

第九届分枝过程及相关课题研讨会

2023 年9 月23 日-28 日
(9 月23 日报到, 9 月28 日离会)

召集人:

李增沪、任艳霞、石权、施展

地点:

天元数学国际交流中心

会议指南

- 一：会议地点：科研楼一层报告厅
- 二：住宿：专家楼
- 三：用餐：在保障楼二层餐厅用餐：
 - 早餐：7:30-9:00
 - 午餐：11:30-13:00
 - 晚餐：17:30-19:00

温馨提示

1. 中心WIFI全区域覆盖，WIFI密码：88888888
2. 限量供应荞麦枕、决明子枕，如有需要联系前台人员更换。
3. 专家楼宿舍二楼西南角配有洗衣烘干一体机自助洗衣房。
4. 专家楼和研究中心有多功能一体复印机，可打印，扫描文件。
5. 会议中心比较偏僻，请您务必注意安全。中心前台备用部分应急药品。
6. 请注意会务组的临时通知。

服务联系电话：

- 会务前台（科研楼）： 0871-64993941（内线 3941）
- 住宿楼前台（专家楼）： 0871-64993942（内线 3942）
- 保安岗： 0871-64993910（内线3910）

The 9th Workshop on Branching Processes and Related Topics

TianYuan Mathematics Research Center, Yunnan, China
2023/09/23 – 2023/09/28

Saturday 2023/09/23: Registration and Arrival

Thursday 2023/09/28: Departure

	Sunday 09/24	Monday 09/25	Tuesday 09/26	Wednesday 09/27
9:30-10:20	Xinxin Chen	Yuval Peres	Peng Jin	Grégoire Véchambre
10:20-10:50	Tea Break	Tea Break	Tea Break	Tea Break
10:50-11:40	Senya Shlosman	Hui He	Wei Xu	Tianyi Bai
12:00-14:00	Lunch	Lunch	Lunch	Lunch
15:30-16:00	Problem Session Starts from 14:00 Tea at 15:30	Tea	Tea	Tea
16:00-16:50		Zhenyao Sun	Youzhou Zhou	
16:50-17:00		Break	Break	
17:00-17:50		Jieliang Hong	Haojie Hou Heng Ma	
18:00	Dinner	Dinner	Dinner	Dinner

Titles and Abstracts

- ◆ **Bai, Tianyi (AMSS, Chinese Academy of Sciences)**

Recent progresses in branching capacity

Abstract: Capacity is a fundamental concept with wide application in potential theory and random interacements. It records information about hitting probabilities and Green's functions of a set. Replacing random walks by branching random walks in the definition of capacity, a parallel branching capacity is defined in [Zhu 2016].

Recently, there has been significant developments around this quantity in [Asselah, Schapira, Sousi 2023], [Schapira 2023] etc. In this talk, we give a walk-through for these works, and introduce our present result (joint work with Jean-Francois Delmas and Yueyun Hu) on the branching capacity of the range of a simple random walk and its continuous counterpart.

- ◆ **Chen, Xinxin (Beijing Normal University)**

Conditioned Branching Random Walk

Abstract: We consider a supercritical branching random walk on the real line in the so called kappa case where the whole system a.s. goes to +1 eventually, and the additive martingale converges a.s. and in mean to some non-degenerate random variable W_1 under suitable moment condition. We consider the joint tail of the global minimum and W_1 , and with the help of it, we study the branching random walk conditioned on atypically small global minimum or conditioned on large W_1 . We will also study the biased random walk in random environment which is given by this branching random walk and talk about some related results. This is based on a joint work with L. de Raphelis.

- ◆ **He, Hui (Beijing Normal University)**

Local limits for GW trees and Brownian trees

Abstract: We will review some recent results on local limits for GW trees and Brownian trees.

- ◆ **Hong, Jieliang (Southern University of Science and Technology)**

On the critical probability of range-R bond percolation in six or less dimensions

Abstract: For the range-R bond percolation, the critical probability p_c has been studied by Van der Hofstad and Sakai (2005) for $d > 6$ using lace expansion. In lower dimensions $d \leq 6$, by connecting the bond percolation with the SIR epidemic model, we obtain the corresponding upper and lower bounds for the critical probability p_c for R large, thus complementing the previous results in $d > 6$.

- ◆ **Hou, Haojie (Peking University)**

Asymptotic expansion for branching killed Brownian motion with drift

Abstract: Let $Z_t^{\lambda}(0, \infty)$ be the point process formed by the positions of all particles alive at time t in a branching Brownian motion with drift and killed upon reaching 0.

We study the asymptotic expansions of $Z_t^{\lambda}(0, \infty)(A)$ for $A = (a, b)$ and $A = (a, \infty)$ under the assumption that $\sum_{k=1}^{\infty} k(\log k)^{1+\lambda} p_k < \infty$ for large λ in the regime of $\theta \in [0, \sqrt{2\beta(\mu-1)}]$. These results extend and sharpen the results of Louidor and Saglietti [J. Stat. Phys, 2020] and Kesten [Stochastic Process. Appl., 1978].

- ◆ **Jin, Peng (Beijing Normal University-Hong Kong Baptist University United International College)**

Long-time behavior of affine processes

Abstract: Affine processes are Markov processes for which the logarithm of the characteristic function of its transition distribution is affine with respect to the initial state. This type of process unifies the concepts of continuous-state branching processes with immigration and Ornstein–Uhlenbeck type processes. In this talk I will first talk about recent results on the long-time behavior of traditional affine processes. In the second part I will talk about the recent extension of affine processes to the non-Markovian setting, the so-called Volterra affine processes. In particular, I will present our recent result on the existence of limiting distributions for the Volterra square-root process, a particular class of affine Volterra processes. This talk is based on joint works with Martin Friesen, Jonas Kremer and Barbara Rüdiger.

- ◆ **Ma, Heng (Peking University)**

Extrema of two-type reducible branching Brownian motion

Abstract: Consider a two-type reducible branching Brownian motion in which particles' diffusion coefficients and branching rates are influenced by their types. Here reducible means that type 1 particles can produce particles of type 1 and type 2 , but type 2 particles can only produce particles of type 2 . The maximum of this process is determined by two parameters: the ratio of the diffusion coefficients and the ratio of the branching rates for particles of different types. Belloum and Mallein [Electron. J. Probab. **26**(2021), no. 61] identified three phases of the maximum and the extremal process, corresponding to three regions in the parameter space.

We investigate how the extremal process behaves asymptotically when the parameters lie on the boundaries between these regions. An interesting consequence is that a double jump occurs in the maximum when the parameters cross the boundary of the so called anomalous spreading region. Furthermore if the parameters depend on time horizon t and approach properly to the boundaries, the order of the maximum can interpolate smoothly between different regimes. Based on joint works with Yanxia Ren.

- ◆ **Peres, Yuval (BIMSA)**

Controlled diffusion on Galton-Watson trees

Abstract: Given a unit of mass at the root of a Galton-Watson tree, how many mass splittings are needed to bring half the mass to distance n ? In each split, the mass at a chosen vertex is divided equally among its neighbors. The surprising answer is related to random walk on these trees and to the maximum overhang problem.

- ◆ **Shlosman, Senya (BIMSA)**

Glassy trees

Abstract: I will talk about the Ising model on Cayley trees T_k . I will describe the difference between the Ising on trees T_k and on the regular lattices Z^d . In particular, on trees, one sees the glassy states. All the necessary definitions will be provided.

- ◆ **Sun, Zhenyao (Beijing Institute of Technology)**

On the coming down from infinity of coalescing Brownian motions

Abstract: Consider a system of Brownian particles on the real line where each pair of particles coalesces at a certain rate according to their intersection local time. Assume that there are infinitely many initial particles in the system. We give a necessary and sufficient condition for the number of

particles to come down from infinity. We also identify the rate of this coming down from infinity for different initial configurations. This is a joint work with Clayton Barnes and Leonid Mytnik.

♦ **Véchambre, Grégoire (AMSS, Chinese Academy of Sciences)**

Wright-Fisher diffusions in Lévy environments via combinatorics of some branching-coalescing processes

Abstract: We are interested in the evolution of a constant size population with two-types, modeled by a Wright-Fisher diffusion. We will present genealogy methods which are based on a branching-coalescing process called the Ancestral Selection Graph (ASG) that was introduced by Krone and Neuhauser in 1997. These methods allow to study interesting quantities like the probability of fixation of a type, the fixation time, or the distribution of types in the population after a long time. In recent works, we considered models where a Lévy environment drives the selection and, in particular, we allowed both types to have a selective advantage: depending on the random environment, selection sometimes favors an allele and sometimes the other. Because of the double selection, classical ASG methods fail in the case of this model. We propose a new combinatorics approach to study the ASG which allows, in the case of this model, to derive a series representation and a Taylor expansion for the fixation probability.

♦ **Xu, Wei (Beijing Institute of Technology)**

Stochastic Volterra Equations for the Local Times of Spectrally Positive Stable Processes

Abstract: In this talk, we introduce the macroevolution mechanism of local times of a spectrally positive stable process in the spatial direction. Our main results state that conditioned on the finiteness of the first time at which the local time at zero exceeds a given value, the local times at positive half line are equal in distribution to the unique solution of a stochastic Volterra equation driven by a Poisson random measure whose intensity coincides with the Lévy measure. This helps us to provide not only a simple proof for the Hölder regularity, but also a uniform upper bound for all moments of the Hölder coefficient as well as a maximal inequality for the local times. Moreover, based on this stochastic Volterra equation, we extend the method of duality to establish an exponential-affine representation of the Laplace functional in terms of the unique solution of a nonlinear Volterra integral equation associated with the Laplace exponent of the stable process.

♦ **Zhou, Youzhou (Xi'an Jiaotong Liverpool University)**

Transition Density of an Infinite-dimensional diffusion with the Jack Parameter

Abstract: From the Poisson-Dirichlet diffusions to the $\$Z\$$ -measure diffusions, they all have explicit transition densities. In this paper, we will show that the transition densities of the $\$Z\$$ -measure diffusions can also be expressed as a mixture of a sequence of probability measures on the Thoma simplex. The coefficients are still the transition probabilities of the Kingman coalescent stopped at state $\$1\$$. This fact will be uncovered by a dual process method in a special case where the $\$Z\$$ -measure diffusions is established through up-down chain in the Young graph.

参会人员名单

序号	姓名	单位
1	侯浩杰	北京大学
2	马恒	北京大学
3	任艳霞	北京大学
4	朱雅萍	北京大学
5	李豆豆	北京工业大学
6	孙振尧	北京理工大学
7	徐伟	北京理工大学
8	陈昕昕	北京师范大学
9	何辉	北京师范大学
10	李增沪	北京师范大学
11	杨帆	北京师范大学
12	张梅	北京师范大学
13	金鹏	北京师范大学-香港浸会大学联合国际学院
14	Peres, Yuval	北京雁栖湖应用数学研究院
15	Senya Shlosman	北京雁栖湖应用数学研究院
16	吕铀	东华大学
17	毕洪伟	对外经济贸易大学
18	aidekon, elie	复旦大学
19	胡行健	复旦大学
20	钱东箭	复旦大学

21	王诚石	复旦大学
22	肖阳	复旦大学
23	俞姚琳	复旦大学
24	洪杰梁	南方科技大学
25	刘嘉伟	南方科技大学
26	马春华	南开大学
27	王龙敏	南开大学
28	田子桐	清华大学求真书院
29	陈新兴	上海交通大学
30	叶印娜	西交利物浦大学
31	周友洲	西交利物浦大学
32	李应求	长沙理工大学
33	危渝绍	长沙理工大学
34	赵敏智	浙江大学
35	Vechambre, Grégoire	中国科学院数学与系统科学研究院
36	白天衣	中国科学院数学与系统科学研究院
37	梁渝涛	中国科学院数学与系统科学研究院
38	毛俊仁	中国科学院数学与系统科学研究院
39	施展	中国科学院数学与系统科学研究院
40	石权	中国科学院数学与系统科学研究院
41	肖惠	中国科学院数学与系统科学研究院
42	郑玉书	中国科学院数学与系统科学研究院