the contact process on evolving scale-free networks
Dr Emmanuel Jacob

12:40-13:40 Lunch Break

13:40-14:30 Branching random walks in random environment
Dr Marcel Ortgiese

14:30 - 15:00 Coffee Break

15:00-15:50 Networks with preferential attachment
Prof Steffen Dereich

15:50-16:20 Talk followed by group photo
Prof Peter Mörters

16:30 Wine Reception

19:00 Dinner in Bistrot Pierre

Wolfgang König: Intersections of Brownian motions

We consider the intersection local time (ILT) of p independent Brownian motions in R^d *with* $p(d-2) < d$*. We are interested in the high-density regime, i.e., when the motions have very many intersections with each other in a given compact set. We describe the most likely form of the ILT in terms of a law of large masses, describe the exponential moments of the total mass, analyse the dimension spectrum of the thick points and give a large-deviation principle for the shape of the ILT. This talk is based on joint works with Peter Mörters and Chiranjib Mukherjee.*

Marcel Ortgiese: Branching random walks in random environment

We will consider the following model of a motion influenced by a random medium: A branching random walk on the lattice changes its branching rate according to a random potential. It is well known that the expected number of particles satisfies the heat equation with a random potential, known as the parabolic Anderson model. The interest in these models stems from the fact that they exhibit intermittency, a localisation of the particle flow in a few well-spread out islands. Over the last decade considerable progress has been made in describing intermittency for this heat equation: we will take Peter's work as a starting point and we will compare the parabolic Anderson model to the system of branching random walks. In particular, we will discuss the differences and similarities that arise depending on the extreme value statistics of the underlying potential.

Emmanuel Jacob: Metastability of the contact process on evolving scale-free networks.

The contact process on scale-free networks is a simple model for the spread of epidemics on social networks. On a fixed network, a striking metastability phenomenon occurs: whatever the infection rate of the epidemics, it can spread through the whole network, and survive on it for an extremely long time, by specifically overinfecting the neighbourhood of the main hubs of the network.

In our model, we further introduce dynamics for the network, which evolves on the same time-scale as the epidemics. We characterize the phases of long survival and the metastable infection densities in terms of the infection rate and the "speed" of the network dynamics.

Steffen Dereich: Networks with preferential attachment

A popular model for complex networks is the preferential attachment model which gained popularity in the end of the 90's since it gives a simple explanation for the appearance of power laws in real world networks. Mathematically, one considers a sequence of random graphs that is built dynamically according to a simple rule. In each step a new vertex is added and linked randomly by a random or deterministic number of edges to the vertices already present in the system. In this process, links to vertices with high degree are preferred.

I review joint work with Peter that we obtained in the last ten years and point out future challenges. The focus will be on largest components, typical *distances and the effect of a fitness feature on the network formation.*

Jin Feng: A Hamilton-Jacobi theory to large deviation

Large deviation theory for metric space valued Markov processes can be characterized using convergence of Hamiltonian operators and unicity of the limiting Hamilton-Jacobi equation. In this talk, I will quickly introduce an abstract theory of this type. Then, through examples of mean field interacting particles, I turn to the need of developing new Hamilton-Jacobi theories in the space of probability measures. In some cases, we benefit by viewing this space as limit of quotient spaces and by using tools from analysis in geodesic metric spaces. The equation in quotient space structure seems canonical for a wide class of physical applications. I end the talk with an open problem.