Institut für Mathematik

Lehrstuhl für Wahrscheinlichkeitstheorie

Forschungsseminar : Stochastische Analysis

Sommersemester 2018, donnerstags, 16:15-17:45, Golm, Haus 9 Raum 0.13

18.04.18 **J. Fischer** (UP): *Martingale limit theorems using the Wright-Fisher model as an example*

26.04.18 **A. de Oliveira Gomes** (UP): *The first exit time problem in the small noise limit*

Abstract: It is our intention to describe the first exit time problem for an ordinary differential equation (ODE) perturbed by additive noise. We consider a dynamical system described by the ODE $\dot X_t= -\nabla U(X_t)$ in $\RR^d$ with a unique asymptotically stable state, which means that, for any initial condition, the solution trajectories converge to the stable state. Now we perturb this differential equation, adding some small random noise, given by a stochastic process $ \varepsilon(\eta_t)_{t \geq 0}$ and where $\varepsilon>0$ is the small noise intensity parameter that will be tuned to 0. In this different situation, even when the source of noise vanishes, the stable state becomes meta-stable and exits from its domain of attraction become possible. It is the intention of our talk to present results concerning the law and the expected value of the random variable that describes the first exit of the trajectories of the perturbed ODE in different scenarios. We will present the asymptotics, in the small noise limit, of the first exit time using large deviations estimates. This can be rephrased in an informal way as saying that the law and the expected value of the first exit time are exponentially small in the parameter that tunes the noise and that they are written in the small noise limit in terms of deterministic quantities that depend on the geometry of the potential function U. The first part of the talk will be introductory and it aims to describe well-known results in the literature of this problem through motivating examples. We will focus in discussing simple examples of randomly perturbed dynamical systems. The second part of the talk is about research results of the PhD thesis of the speaker on this subject.

03.05.18 **P. dai Pra** (Padova): *Thermodynamic limit and phase transitions in non-cooperative games: some mean-field examples*

Abstract: In stochastic dynamics inspired by Statistical Mechanics the interaction between different particles, or agents, is usually expressed as a given function of their states. The behavior of the system, in the limit of infinitely many particles (thermodynamic limit), may change dramatically by small changes in the parameters of the model: when this occurs we say there is a phase transition. In many applications the interaction cannot be given a priori but it is rather a result of agents' strategy, aimed at optimizing a given performance. Using the simplest models of this nature, mean field games, we illustrate some examples of phase transitions, pointing to difficulties in the proof of the thermodynamic limit.

17.05.18 **G. Gallo** (Turin): *Wald Identity, Optimal Stopping and Coupon-Collector Problem*

24.05.18 **P. Ménard** (Toulouse): *Bandit problems*

First Talk Title: *An introduction to best arm identification in the bandit problems*

Abstract: In this talk we will introduce the bandit setting and in particular the problem of best arm identification in the fixed confidence setting. We will show how to characterize the complexity of these problems and present an algorithm that reaches asymptotically this complexity. Most of the results that will be presented are extract from Optimal Best Arm Identification with Fixed Confidence, Garivier and Kaufmann, 2016.

Second Talk Title: *Threshold bandit for dose-ranging*

Abstract: We will present a variant of the best arm identification in the bandit problem: the threshold bandit problem. It is a way to model the dose-ranging problem for phase I of clinical trials. As in the fist

talk we will give the complexity of these problems and present an algorithm to solve them. This talk is based on the paper: Thresholding Bandit for Dose-ranging: The Impact of Monotonicity, Garivier et al., 2017.

31.05.18 **S. Sindayigaya** (Kigali): *A stochastic model for population evolution with genocide incidence*

Abstract: We study Birth-Death-Immigration-Emigration (BDIE) Processes with genocide incidence via their probability generating functions. The influence of genocide incidence, as a partial catastrophe, consists in reducing the population size to a non-zero state. We compute explicitly the first moments of such a random population size as function of the genocide parameters. An application to the population of Rwanda will be discussed.

07.06.18 **T. Ehlen** (UP): *Martingales associated to MC*

14.06.18 **J.-F. Jabir** (Moskau): *Overview on stochastic models, McKean-Vlasov dynamics and their applications*

Abstract: This seminar aims to give a broad and straightforward presentation on fundamental aspects related to the theory and application of continuous-time stochastic processes and the more specific class of McKeanVlasov dynamics. The first part of the talk will present/recall some essentials of stochastic analysis, stochastic modeling, some notion of numerical probability, and some elemental examples and applications in Physics and Finance. We will in particular review the notions of diffusion processes, Brownian motion, martingales, Itô's calculus, Stochastic Differential Equations and their link with partial differential equations. These notions will serve as prerequisite for the second part of the talk which will be dedicated to the general subject of McKean-Vlasov dynamics. These stochastic models were originaly introduced in the last century for the probabilistic interpretation of nonlinear equations arising from statistical physics and emerge typically from the asymptotic of some interacting particle systems. Nowadays McKean-Vlasov dynamics are more largely studied and applied in the fields of game theory (Mean-Field Games), optimal control problem and the modeling of interacting multiagent systems. After a short presentation on the mathematical characteristics of such models, we will review some past and current trends related to these models in the framework of fluid mechanics, Finance, stochastic interacting particle/agents models, and Economy.

12.07.18 **M. Fradon** (Lille): *Random dynamics for hard spheres.*

Abstract: What is the closest packing for a finite number of non-overlapping spheres with equal radius ? The answer to this apparently simple question in only known for very small systems, despite the existence of many applications in physics, storage, communication, engineering, and so on. We present a probabilistic approximation to the closest packing problem using reflected stochastic differential equations. During the first part of the talk we will present the sphere packing problem and the corresponding reflected equation. We focus on the regularity of the boundary of the set of hard sphere configurations, the solvability of the equation and the construction of its solution, i.e. the existence of the Brownian hard sphere dynamics. The second part of the talk will be devoted to the concentration of the solution at large time on a set of configurations with minimal energy. A sketch of the proof will be presented as well as many open questions about this topics.

28.06.18 **D. Henriquez** (Bogota): *Ornstein-Uhlenbeck Process*

05.07.18 **T. Rodenhagen** (UP): *Stochastic integration in L^2 as isometry and as martingale. Evaluating Itô integrals*

16.07.18 **C. Léonard** (Paris): *Entropic and optimal transport*

Abstract: The Schrödinger problem is an entropy minimization problem on a set of path measures with prescribed initial and final marginals. It arises from a large deviation principle for the empirical measures of large particle systems. When the dynamics of the particles is slowed down while the prescribed

marginals are unchanged, a second level large deviation phenomenon occurs. This leads to a sequence, indexed by the slowdown parameter, of Schrödinger problems Gamma-converging to a dynamical optimal transport problem.

Interessenten sind herzlich eingeladen !

Dr. Tania Kosenkova, Prof. Dr. Sylvie Roelly

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