

北京师范大学数学科学学院
随机数学研究中心学术交流会日程安排

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2022年12月24日（周六）			
报告时间	报告人	报告题目	主持人
08:30-09:00	梁盛利	Convergence of the derivative martingale for the branching random walk in time-inhomogeneous random environment	洪文明
09:00-09:30	陈增彩	Lower deviation and moderate deviation probabilities for maximum of two speed branching Brownian motion	
09:30-10:00	朱雅萍	Survival probability and a large deviation for a supercritical super-Brownian motion with absorption	
10:00-10:30	中场休息		
10:30-11:00	王 涛	Variational formulas for the exit time of Hunt processes generated by semi-Dirichlet forms	何辉
11:00-11:30	姚 丹	Conditional central limit theorem for subcritical branching random walk	
11:30-12:00	程子苓	Construction of age-structured branching processes of remaining lifetime by stochastic equations	
12:00-14:00	中场休息		
报告时间	报告人	报告题目	主持人
14:00-14:30	赵 奕	On some classical problems about Block-structured Markov processes	毛永华
14:30-15:00	谭江睿	Ergodic property for Galton-Watson processes in which individuals have variable lifetimes	
15:00-15:30	杜 倩	Representation of eigenvector of Markov chains with countable states	

Convergence of the derivative martingale for the branching random walk in time-inhomogeneous random environment

Shengli LIANG 梁盛利 (博三, 导师:洪文明)

Abstract: Consider a branching random walk on the real line with a random environment in time (BRWRE). A necessary and sufficient condition for the non-triviality of the limit of the derivative martingale is formulated. To this end, we investigate the random walk in time-inhomogeneous random environment (RWRE), which related the BRWRE by the many-to-one formula. The key step is to figure out the quenched Tanaka's decomposition for the RWRE conditioned to stay non-negative (or above a line), which is interesting itself as well. This is a joint work with Wenming Hong.

Lower deviation and moderate deviation probabilities for maximum of two speed branching Brownian motion

Zengcai CHEN 陈增彩 (博三, 导师:何辉)

Abstract: For variable speed branching Brownian motion, it has been shown in Bovier and Hartung (2014, 2015) that the maximum position M_t of all particles alive at time t , suitably centred by a deterministic function m_t , converge weakly. In this talk, I will focus on the decay rate of the lower deviation and moderate deviation probabilities, as t goes to infinity. For simplicity, we only consider the two speed case that the speed is σ_1 for $s \leq bt$ and σ_2 for $bt < s \leq t$. Based on the joint work with Xinxin Chen, Lisa Hartung and Hui He.

Survival probability and a large deviation for a supercritical super-Brownian motion with absorption

Yaping ZHU 朱雅萍 (博三, 导师:李增沪)

Abstract: We consider a one-dimensional superprocess with a supercritical branching mechanism ψ , where particles move as a Brownian motion with drift $-\rho$ and are killed when they reach the origin. It is known that the process survives with a positive probability if and only if $\rho < \sqrt{2\alpha}$ where $\alpha = -\psi'(0)$. When $\rho > \sqrt{2\alpha}$, we obtain a large-time asymptotic formula for the survival probability. When $\rho < \sqrt{2\alpha}$, Kyprianou et al. (2012) proved that $\lim_{t \rightarrow \infty} \frac{R_t}{t} = \sqrt{2\alpha} - \rho$ almost surely on the survival set, where R_t is the right-most position of the support at time t . Motivated by this work, we investigate its large deviation, in other words, the convergence rate of $\mathbb{P}_{\delta_x}(R_t > \gamma t + \theta)$ as $t \rightarrow \infty$, where $\gamma > \sqrt{2\alpha} - \rho$, $\theta \geq 0$. As a by-product, the related Yaglom-type conditional limit theorem is obtained. Analogous results for branching Brownian motion can be found in Harris et al. (2006, 2007).

Variational formulas for the exit time of Hunt processes generated by semi-Dirichlet forms

Tao WANG 王涛 (博三, 导师:毛永华)

Abstract: Variational formulas for the Laplace transform of the exit time from an open set of a Hunt process generated by a regular lower bounded semi-Dirichlet form are established. While for symmetric Markov processes, variational formulas are derived for the exponential moments of the exit time. As applications, we provide some comparison theorems and quantitative relations of the exponential/polynomial moments and Dirichlet eigenvalues. Based on a joint work (Stochastic Process. Appl. 148 (2022) 380 - 399) with Lu-Jing Huang (FJNU), Kyung-Youn Kim (Chung Hsing U) and Yong-Hua Mao (BNU).

Conditional central limit theorem for subcritical branching random walk

Dan YAO 姚丹 (博二, 导师:洪文明)

Abstract: Consider a subcritical branching random walk on \mathbb{R} . Let $Z_n(A)$ be the number of the individuals in the n -th generation located in $A \in \mathcal{B}(\mathbb{R})$, and $N_n := Z_n(\mathbb{R})$ denote the size of n -th generation. Under some conditions, we prove that when $0 < \mathbf{E}N_1 = m < 1$, for all $x \in \mathbb{R}$, as $n \rightarrow \infty$,

$$\mathcal{L}(Z_n((-\infty, \sqrt{nx}] | N_n > 0) \implies \mathcal{L}(\xi \mathbf{1}_{\{\mathcal{N} \leq x\}}),$$

where \implies means convergence in law, ξ is the Yaglom limit of the Galton-Watson process $\{N_n; n \geq 0\}$ conditioned on non-extinction, \mathcal{N} is a standard normal random variable and independent of ξ . This is a joint work with Wenming Hong.

Construction of age-structured branching processes of remaining lifetime by stochastic equations

Ziling CHENG 程子苓 (博二, 导师:李增沪)

Abstract: We provide constructions of age-structured branching processes of remaining lifetime as pathwise-unique solutions to stochastic integral equations. The extinction probability and critical condition of the processes are also studied.

On some classical problems about Block-structured Markov processes

Yi ZHAO 赵奕 (博二, 导师:张余辉)

Abstract: Block-structured Markov chains (BSMC) have many important applications in various areas. For some special cases of them, there are many relevant results on some classical problems. Aiming to deal with BSMC, two methods are prepared. One is the classical matrix analysis method and the other is comparison method. Moreover, regarding the phases as some kind of “environment”, we can view BSMC as “Markov chains in random environment” or some regime switching Markov chains. We can also get some necessary or sufficient conditions in this view.

Ergodic property for Galton-Watson processes in which individuals have variable lifetimes

Jiangrui TAN 谭江睿 (博二, 导师:张梅)

Abstract: Galton-Watson process in which individuals have variable lifetimes (BPVL) was introduced by Whittle in 1964. In this talk, we construct an equivalent GW process with infinitely countably many types to investigate ergodic properties of BPVL. We first derive formula of calculating the convergence radius of mean matrix and show that, in supercritical case, it is actually the extinction probability of a Galton-Watson process. Next, we give clear criteria for the ergodic property of BPVL. The criteria rely on the properties of lifetime distribution which are easier to be verified than current results. Finally, we show the asymptotic behavior of the total population size of each type of individuals under certain conditions which illustrates the evolution of BPVL. Based on a joint work with Junping Li (CSU) and Mei Zhang (BNU).

Representation of eigenvector of Markov chains with countable states

Qian DU 杜倩 (博二, 导师:毛永华)

Abstract: There is a Markov chain representation of Perron-Frobenius eigenvalue for a primitive matrix with finite states. We use a different approach to get the same result. As well, we generalize this result to the states that are countable. In the process, we see the important role of Markov chains.
