



Institute of Mathematics

## Research seminar in Probability

Summer term 2023, **Wednesdays 10:00-11:00** (Online & sur place)

Zoom: <https://uni-potsdam.zoom.us/j/69067420670> (Kenncode: 49220780)  
Campus Golm, Building 9, Room 0.17

### **26.04.23 Laetitia Colombani** (Univ. Bern)

#### *Construction of a biological model and study of experimental design*

In this seminar, I will introduce a biological model we are constructing, and explain the questions that drives us. In link with this model, I will present the notion of experimental design, and how mathematics can help biology (and other fields) by studying optimal experimental design.

### **03.05.23 Jens Fischer** (D-fine AG, Zürich; Univ. Toulouse)

#### *High-dimensional grid exploration using self-avoiding exclusion processes*

With the advancements in quantum computing in recent years, the need for secure encoding methods, which can withstand quantum attacks, has motivated a new research branch in cryptography known as post-quantum cryptography. One proposed method relies d-dim grids and an associated problem of finding minimal distant grid points of a given point in  $\mathbb{R}^d$ . In this talk, we discuss a way of recovering efficiently probabilistically information on any grid using an extension of an exclusion process and open the discussion regarding the parameter choices and transition probabilities.

### **10.05.23 Sophie Pénisson** (Univ. Paris-Est Créteil)

#### *Stochastic model of tumor evolution for cancer etiology and risk*

We present a mathematical model of tumor evolution that includes all phases in the life of a tissue, from tissue development to cancer occurrence. The effects of a carrying capacity, different types of cell division, and different types of driver mutations are also accounted for. New analytical closed-form expressions are obtained from this mechanistic model, providing a simple probability distribution for the timing of a highly complex evolutionary process. The results of the mathematical model are then used to provide key insights into cancer etiology, by assessing the role played by normal endogenous mutational processes.

### **17.05.23 Ben Povar** (Univ. of Warwick)

#### *Yaglom limits and convergence on local times for Bienaymé-Galton-Watson processes with immigration reflected diffusions in cones*

We study the joint convergence of Bienaymé-Galton-Watson processes with immigration (BGWI) and its "naive" local times at 0 to the corresponding Continuous Branching Process with immigration (CBI) and its local time at 0. We do this by analysing the structure of excursions from zero and around positive levels and looking at the convergence of the hitting times of the BGWI to the hitting times of CBI. The research is done jointly with Aleksandar Mijatovic and Gerónimo Uribe Bravo.

### **31.05.23 David Dereudre** (Univ. Lille)

#### *Number-Rigidity and $\beta$ -Circular Riesz gas*

For an inverse temperature  $\beta > 0$ , we define the  $\beta$ -circular Riesz gas on  $\mathbb{R}^d$  as any microscopic thermodynamic limit of Gibbs particle systems on the torus interacting via the Riesz potential

$g(x)=\|x\|^{-s}$ . We focus on the non integrable case  $d-1 < s < d$ . Our main result ensures, for any dimension  $d \geq 1$  and inverse temperature  $\beta > 0$ , the existence of a  $\beta$ -circular Riesz gas which is not number-rigid. It is the first time that the non number-rigidity is proved for a Gibbs point process interacting via a non integrable potential. We follow a statistical physics approach based on the canonical DLR equations. It is inspired by Dereudre-Hardy-Leblé and Maïda (2021) where the authors prove the number-rigidity of the Sine $\beta$  process.

**07.06.23 Wioletta Ruszel** (Univ. Utrecht)

*Sandpile models and spanning trees*

The sandpile model (aka chip-firing game) is a toy model for studying self-organized criticality (SOC). SOC models are characterized by displaying power-law probability behaviour of certain quantities without fine-tuning any parameter. There has been a lot of activity and progress in understanding connections to spanning trees, Abelian groups, studying existence of infinite volume measures or avalanche size distributions of the model on different lattices.

In this talk we will discuss the basic model on  $\mathbb{Z}^2$ , show how it is related to spanning trees and discuss special configurations called height-one configurations.

**28.06.23 Pierre-Yves Louis** (Univ. Bourgogne Franche-Comté)

*About some reinforcement stochastic processes*

We will present an overview of some new models and results about the long time behaviour of stochastic processes with reinforcement. Some applications will be outlined : urn models with different kind of sampling and reinforcement schemes, stochastic algorithms, opinion dynamics. This talk is based on joint works with I. Crimaldi, P. Dai Pra, I. Minelli, M. Mirebrahimi.

**05.07.23 Giovanni Conforti** (Ecole Polytechnique, Palaiseau)

*Improved error bounds for score-based diffusion models*

The aim of this talk is to provide with an introduction to score-based diffusion models, that are a special class of generative models that has recently provided with impressive experimental results on various learning tasks. In the second part of the talk, I will illustrate a novel approach to show theoretical guarantees of convergence for these models that relies on the connection between time-reversal of diffusion processes and stochastic control. Despite its simplicity, the proposed methodology allows to considerably relax several assumptions made in the literature in order to obtain explicit error bounds. Joint work with A. Durmus and M. Gentiloni Silveri.

**12.07.23 Patrik Ferrari** (Univ. Bonn)

*On the space-time correlations in KPZ growth models*

We will discuss results on the correlation structure of some models in the KPZ universality class, for instance, on the covariance of limiting the processes along characteristic lines and of the limiting spatial processes.

**Interessenten sind herzlich eingeladen! Anyone interested is welcome!**

**Prof. Dr. Sylvie Roelly, Junior-Prof. Peter Nejjar**