The 10th Workshop on Branching Processes and Related Topics

November 11-15, 2024

Shenzhen MSU-BIT University

Scientific Committee: Zenghu Li (Beijing Normal University)
Yanxia Ren (Peking University)
Zhan Shi (AMSS, Chinese Academy of Sciences)
Jie Xiong (Southern University of Science and Technology)
Xiaowen Zhou (Concordia University)

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Sign In

The Coli Hotel Shenzhen (深圳中海凯骊酒店)

Address: No. 168 Dayun Road, Longgang District, Shenzhen, Guangdong

Time: 09:00-20:00, November 10

Transportation Suggestions:

1.From Shenzhen Bao'an Airport (Terminal 3):

Taxi fare: approximately 100-130 RMB

Highway toll: 25 RMB

2.**From Shenzhenbei Railway Station:**

Taxi fare: approximately 70-80 RMB

Highway toll: 8 RMB

3.**From Shenzhen Pingshan Railway Station:**

Taxi fare: approximately 40-50 RMB

Beijing Time	Nov.11	Nov.12	Nov.13	Nov.14	Nov.15
08:30-09:00	**Opening Ceremony & Group Photo**				
Chairman	**Bastien Mallein**	**Zenghu Li**		**Xiaowen Zhou**	**Jie Xiong**
09:00-09:40	Julien Berestycki	Romain Abraham		Jieliang Hong	Vladimir Vatutin
09:40-10:20	Wen Sun	Jean-Francois Delmas		Michel Pain	Jiayan Guo
10:20-10:50	**Tea Break**			**Tea Break**	
Chairman	**Zhan Shi**	**Yanxia Ren**		**Clement Foucart**	**Hui He**
10:50-11:30	Sergey Bocharov	Hui Xiao		Chenlin Gu	Dong Yao
11:30-12:10	Zhenyao Sun	Haojie Hou		Lianghui Luo	Jing Zhang
12:10-14:00	**Lunch**		Free Time / Guided Tour	**Lunch**	
Chairman	**Quan Shi**	**Romain Abraham**		**Chenlin Gu**	Free Discussion
14:00-14:40	Irina Shevtsova	Xinxin Chen		Xiaowen Zhou	
14:40-15:20	Open Problem Session (Zhan Shi) &Tea Break	Quan Shi		Clement Foucart	
15:20-15:50		**Tea Break**		**Tea Break**	
Chairman		**Jean-Francois Delmas**		**Hui Xiao**	
15:50-16:30		Yushu Zheng		Tianyi Bai	
16:30-17:10		Chengshi Wang		Fan Yang	
17:30-20:00	**Banquet**	**Dinner**			

November 11

Chairman: Hui He

08:30-09:00 *Opening*

Chairman: Bastien Mallein

09:00-09:40 Julien Berestycki (University of Oxford, UK)

TBA

09:40-10:20 Wen Sun (University of Science and Technology of China, China)

On the moderate deviation principles in the sparse multi-type Erdös Rényi random graph

10:20-10:50 Tea break

Chairman: Zhan Shi

10:50-11:30 Sergey Bocharov (Xi'an Jiaotong-Liverpool University, China)

Limit theorems for edge lengths in Galton-Watson trees

11:30-12:10 Zhenyao Sun (Beijing Institute of Technology, China)

On the subcritical self-catalytic branching Brownian motions

Chairman: Quan Shi

14:00-14:40 Irina Shevtsova (Lomonosov Moscow State University, Russia)

Moment-type estimates for characteristic functions

14:40-17:10 Zhan Shi (Chinese Academy of Sciences, China)

Open Problem Session

November 12

Chairman: Zenghu Li

09:00-09:40 Romain Abraham (Orléans University, France)

Marked Bienaymé-Galton-Watson trees

09:40-10:20 Jean-Francois Delmas (Ecole nationale des ponts et chaussées, France)

Heterogeneous SIS model

10:20-10:50 Tea break

Chairman: Yanxia Ren

10:50-11:30 Hui Xiao (Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China)

The extremal position of a branching random walk on the general linear group

11:30-12:10 Haojie Hou (Beijing Institute of Technology, China)

Tails of extinction time and maximal displacement for critical branching killed Lévy process

Chairman: Romain Abraham

14:00-14:40 Xinxin Chen (Beijing Normal University, China)

Fourier analysis of Mandelbrot cascades

14:40-15:20 Quan Shi (AMSS, Chinese Academy of Sciences)

Boundary classification at infinity for time-changed Lévy processes

15:20-15:50 Tea break

Chairman: Jean-Francois Delmas

15:50-16:30 Yushu Zheng (Chinese Academy of Sciences, China)

Sites for simple random walk in two and more dimensions

16:30-17:10 Chengshi Wang (Fudan University, China)

The BESQ flow and its application to skew Brownian flow

November 14

Chairman: Xiaowen Zhou

09:00-09:40 Jieliang Hong (Southern University of Science and Technology, China)

Exceptional times for the instantaneous propagation of superprocess

09:40-10:20 Michel Pain (Mathematical Institute of Toulouse, France)

Two-temperature overlap in the branching Brownian motion

10:20-10:50 Tea break

Chairman: Clément Foucart

10:50-11:30 Chenlin Gu (Tsinghua University, China)

Size distribution of clusters in site-percolation on random recursive tree

11:30-12:10 Lianghui Luo (Université Toulouse III-Paul Sabatier, France)

Precise upper deviation estimates for the maximum of a branching random walk

Chairman: Chenlin Gu

14:00-14:40 Xiaowen Zhou (Concordia University, Canada)

Speeds of coming down from infinity for Λ-Fleming-Viot supports

14:40-15:20 Clément Foucart (Vćtor Rivero, Anita Winter CMAP, France)

Conditioning the logistic continuous-state branching process on non-extinction via its total progeny

15:20-15:50 Tea break

Chairman: Hui Xiao

15:50-16:30 Tianyi Bai (Chinese Academy of Sciences, China)

Hitting probability for Minkowski sum of random sets

16:30-17:10 Fan Yang (Beijing Normal University, China)

The extremal process of branching Brownian motion with absorption

November 15

Chairman: Jie Xiong

09:00-09:40 Vladimir Vatutin (Steklov Mathematical Institute, Moscow, Russia)

On the prospective minimum of the random walk conditioned to stay nonnegative

09:40-10:20 Jiayan Guo (Beijing Normal University, China)

Precise large deviations for the total population of heavy-tailed non-supercritical branching processes with immigration

10:20-10:50 Tea break

Chairman: Hui He

10:50-11:30 Dong Yao (Jiangsu Normal University, China)

Pólya urns with graph-based interactions

11:30-12:10 Jing Zhang (Beijing Normal University, China)

Strong Feller property and ergodicity of generalised Ornstein-Uhlenbeck processes

ABSTRACT

Marked Bienaymé-Galton-Watson trees

R. ABRAHAM *Orléans University, France*, E-mail: romain.abraham@univ-orleans.fr

Abstract: The talk is based on a joint work with Sonia BOULAL and Pierre DEBS.

We consider a Bienaymé-Galton-Watson (BGW) tree where we add marks on the vertices randomly, where, conditionally given the tree, every vertex is marked indepently of the others with a probability that depends on its out-degree. Our goal is to get trees with a large number of marked nodes. To this end, we study two procedures:

- We consider critical or sub-critical BGW trees that we condition on having n marks. We then study the (local) limit in distribution of this tree as $n \to +\infty$.
- We make a change of probability with some martingales that give weight to the trees with many marks. These martingales are obtained via a penalization approach (previously introduced to construct martingales for the Brownian motion or random walks).

In both cases, we describe the distribution of the resulting tree with a large number of marks.

Hitting probability for Minkowski sum of random sets

Tianyi BAI *Chinese Academy of Sciences, China*, E-mail: tianyi.bai73@amss.ac.cn

Abstract: Recently, there has been progress on hitting probability of a distant set for the sum of independent simple random walks in Asselah et al. 2023.

We show that this phenomenon holds for a family of general random sets. The proof is based on intersection equivalence of fractal percolation in Peres 1996, as well as a result for energy and capacity of product of Markov chains introduced in Salisbury 1989.

This talk is based on joint work with Xinxin Chen and Yuval Peres.

TBA

Julien BERESTYCKI *University of Oxford, UK*, E-mail: berestyc@stats.ox.ac.uk

Abstract: TBA

Limit theorems for edge lengths in Galton-Watson trees

Sergey BOCHAROV *Xi'an Jiaotong-Liverpool University, China*, E-mail: Sergey.Bocharov@xjtlu.edu.cn

Abstract: We discuss a number of results concerning the limiting behaviour of edges in the genealogical tree generated by a continuous-time supercritical Galton-Watson process with branching rate β and mean of the offspring distribution m. We classify edges in such a tree as either pendant or interior depending on whether the individual corresponding to an edge is alive or dead at time t.

We shall show that longest edges in the tree at a large time t (either pendant or interior) are approximately of length $(1-\frac{1}{m})t$ and establish the limiting distribution of the nth longest pendant/interior edge at time t centred around $(1-\frac{1}{m})t$.

We shall also give the Strong Law of Large Numbers for pendant and interior edges, which, in particular, will imply that the length of a typical edge (either pendant or interior) at a large time t has $Exp(m\beta)$ distribution.

Fourier analysis of Mandelbrot cascades

Xinxin CHEN *Beijing Normal University, China*, E-mail: xinxin.chen@bnu.edu.cn

Abstract: We consider Mandelbrot canonical cascades measure (MCCM). We prove that the MCCM is Rajchman and derive the exact formula for its Fourier dimension under mild condition. This a joint work with Y. Han, Y. Qiu and Z. Wang.

Heterogeneous SIS model

J.-F. DELMAS *Ecole nationale des ponts et chaussées, France*, E-mail: delmas@cermics.enpc.fr

Abstract: In a first part, we will present an individual based model for the spread of an SIS epidemic in an heterogeneous population. On the one hand the epidemiological model is elementary, as an individual is either infected or susceptible, but on the other hand the heterogeneity of the population is general but static (that is, the trait of each individual is constant in time). When the population is large, the behavior can be represented through an infinite dimensional ordinary differential equation:

$$\partial u_t(x) = (1-u_t(x))\, T_k u_t(x) - \gamma(x) u_t(x), \tag{1}$$

where $u_t(x) \in [0,1]$ represents the proportion of infected individuals in the population with trait $x \in \Omega$ at time $t \geq 0$, $\gamma(x) \geq 0$ is the recovery rate (depending on the trait) and T_k is a kernel integral operator, that is, $T_k f(x) = \int_\Omega k(x,y) f(y)\, \mu(\mathrm{d}y)$ with $\mu(\mathrm{d}y)$ the probability of a random individual to have trait y and $k(x,y)$ is the transmission kernel of the epidemic from an infected individual with trait y to an individual of type x.

We then consider the reproduction number R_0 associated to the ODE (1) given by the spectral radius of the kernel integral operator with kernel $k(x,y)/\gamma(y)$. As usual if $R_0 \leq 1$, then

the epidemics get extinct asymptotically: $\lim_{t\to\infty} u_t(x) = 0$; and if $R_0 > 1$, then there exists a non-zero maximal equilibrium given by $\mathbf{g}(x) = \lim_{t\to\infty} u_t(x)$ with initial condition $u_0 \equiv 1$ (that is, initially all the population is infected).

In a second part, we consider a vaccination policy η at time $t = 0$, with $\eta(x) \in [0, 1]$ the proportion of individual with trait x which are not vaccinated. Thus $\eta \equiv 1$ corresponds to doing nothing, and $\eta \equiv 0$ corresponds to vaccinating all the population. The evolution of the SIS population with vaccination η satisfies also the ODE (1) with the probability measure $\mu(\mathrm{d}y)$ replaced by the sub-probability measure $\eta(y)\,\mu(\mathrm{d}y)$. Thus the effective reproduction number $R_e(\eta)$ is then the the spectral radius of the kernel integral operator with kernel $k(x, y)\,\eta(y)/\gamma(y)$. If $R_0 > 1$, then a vaccination η is critical if $R_e(\eta) = 1$; and as an interesting result, we get that the strategy $1 - \mathbf{g}$ is critical.

In the last part, we will consider the bi-objective problem $\min(R_e(\eta), C(\eta))$, where $C(\eta)$ is the cost associated to the vaccination strategy η. A typical cost we shall consider is the quantity of vaccine given by $C(\eta) = \int_\Omega (1 - \eta)(x)\,\mu(\mathrm{d}x)$ (recall $1 - \eta(x)$ is the proportion of vaccinated individual among the population with trait x).

Conditioning the logistic continuous-state branching process on non-extinction via its total progeny

Clément FOUCART *Víctor Rivero, Anita Winter CMAP, France*, E-mail: clement.foucart@polytechnique.edu

Abstract: The problem of conditioning a continuous-state branching process with quadratic competition (logistic CB process) on non-extinction is investigated. We first establish that non-extinction is equivalent to the total progeny of the population being infinite. The conditioning we propose is then designed by requiring the total progeny to exceed arbitrarily large exponential random variables. This is related to a Doob's h-transform with an explicit excessive function h. The h-transformed process, i.e. the conditioned process, is shown to have a finite lifetime almost surely (it is either killed or it explodes continuously). When starting from positive values, the conditioned process is furthermore characterized, up to its lifetime, as the solution to a certain stochastic equation with jumps. The latter superposes the dynamics of the initial logistic CB process with an additional density-dependent immigration term. Last, it is established that the conditioned process can be starting from zero. Key tools employed are a representation of the logistic CB process through a time-changed generalized Ornstein-Uhlenbeck process, as well as Laplace and Siegmund duality relationships with auxiliary diffusion processes.

Size distribution of clusters in site-percolation on random recursive tree

Chenlin GU *Tsinghua University, China*, E-mail: gclmath@tsinghua.edu.cn

Abstract: This talk presents the rigorous proof of several results about the site-percolation on random recursive trees, observed in the previous work by Kalay and Ben-Naim (*J.Phys.A*, 2015). For a random recursive tree of size n, let every site have probability $p \in (0, 1)$ to remain and with probability $(1 - p)$ to be removed. As $n \to \infty$, we show that the proportion of the remaining clusters of size k is of order $k^{-1-\frac{1}{p}}$, resulting in a Yule–Simon distribution; the largest cluster size is of order n^p, and admits a non-trivial scaling limit. The proofs are based on the

embedding of this model in the multi-type branching processes, and a coupling with the bond-percolation on random recursive trees. This talk is based on a joint work with Linglong Yuan (University of Liverpool).

Precise large deviations for the total population of heavy-tailed non-supercritical branching processes with immigration

Jiayan GUO *Beijing Normal University, China*, E-mail: guojiayan@mail.bnu.edu.cn

Abstract: Consider the partial sum $S_n = X_1 + \cdots + X_n$ of the non-supercritical branching process with immigration $\{X_n\}$. When the offspring ξ or immigration η is heavy-tailed, we prove precise large deviation probabilities for S_n, that is,

$$\lim_{n\to\infty} \sup_{x\in\Lambda_n} \left| \frac{P(S_n > x)}{nx^{-\gamma}L(x)} - 1 \right| = 0,$$

where Λ_n is some suitable interval chosen differently in the critical and subcritical case, γ is a positive constant related with the offspring and the immigration, and $L(x)$ is slowly varying. A key step in the proof is to give the tail behavior of the stationary distribution of $\{X_n\}$. This is a joint work with Professor Wenming Hong.

Exceptional times for the instantaneous propagation of superprocess

Jieliang HONG *Southern University of Science and Technology, China*, E-mail: hongjl@sustech.edu.cn

Abstract: For a Dawson-Watanabe superprocess X on R^d, it is shown in Perkins [Ann. Probab. 18: 453 – 491, (1990)] that if the underlying spatial motion belongs to a particular class of Lévy processes that admit jumps, then for any fixed $t > 0$, the closed support of X_t is the whole space almost surely when conditioned on $\{X_t \neq 0\}$, the so-called "instantaneous propagation" property. In this paper, for the superprocess on R^d whose spatial motion is the symmetric stable process of index $\alpha \in (0, 2/3)$, we prove that there exist exceptional times at which the support is compact and nonempty. Moreover, we show that the set of exceptional times is dense with a full Hausdorff dimension. Besides, we prove that near extinction, the support of the superprocess is concentrated arbitrarily close to the extinction point, thus upgrading the corresponding results in Tribe [Ann. Probab. 20: 286 – 311, (1992)] from $\alpha \in (0, 1/2)$ and $d = 1$ to $\alpha \in (0, 2/3)$ and $d \geq 1$. We further show that the set of such exceptional times also admits a full Hausdorff dimension. This talk is based on a joint work with Leonid Mytnik.

Tails of extinction time and maximal displacement for critical branching killed Lévy process

Haojie HOU *Beijing Institute of Technology, China*, E-mail: houhaojie@bit.edu.cn

Abstract: In this talk, we study asymptotic behaviors of the tails of extinction time and maximal displacement of a critical branching killed Lévy process $(Z_t^{(0,\infty)})_{t\geq 0}$ in which all particles

(and their descendants) are killed upon exiting $(0,\infty)$. Let $\zeta^{(0,\infty)}$ and $M_t^{(0,\infty)}$ be the extinction time and maximal position of all the particles alive at time t of this branching killed Lévy process and define $M^{(0,\infty)} := \sup_{t\geq 0} M_t^{(0,\infty)}$. Under the assumption that the offspring distribution belongs to the domain of attraction of an α-stable distribution, $\alpha \in (1,2]$, and some moment conditions on the spatial motion, we give the decay rates of the survival probabilities

$$P_y(\zeta^{(0,\infty)} > t), \quad P_{\sqrt{t}y}(\zeta^{(0,\infty)} > t)$$

and the tail probabilities

$$P_y(M^{(0,\infty)} \geq x), \quad P_{xy}(M^{(0,\infty)} \geq x).$$

We also study the scaling limits of $M_t^{(0,\infty)}$ and the point process $Z_t^{(0,\infty)}$ under $P_{\sqrt{t}y}(\cdot|\zeta^{(0,\infty)} > t)$ and $P_y(\cdot|\zeta^{(0,\infty)} > t)$. The scaling limits under $P_{\sqrt{t}y}(\cdot|\zeta^{(0,\infty)} > t)$ are represented in terms of super killed Brownian motion. This talk is based on a joint work with Yan-Xia Ren (Peking University) and Renming Song (University of Illinois at Urbana-Champaign).

Precise upper deviation estimates for the maximum of a branching random walk

Lianghui LUO *Université Toulouse III-Paul Sabatier, France*, E-mail: lianghui.luo@math.univ-toulouse.fr

Abstract: We consider a branching random walk on the real line. Under some mild conditions, we study the precise upper deviation estimates for the maximal displacement of particles alive at time n, which improves the results in [2]. In addition, we obtain a description of the extremal process of the branching random walk conditioned on this large deviation event. This introduces a family of point measure playing a role similar to the decoration measures introduced in [1] for branching Brownian motion. As applications, for a two-speed branching random walk, the limiting distribution of the maximum is presented, which extends the results in [1].

References

[1] A. Bovier and L. Hartung. The extremal process of two-speed branching Brownian motion. *Electronic Journal of Probability* **19**(18), 1-28, 2014.

[2] N. Gantert and T. Höfelsauer. Large deviations for the maximum of a branching random walk. *Electronic Communications in Probability* **23**(34), 1-12, 2018.

Two-temperature overlap in the branching Brownian motion

Michel PAIN *Mathematical Institute of Toulouse, France*, E-mail: michel.pain@math.univ-toulouse.fr

Abstract: Motivated by spin glass theory, I will present the study of the overlap between two particles chosen according to Gibbs measures in a branching Brownian motion. In the case

of two Gibbs measures at the same temperature, the behavior is the same as in the case of i.i.d. energies. For different temperatures, the mean overlap is strictly smaller for the BBM in the supercritical phase. Moreover, we can quantify this difference as one of the temperature approaches the critical temperature, using precise results on the decoration of the extremal process of the BBM. This is based on joint works with Benjamin Bonnefont and Olivier Zindy.

Moment-type estimates for characteristic functions

Irina SHEVTSOVA *Lomonosov Moscow State University, Russia*, E-mail: ishevtsova@cs.msu.ru

Abstract: We present some estimates for characteristic functions under the first three given moments. The presented estimates yield, for example, various improvements of the Taylor formula. The case under consideration when only the first three moments are given plays a significant role for construction of convergence rate estimates in such fundamental theorems of probability as the law of large numbers and the central limit theorem. Some of the presented estimates admit further extensions to higher-order moments.

Boundary classification at infinity for time-changed Lévy processes

Quan SHI *AMSS, Chinese Academy of Sciences*, E-mail: quan.shi@amss.ac.cn

Abstract: Starting Markov processes from boundary points of the state space has a long history, dating back all the way to William Feller. In this talk we present different ways to start time-changed Lévy processes from infinity, a question that has attracted a lot of interest in the past decade for instance in the study of self-similar Markov processes or branching processes with state-dependent immigration. Our main results give sharp conditions on the Lévy process and the time-change function to allow entrance and regular boundaries respectively.

Joint work with Leif Döring (Mannheim) and Samuel Baguley (Postdam).

On the moderate deviation principles in the sparse multi-type Erdős Rényi random graph

Wen SUN *University of Science and Technology of China, China*, E-mail: wsun@ustc.edu.cn

Abstract: We present recent progress of the multi-type sparse Erdős Rényi random graphs. Despite that the corresponding central limit results are unknown, we are able to prove the moderate deviation principles for the number of all sizes of connected components, the total number of the connected components, as well as the size of the largest one. The rate functions are given explicitly. The proof relies on a careful study on the multi-type branching process and also on a study of the multi-dimensional compound Poisson process. This is a joint work with Rui YU.

On the subcritical self-catalytic branching Brownian motions

Zhenyao SUN *Beijing Institute of Technology, China*, E-mail: zhenyao.sun@gmail.com

Abstract: Self-catalytic branching Brownian motions (SBBM) are a class of one-dimensional branching Brownian motions that incorporate pairwise catalytic branchings, triggered by the intersection local times of particle pairs. These processes naturally arise as the moment duals of certain reaction-diffusion equations perturbed by multiplicative space-time white noise. For the subcritical case of the catalytic branching mechanism, we construct the SBBM allowing an infinite number of initial particles. Additionally, we establish the coming down from infinity (CDI) property for these systems and characterize their CDI rates. This is based on ongoing joint research with Haojie Hou.

On the prospective minimum of the random walk conditioned to stay nonnegative

Vladimir VATUTIN *Steklov Mathematical Institute, Moscow Russia*, E-mail: vatutin@mi-ras.ru

Abstract: Let

$$S_0 = 0, \quad S_n = X_1 + ... + X_n, \ n \geq 1,$$

be a random walk whose increments belong without centering to the domain of attraction of a stable law with scaling constants a_n, that provide convergence as $n \to \infty$ of the distributions of the sequence $\{S_n/a_n, n = 1, 2, ...\}$ to this stable law. Let $L_{r,n} = \min_{r \leq m \leq n} S_m$ be the minimum of the random walk on the interval $[r, n]$. We show that

$$\lim_{r,k,n \to \infty} \mathbf{P}\left(L_{r,n} \leq y a_k | S_n \leq t a_k, L_{0,n} \geq 0\right), t \in (0, \infty)$$

can have five different expressions, the forms of which depend on the relationships between the parameters r, k and n.

Properties of the prospective minimum of the random walk are important in studying the distribution of the population size of reduced branching processes evolving in random environment.

The BESQ flow and its application to skew Brownian flow

Chengshi WANG *Fudan University, China*, E-mail: cswang21@m.fudan.edu.cn

Abstract: The BESQ flow is a collection of squared Bessel processes driven by the same white noise starting at all space-time points in the right half plane. It was studied by Aïdékon, Hu and Shi in 2023 (arXiv:2306.12716) as the local time flow of a two-sided perturbed reflecting Brownian motion. In this talk, I will mainly introduce the bifurcation events of BESQ flows and study the meeting of flow lines, and give the description of bifurcation points and properties of processes of meeting. These results can be applied to the skew Brownian flow studied by Burdzy and Chen 2001 and Burdzy and Kaspi 2004, which is a flow of solutions to the SDE $dX_t = dB_t + (2p-1)dL_t(X)$ with parameter $0 < p < 1$. I will show how those results work on

the skew Brownian flow, such as the Ray-Knight theorems and bifurcation times. This is a joint work with Elie Aïdékon and Yaolin Yu.

The extremal position of a branching random walk on the general linear group

Hui XIAO *Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China*, E-mail: xiaohui@amss.ac.cn

Abstract: Consider a branching random walk $(G_u)_{u\in\mathbb{T}}$ on the general linear group $\mathrm{GL}(V)$ of a finite dimensional space V, where $\mathbb{T}$ is the associated genealogical tree with nodes u. For any starting point $v \in V\setminus\{0\}$ with $\|v\| = 1$ and $x = \mathbb{R}v \in \mathbb{P}(V)$, let $M_n^x = \max_{|u|=n} \log \|G_u v\|$ denote the maximal position of the walk $\log \|G_u v\|$ in the generation n. We first show that under suitable conditions, $\lim_{n\to\infty} \frac{M_n^x}{n} = \gamma$ almost surely, where $\gamma \in \mathbb{R}$ is a constant. Then, in the case when $\gamma = 0$, under appropriate *boundary conditions*, we refine the last statement by determining the rate of convergence at which M_n^x converges to $-\infty$. We prove in particular that $\lim_{n\to\infty} \frac{M_n^x}{\log n} = -\frac{3}{2\alpha}$ in probability, where $\alpha > 0$ is a constant determined by the boundary conditions. Analogous properties are established for the minimal position. As a consequence we derive the asymptotic speed of the maximal and minimal positions for the coefficients, the operator norm and the spectral radius of G_u. Joint work with Ion Grama and Sebastian Mentemeier.

The extremal process of branching Brownian motion with absorption

Fan YANG *Beijing Normal University, China*, E-mail: fan-yang@bnu.edu.cn

Abstract: In this talk, we study branching Brownian motion with absorption, in which particles undergo Brownian motions with drift and are killed upon reaching the origin. We prove that the extremal process of this branching Brownian motion with absorption converges to a randomly shifted decorated Poisson point process. Furthermore, we show that the empirical distribution function of the maximum of this process converges almost surely to a randomly shifted Gumbel distribution. This talk is based on a joint work with Yaping Zhu.

Pólya urns with graph-based interactions

Dong YAO *Jiangsu Normal University, China*, E-mail: dongyao@jsnu.edu.cn

Abstract: Given a connected graph, place a bin at each vertex. Two bins are called a pair if they share an edge. At discrete times, a ball is added to each pair of bins, and one of the bins gets the ball with probability proportional to its current number of balls raised by some fixed power $\alpha > 0$. We review some known results for this model (called graph-based Pólya urns) on finite graphs, and discuss some recent work concerning its long-time behavior on infinite graphs. We will also mention some variants of this model.

Strong Feller property and ergodicity of generalised Ornstein-Uhlenbeck processes

Jing ZHANG *Beijing Normal University, China*, E-mail: jingz@mail.bnu.edu.cn

Abstract: By a coupling method, we prove some upper bound estimates for the variations of the transition probabilities of a generalized Ornstein–Uhlenbeck process driven by two independent Lévy processes. From those results, we derive the strong Feller property and the exponential ergodicty of the process in some Wasserstein distances under conditions given directly by the characteristic triplets of the driving noises. This is a joint work with Professor Zenghu Li.

Sites for simple random walk in two and more dimensions

Yushu ZHENG *Chinese Academy of Sciences, China*, E-mail: yszheng666@gmail.com

Abstract: On the trace of a discrete-time simple random walk on $\mathbb{Z}^d$ for $d \geq 2$, we consider the evolution of favorite sites, i.e., sites that achieve the maximal local time at a certain time. For $d = 2$, we show that almost surely three favorite sites occur simultaneously infinitely often and eventually there is no simultaneous occurrence of four favorite sites. For $d \geq 3$, we derive sharp asymptotics of the number of favorite sites. This answers an open question of Erdős and Révész (1987), which was brought up again in Dembo (2005).

Speeds of coming down from infinity for Λ-Fleming-Viot supports

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Abstract: Λ-Fleming-Viot process is a probability-measure valued process that is dual to a Λ-coalescent involving multiple collisions. It is well known that such processes can have the compact support property, i.e. its support becomes finite as soon as $t > 0$ even though the initial measure has an unbounded support.

For Λ-Fleming-Viot processes with Brownian spatial motion and with the associated Λ-coalescents coming down from infinity, applying the lookdown representation we obtain asymptotic results characterizing how fast the supports become finite near time 0. Our results are expressed using the asymptotics of tail distribution of the initial measure and speed function of coming down from infinity for the associated Λ-coalescent.

This talk is based on joint work with Zenghu Li and Huili Liu.

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