

Fudan-NYU Shanghai Probability Day

时间：2023 年 11 月 4 日

地点：光华楼东主楼 1801

主办单位：复旦大学

主办人：Elie Aidekon（复旦大学）

报告人（按报告顺序排列）：

张 仑（复旦大学）

李利平（复旦大学）

Christophe Garban（Université Claude Bernard Lyon 1）

Eric Endo（NYU Shanghai）

Vahagn Nersesyan（NYU Shanghai）

Pierre Tarrès（NYU Shanghai）

会议时间安排 Arrangements	
9:00-9:50	Zhang Lun
9:50-10:40	Li Liping
10:40-11:00	Break
11:00-11:50	Christophe Garban
11:50-14:00	Lunch
14:00-14:50	Eric Endo
14:50-15:40	Vahagn Nersesyan
15:40-16:00	Break
16:00-16:50	Pierre Tarrès

报告题目： On the gap probability of the tacnode process

报告人： 张仑

报告人所在单位： 复旦大学

报告摘要： The tacnode process is a universal determinantal point process arising from non-intersecting particle systems and tiling problems. It is the aim of this talk to explore the integrable structure and large gap asymptotics for the gap probability of the thinned/unthinned tacnode process over $(-s,s)$. We establish an integral representation of the gap probability in terms of the Hamiltonian associated with a system of differential equations. With the aids of some remarkable differential identities for the Hamiltonian, we also compute large gap asymptotics, up to and including the constant term in the thinned case. As direct applications, we obtain expectation, variance and a central limit theorem for the associated counting function.

报告题目： Ray-Knight compactification of birth and death processes

报告人： 李利平

报告人所在单位： 复旦大学

报告摘要：

Abstract: A birth and death process is a continuous-time Markov chain with the minimal state space \mathbb{N} , whose transition matrix is standard and whose density matrix is the given birth-death matrix. Birth and death process is unique if and only if ∞ is an entrance or natural. When ∞ is neither an entrance nor natural, there are two ways in the literature to obtain all birth and death processes. The first one is an analytic treatment proposed by Feller in 1959, and the second one is a probabilistic construction completed by Wang in 1958. In this talk, we will give another way to study birth and death processes using the Ray-Knight compactification. This way has the advantage of both the analytic and probabilistic treatments above. By applying the Ray-Knight compactification, every birth and death process can be modified into a càdlàg Ray process on $\mathbb{N} \cup \{\infty\} \cup \{\partial\}$, which is either a Doob processes or a Feller Q -process. Every birth and death process in the second class has a modification that is a Feller process on $\mathbb{N} \cup \{\infty\} \cup \{\partial\}$. We will derive the expression of its infinitesimal generator, which explains its boundary behaviours at ∞ . Furthermore, by utilizing transformations of killing and Ikeda-Nagasawa-Watanabe's piecing out, we will also provide a probabilistic construction for birth and death processes. This construction relies on a triple determining the resolvent matrix introduced by Wang and Yang.

报告题目: Surface law and charge rigidity for the Coulomb gas on Z^d

报告人: Christophe Garban

报告人所在单位: Université Claude Bernard Lyon 1

报告摘要: I will start by introducing and motivating the (two-component) Coulomb gas on the d -dimensional lattice Z^d . I will then present some puzzling properties of the fluctuations of this Coulomb gas. The connection of this model with integer-valued fields and compact-valued spin systems will be emphasised through the talk. This is based on joint works with Avelio Sepúlveda and David Dereudre.

报告题目: Local Central Limit Theorem for Unbounded Long-Range Potentials

报告人: Eric Endo

报告人所在单位: NYU Shanghai

报告摘要: The Local Central Limit Theorem is a result that is vastly studied for random variables generated by models coming from Statistical Mechanics. Several papers such as [1,2,3] give certain conditions for the potentials such that, if the Central Limit Theorem holds for random fields defined on the lattice, then the Local Central Limit Theorem will hold as well. Considering potentials with long-range interactions with spins in \mathbb{R} on the lattice, we prove that for a sequence of Gibbs measures for which the Central Limit Theorem is satisfied, then the Local Central Limit Theorem also holds for that sequence. Our result extends [2] that shows for short-range models. Joint work with R. Fernández (NYU Shanghai), V. Margarint (University of Colorado Boulder, USA), and T.X. Nguyen (NYU Shanghai).

[1] M. Campanino, D. Capocaccia, and B. Tirozzi. The local central limit theorem for a Gibbs random field. *Comm. Math. Phys.* 70(2): 125--132, 1979.

[2] M. Campanino, G. Del Grosso, and B. Tirozzi. Local limit theorem for Gibbs random fields of particles and unbounded spins. *Journal of Mathematical Physics* 20(8): 1752--1758, 1979.

[3] E.O. Endo, and V. Margarint. Local Central Limit Theorem for Long-Range Two-Body Potentials at Sufficiently High Temperatures. *Journal of Statistical Physics*. 189(34), 2022.

报告题目: Ergodicity via controllability

报告人: Vahagn Nersesyan

报告人所在单位: NYU Shanghai

报告摘要: The problem of ergodicity of randomly forced PDEs has attracted a lot of attention in the last twenty years. It is now well understood that if all or sufficiently many Fourier modes of the PDE are directly perturbed by the noise, then the problem has a unique stationary measure that is exponentially ergodic in an appropriate metric. The case when the random perturbation acts directly only on a few Fourier modes is much less understood and is the main subject of this talk. We will see how the controllability properties of the underlying deterministic system can be used to study the ergodic behavior of stochastic dynamics. The results will be illustrated through the examples of 2D Navier-Stokes and Ginzburg-Landau equations; however, the methods apply to a wider class of systems as far as they satisfy appropriate controllability conditions. This talk is mainly based on joint works with S. Kuksin and A. Shirikyan.

报告题目: The \ast -Edge Reinforced random walk, bayesian statistics and statistical physics

报告人: Pierre Tarrès

报告人所在单位: NYU Shanghai

报告摘要: We will discuss recent non-reversible generalizations of the Edge-Reinforced Random Walk and its motivation in Bayesian statistics for variable order Markov Chains. The process is partially exchangeable in the sense of Diaconis and Freedman (1982), and its mixing measure can be explicitly computed. It can also be

associated to a continuous process called the \ast -Vertex Reinforced Random Walk, which itself is in general not exchangeable. We will also discuss some properties of that process. Based on joint work with S. Bacallado and C. Sabot.