Forschungsseminar : Stochastic Analysis

Wintersemester 2018-19, montags 10:15-11:45, Campus Golm, Haus 9 Raum 2.22

10.10.18 **B. Jahnel** (Berlin):

Gibbsian representation for point processes via hyperedge potentials

We consider marked point processes on the d-dimensional euclidean space, defined in terms of a quasilocal specification based on marked Poisson point processes. We investigate the possibility of constructing uniformly absolutely convergent Hamiltonians in terms of hyperedge potentials in the sense of Georgii and Dereudre. These potentials are natural generalizations of physical multibody potentials which are useful in models of stochastic geometry. With this we draw a link between the abstract theory of point processes in infinite volume, the study of measures under transformations, and statistical mechanics of systems of point particles.

18.10.18 **W. Oçafrain** (Toulouse):

Quasi-stationarity for one-dimensional renormalized Brownian motion

The goal is to approximate the law of a one-dimensional Brownian motion conditioned not to cross fleeing boundaries when the time is large enough. To do so, we will study the quasi-stationarity of a Brownian motion rescaled by a time-dependent function.

29.10.18 **A. Suvorikova** (Potsdam):

Statistical inference with optimal transport

Optimal transportation (OT) theory provides a powerful toolbox for data analysis in nonlinear spaces, where nonlinearity appears as an inevitable consequence of complexity of objects of interest (e.g. medical images or meta-genomes). OT opens a new direction in creating complete package of statistical instruments which takes into account the underlying geometry of an observed data set. In this talk we introduce basics on statistical inference based on OT and present our recent results on the subject.

05.11.18 **A. de Oliveira Gomes** (Potsdam):

A Large Deviations Approach to the homogenization of nonlocal PDEs

Homogenization theory studies, roughly speaking, the effects of high frequency oscillations on the coefficients of the solutions of PDEs. In the simplest setting we are given a PDE with two natural scales, a macroscopic scale of order 1 and a microscopic scale measuring the period of oscillations. The interplay between Probability theory and PDEs is well known by the celebrated Feynman-Kac formula that expresses the solutions of parabolic PDEs as functionals of microscopic particles governed by SDEs. By the use of Forward-Backward Stochastic Differential Equations this link is extended to quasilinear and semilinear parabolic PDEs. This is the approach we propose for the study of the homogenization problem: the homogenization (oscillation frequency intensity) parameter of the PDE itself and the parameter that tunes the source of the noise term in the underlying SDE. It is our goal to study, when both parameters scale in some sense to be defined, the behavior of the solutions of the nonlocal PDEs that are associated to FB-SDEs with jumps.

19.11.18 **S.-I. Schmidt** (Potsdam): Verteidigung der Masterarbeit

Der Phasenübergang im zufälligen Erdös-Renyi-Graphen

26.11.18 **E. Mariucci** (Potsdam):

Gaussian approximation for the small jumps of Lévy processes.

It is common practice to treat small jumps of a Lévy process as Wiener noise and thus to approximate their marginals by means of their corresponding Gaussian distributions. However, results that allow to quantify the goodness of such an approximation according to a given metric are rare. In this talk we will focus on two metrics: the Wasserstein distance of order p and the total variation distance. Upper bounds for these metrics are discussed. In particular, sharp and non asymptotic bounds for a Gaussian approximation for jumps of infinite activity are presented. The theory is illustrated by concrete examples and an application to statistical lower bounds.

17.12.18 F. **Hildebrandt** (Hamburg):

Parameter estimation for SPDEs based on discrete observation in time and space

Stochastic partial differential equations (SPDEs) are becoming increasingly popular for modeling phenomena from the natural sciences and finance and thus require statistical methods for their calibration. We study parameter estimation for the parabolic, linear, second order SPDE $dX_t = (\theta_2 \Delta X_t + \theta_1 \nabla X_t + \theta_0 X_t)\, dt + \sigma dW_t$ with Dirichlet boundary condition in dimension one. Assuming a discrete observation pattern given by a grid in time and space, our aim is to understand the interplay between temporal and spatial sampling frequencies. Focusing on volatility estimation, recent works study a high frequency regime in time with only few spatial observations. Instead, we first consider a larger space than time sampling frequency. Using space increments, we are able to construct an asymptotically normal and efficient estimator. Next, we present a volatility estimator based on space-time increments. It turns out that although the analysis of this estimator works quite differently across different sampling regimes it always satisfies a central limit theorem with parametric rate of convergence. Finally, we discuss first results about estimation of (subsets of) the whole parameter vector .

14.01.19 **P. Houdebert** (Potsdam):

Sharp phase transition of the Widom-Rowlinson model

The Widom-Rowlinson model is formally defined as two homogeneous Poisson point processes forbidding the points of different type to be too close. For this Gibbs model the question of uniqueness/ non-uniqueness depending on the two intensities is relevant. This model is famous because it was the first continuum Gibbs model for which phase transition was proven, in the symmetric case of equal intensities large enough. But nothing was known in the non-symmetric case, where it is conjectured that uniqueness would hold.

In a recent work with D. Dereudre (Lille), we partially solved this conjecture, proving that for large enough activities the phase transition is only possible in the symmetric case of equal intensities. The proof uses percolation and stochastic domination arguments.

21.01.19 **J. Dianetti** (Bielefeld):

Nash equilibria for stochastic games with singular control

A singular stochastic control problem typically describes the situation in which an agent has to choose optimally an irreversible strategy in order to minimize a certain cost functional. In this talk we study a game of singular control, i.e. the problem of different agents where each agent faces a singular control problem parametrized by the strategies of her opponents. In a non-Markovian setting, we establish the existence of Nash equilibria. Moreover, we introduce a sequence of approximating games by forcing players to choose more regular controls, and we prove the convergence of the Nash equilibria of the approximating games to the Nash equilibria of the original game of singular control. We finally show some applications and we propose an algorithm to determine a Nash equilibrium for the game.

04.02.19 **A. Pilipenko** (Kyiv):

On pertubertation of an ODE with non-Lipschitz coefficients by a small noise

We study the limit behavior of an ordinary differential equation with non-Lipschitz coefficients that are perturbed by a small noise. Perturbed equations may have unique solutions while the initial ODE does not have a unique solution. Hence a limit of perturbed SDEs may be interpreted as a natural selection of a solution to the initial ODE.

The identification of the limit is closely related with averaging principle and also with the study of the exact growth rate of solutions to SDEs.

O. Aryasova (Kyiv):

On mutual behavior of solutions of an SDE with non-regular drift

We consider a multidimensional stochastic differential equation with a Gaussian noise and a drift vector having a jump discontinuity along a hyperplane. The large time behavior of the distance between two solutions starting from different points is studied. We also prove existence and uniqueness of a strictly stationary solution.

11.02.19 **T. Kosenkova** (Potsdam):

Conditioned point processes with applications to Lévy bridges

In the talk, we present a characterization of the bridges of Lévy processes through a functional equation. This result allows us to obtain stochastic domination for the bridges through un-conditioned Lévy processes and a new sampling algorithm for Lévy bridges.

We also discuss the connection between the Poisson point processes conditioned to satisfy linear constraints and Lévy bridges, showing how the above results rely upon it.

18.02.19 **F. Bachoc** (Toulouse):

Gaussian processes with inequality constraints

We consider a Gaussian process subjected to inequality constraints (for instance boundedness, monotonicity or convexity). These types of inequality constraints correspond to additional information on the Gaussian process realization, that are regularly available in applications. We explain how to simulate from the conditional distribution of a constrained Gaussian process, given observed values. We also introduce a maximum likelihood estimator taking the constraints into account. We obtain its asymptotic properties and compare it to the usual maximum likelihood estimator, that does not take the constraints into account.

Interessenten sind herzlich eingeladen !

Dr. Pierre Houdebert, Prof. Dr. Sylvie Roelly

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