Institut für Mathematik

Chairs of Probability and Mathematical Statistics

(Online) **Research seminar**

Sommersemester 2021, montags 14:00-15:00

Zoom: https://uni-potsdam.zoom.us/j/69067420670 (Kenncode: 49220780)

26.04.21 **David Dereudre** (Lille):

Random connected subgraph on Zd: A phase transition result

We consider the bond percolation model on the lattice Z*d* (*d*≥2) with the constraint to be fully connected. Each edge is open with probability *p*∈(0,1), closed with probability 1−*p* and then the process is conditioned to have a unique open connected component (bounded or unbounded). The model is defined on Z*d* by passing to the limit for a sequence of finite volume models with general boundary conditions. Several questions and problems are investigated: existence, uniqueness, phase transition, DLR equations. Our main result involves the existence of a threshold $0<p*(d)<1$ such that any infinite volume process is necessary the vacuum state in subcritical regime (no open edges) and is non trivial in the supercritical regime (existence of a stationary unbounded connected cluster). Bounds for $p*(d)$ are given and show that it is drastically smaller than the standard bond percolation threshold in Z*d*. For instance $0.128<p*(2)<0.202$ (rigorous bounds) whereas the 2D bond percolation threshold is equal to 1/2.

10.05.21 **Luisa Andreis** (Firenze):

Sparse inhomogeneous random graphs from a large deviation point of view

Inhomogeneous random graphs are a natural generalization of the well-known Erdös Rényi random graph, where vertices are characterized by a type and edges are independent but distributed according to the type of the vertices that they are connecting. In the sparse regime, these graphs undergo a phasetransition in terms of the emergence of a giant component exactly as the classical Erdös Rényi model. In this talk we will present an alternative approach,via large deviations, to prove this phase transition. This allows a comparison with the gelation phase transition that characterizes some coagulation process and with phase transitions of condensation type emerging in several systems of interacting components.This is an ongoing joint work with W. König (WIAS and TU Berlin), R. Patterson (WIAS) and H. Langhammer (WIAS Berlin)

17.05.21 **Alexander Zass** (Potsdam):

A multifaceted study of marked Gibbs point processes

In this talk we present some results on the existence and uniqueness of marked Gibbs point processes. Firstly, we prove in a general setting the existence of an infinite-volume marked Gibbs point process, via the so-called entropy method from large deviations theory. We then adapt it to the setting of infinite-dimensional Langevin diffusions, put in interaction via a Gibbsian description; we also obtain the uniqueness of such a Gibbs process via cluster expansion techniques. Finally, we explore the question of uniqueness in the case of repulsive interactions, in a novel approach to uniqueness by applying the discrete Dobrushin criterion to the continuum framework.

Tuesday 18.05.21 8:15-9:45 **Sebastian Mieruch-Schnülle** (AWI**,** Bremerhaven):

Markov chain analysis in climate dynamics

This talk takes place in the framework of the Klimacampus Week.

Specific Zoom data: https://uni-potsdam.zoom.us/j/68868364659 and Password: 43125469

31.05.21 **Batu Güneysu** (Bonn/Potsdam)

Feynman-Kac formula for 1st order perturbations of covariant Laplace-type operators

It is a classical fact that one can represent the heat semigroup of a Schrödinger operator (that is, a perturbation of the Laplacian by a real-valued potential) as a path integral in terms of Brownian motion: this is the celebrated Feynman-Kac formula. The aim of this talk is to explain a non-selfadjoint variant of this result, where one allows arbitrary first order perturbations of a Bochner-Laplacian that acts on sections of a vector bundle over an arbitrary noncompact Riemannian manifold. In particular, one replaces self-adjoint heat semigroups by holomorphic semigroups. As an application in noncommutative geometry, we obtain an explicit path integral formula for the first degree part of the differential graded Chern character of an even dimensional Riemannian spin manifold. This is joint work with Sebastian Boldt (Leipzig).

07.06.21 **Emilio Corso** (ETH Zürich)

14.06.21 **Oleksandr Zadorozhnyi** (Potsdam):

Contributions to the theoretical analysis of algorithms with adversarial and dependent data.

In this talk I overview the results contained in my thesis that studies theoretical guarantees of both sequential and batch learning algorithms that work with adversarial and dependent data. Firstly, I present concentration inequalities of Bernstein's type for the norms of Banach-valued random sums under functional weak-dependency assumption (the so-called $\cC-$mixing). The latter is then used to prove, in the asymptotic framework, excess risk upper bounds of the regularised Hilbert valued statistical learning rules under τ-mixing assumption on the underlying training sample. These results (of the batch statistical setting) are then supplemented with the regret analysis over the classes of Sobolev balls of the type of kernel ridge regression algorithm in the setting of online nonparametric regression with arbitrary data sequences. Here, in particular, a question of robustness of the kernel-based forecaster is investigated. From the other side, probabilistic inequalities of the first part are extended to the case of deviations (both of Azuma-Hoeffding's and of Burkholder's type) to the partial sums of real-valued weakly dependent random fields (under the type of projective dependence condition). Lastly, in the framework of sequential learning, the multi-armed bandit problem under $\cC-$mixing assumption on the arm's outputs is considered and complete regret analysis of a version of Improved UCB algorithm is given.

28.06.21 **Wioletta Ruszel** (Utrecht):

Emergence of interfaces from sandpile models

Interfaces separating two phases (e.g. water and ice) are created in phase coexistence situations such as at 0 degree Celsius. Random interface models are stochastic models which aim at explaining the macroscopic shape of an interface given the microscopic interaction of its particles (e.g. molecules). Prominent random interface models (in continuum space) are the Gaussian free field or fractional Gaussian fields. In this talk we would like to explain how general Gaussian interface models emerge from divisible sandpiles.

A divisible sandpile models is defined as follows. Given a graph G, assign a (real-valued) height s(x) to each vertex x of G. A positive value s(x)>0 is interpreted as a mass and a negative one as a hole. At every time step do the following: if the mass s(x)>1, then keep mass 1 and redistribute the excess among the neighbours. Under some condition, the sandpile configuration will stabilize, meaning that all the heights will be lower or equal to 1. The odometer function u(x) collects the amount of mass emitted from x during stabilization. It turns out that, depending on the initial configuration and redistribution rule, the odometer interface (u(x))_{x\in G} will scale to a Gaussian field.The results presented in this talk are in collaboration with A. Cipriani (TU Delft), L. Chiarini (TU Delft/IMPA), J. de Graaff (TU Delft), R. Hazra (ISI Kolkata) and M. Jara (IMPA).

Interessenten sind herzlich eingeladen !

Prof. Dr. Sylvie Roelly