

Abstracts

Ellen Baake (Universität Bielefeld)

ANCESTRAL PROCESSES FOR MUTATION-SELECTION MODELS OF POPULATION GENETICS

Abstract: We consider both deterministic and stochastic models that describe the genetics of populations under the joint action of mutation and selection. To this end, mutation and reproduction are modelled in terms of a mutation-selection differential equation, a multi-type branching process, and in terms of a Moran model with mutation and selection; in each case, both the forward and the backward directions of time are analyzed. The ancestral processes turn out as keys for the understanding of the interplay of mutation and selection. For the differential equation and the branching model, it leads to a general variational principle that relates the present population, the ancestral population, and the mean growth rate. In some important cases, this maximum principle boils down to a low-dimensional problem that can be solved explicitly. In the Moran model, a simplified version of the ancestral selection graph is used to reveal the additional effects of genetic drift, which cannot be captured by the deterministic or the branching approach.

Geoffrey Grimmett (Cambridge)

SHARP-THRESHOLDS AND THE 2D ISING MODEL

Abstract: The Ising model is rarely far from Hans-Otto Georgii's work. I will discuss extensions of the KKL-Talagrand theory of influence and sharp thresholds to non-product measures, and present an application to the 2d Ising model (joint work with Ben Graham). Then I will describe an open problem.

Achim Klenke (Johannes Gutenberg-Universität Mainz)

MULTIPLE NON-INTERSECTION EXPONENTS OF PLANAR BROWNIAN MOTION

(joint work with Peter Mörters, Bath University)

Abstract: Consider the paths of three planar Brownian motions killed when they leave the unit circle. It is well known that all three paths intersect (i.e., they produce triple points) if all motions are started at the origin. What is the probability p_R that the paths do *not* intersect when started at random positions at the boundary of a small circle with radius R ?

It is shown that

$$p_R \approx R^\xi \quad \text{as } R \downarrow 0,$$

where ξ is the so-called non-intersection exponent. The exact numerical value is unknown and is estimated via a Monte-Carlo simulation. For a slightly more general setup with different numbers of Brownian motions, we obtain rigorous inequalities, precise results and/or approximate values via simulations.

The situation is quite different (in terms of the quality of results) from the one with double points. Here, the corresponding exponents for the non-intersection of m Brownian motions of one type with n Brownian motions of the other type are known exactly due to work of Lawler, Werner and Schramm.

Roman Kotecký (Warwick/Prague)

POTTS ANTIFERROMAGNET: A CASE OF PURELY ENTROPIC ORDER AT ZERO TEMPERATURE

Abstract:

Errico Presutti (Roma Tre)

STATIONARY NON EQUILIBRIUM STATES: FROM MICROSCOPIC TO MACROSCOPIC DESCRIPTIONS

Abstract: In the presence of external driving forces a system may reach a final state which is not in thermodynamic equilibrium and where non zero currents flow. Many attempts have been done to characterize such states, maybe with the goal of extending the Gibbs theory of equilibrium statistical mechanics to a non equilibrium context, unfortunately the goal is far from being reached but many interesting results have been obtained. I will discuss only a few aspects in the case of heat flow driven by thermal gradients. The microscopic nature of thermal reservoirs and the equivalence between particle models with and without Gaussian thermostatic forces will be discussed first. Then after recalling the derivation of the Fourier law in some stochastic particle systems I will present recent results I have on systems with Kac potentials in a regime where phase transitions are present.

Thomas Richthammer (UCLA)

A PROOF OF ALDOUS' SPECTRAL GAP CONJECTURE

Abstract: Aldous' spectral gap conjecture asserts that on any finite graph the random walk process and the random transposition (or interchange) process have the same spectral gap. We prove the conjecture using a recursive strategy. The approach is a natural extension of the method already used to prove the validity of the conjecture on trees. The novelty is an idea based on electric network reduction, which reduces the problem to the proof of an explicit inequality for a random transposition operator involving both positive and negative rates. The proof of the latter inequality uses suitable coset decompositions of the associated matrices on permutations. (Joint work with Tom Liggett and Pietro Caputo.)

Herbert Spohn (TU Munich)

TASEP AND DIRECTED LAST PASSAGE PERCOLATION

Abstract:

Valentin A.Zagrebnov (Université de la Méditerranée(Aix-Marseille II))

BOSON RANDOM POINT FIELDS

Abstract: It is known that the Random Fermion/Boson (or Determinantal/Permanent) Processes are a particular case of the Random Quantum Point Fields or the *Cox Processes*. This lecture is a short review of results concerning the condensation manifested by the Boson Point Fields.

Hans Zessin (Universität Bielefeld)

THE PAPANGÉLOU PROCESS

Abstract: The aim is the construction of point processes in abstract spaces which are specified by a certain class of kernels, representing the conditional intensity for these processes. This concept goes back to Papangelou. As an interesting example we consider the so-called Polya sum processes. They are of the same importance as Poisson processes.