



东北师范大学数学与统计学院

School of Mathematics and Statistics, Northeast Normal University

2021 年随机系统新进展

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报
告

吉林·长春

2021 年 6 月 19 日-20 日

线上报告日程

腾讯会议 ID: 584 4360 0636		
2021 年 06 月 19 日下午 (北京时间)		
时间	主讲专家及题目	主持人
15:00-15:40	Peter E. Kloeden (德国图宾根大学) The Euler Scheme for Caputo Fractional Stochastic Differential Equations	(英国思克莱德大学) 毛学荣
15:40-16:20	张希承 (武汉大学) Cauchy Problem of Stochastic Kinetic Equations	
16:20-17:00	鲍建海 (天津大学) Exponential Ergodicity for a Class of Markov Processes with Interactions	
17:00-20:00	休息	
2021 年 06 月 19 日晚上 (北京时间)		
20:00-20:40	殷刚 (美国康涅狄格大学) Stochastic Kolmogorov Systems: Some Recent Progress and Applications	(英国斯旺西大学) 袁成桂
20:40-21:20	李增沪 (北京师范大学) Branching Processes in Varying Environments	
21:20-22:00	韩晓莹 (美国奥本大学) Dynamics of The Lottery Ecological Competition Model in Stochastic Environments	

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时间	主讲专家及题目	主持人
15:00-15:40	毛学荣 (英国思克莱德大学) Positivity Preserving Truncated Euler-Maruyama Method for Stochastic Lotka-Volterra Model	(安徽工程大学) 费为银
15:40-16:20	王凤雨 (天津大学) Distribution Dependent Reflecting SDEs	
16:20-17:00	袁成桂 (英国斯旺西大学) Distribution Dependent SDEs Driven by Fractional Brownian Motions	

17:00-19:00

休息

2021 年 06 月 20 日晚上 (北京时间)

19:00-19:40	邵井海 (天津大学) Optimal Stopping Problem for Jump-diffusion Processes with Regime-switching	(东华大学) 胡良剑
19:40-20:20	刘伟 (江苏师范大学) Time-Fractional SPDE	

20:20-20:40

休息

20:40-21:20	吴付科 (华中科技大学) Stochastic Functional Differential Equations with Infinite Delay under Non-Lipschitz Coefficients: Existence and Uniqueness, Markov Property, Ergodicity, and Asymptotic Log-Harnack Inequality	(天津大学) 邵井海
21:20-22:00	胡军浩 (中南民族大学) Stabilization in Distribution of Hybrid Systems by Intermittent Noise	

Exponential Ergodicity for a Class of Markov Processes with Interactions

鲍建海 (E-mail: jianhaibao@tju.edu.cn)

天津大学

Abstract: In this talk, we establish exponential ergodicity for a class of Markov processes with interactions, including two-factor type processes and Gruschin type processes. The proof is elementary and direct via the Markov coupling technique. This talk is based on a join work with Jian Wang.

个人简介: 鲍建海, 天津大学应用数学中心特聘研究员。2012年9月-2013年8月在美国韦恩州立大学从事 Research Fellow, 2013年获英国斯旺西大学的概率论与数理统计专业博士学位。2016年11月-2018年10月在英国斯旺西大学做博士后。主要研究领域: 随机分析, 泛函随机微分方程, 马氏切换随机微分方程。先后在 Stochastic Processes and their Applications、Bernoulli、Electronic Journal of Probability、Journal of Theoretical Probability、Journal of Applied Probability、Potential Analysis、SIAM Journal on Control and Optimization、SIAM Journal on Applied Mathematics 等期刊上发表多篇学术论文。

Stabilization in Distribution of Hybrid Systems by Intermittent Noise

胡军浩 (E-mail: junhaohu74@163.com)

中南民族大学

Abstract: For many stochastic hybrid systems in the real world, it is inappropriate to study if their solutions will converge to an equilibrium state (say, 0 or the trivial solution) but more appropriate to discuss if the probability distributions of the solutions will converge to a stationary distribution. The former is known as the asymptotic stability of the trivial solution while the latter the stability in distribution. In this talk we aim to determine whether or not a stochastic state feedback control can make a given nonlinear hybrid differential equation, which is not stable in distribution, to become stable in distribution. We will refer to this problem as stabilisation in distribution by noise or stochastic stabilisation in distribution. Although the stabilisation by noise in the sense of almost surely exponential stability of the trivial solution has been well studied, there is little known on the stabilisation in distribution by noise.

个人简介: 胡军浩，中南民族大学数学与统计学学院教授、院长。2007年毕业于华中科技大学，获理学博士学位。2008年至2010年，在华中科技大学从事博士后研究。2011年至2012年，在英国思克莱德大学从事博士后研究。2014年被中南民族大学聘为教授。主要从事随机系统理论与应用、动力系统等领域的研究。主持两项国家自然科学基金面上项目、一项国家自然科学基金青年项目、湖北省自然科学基金等，参加国家自然科学基金重点项目。已在国内外学术期刊上发表论文五十余篇。获得湖北省自然科学奖（三等奖）。

Dynamics of The Lottery Ecological Competition Model in Stochastic Environments

韩晓莹 (E-mail: xzh0003@auburn.edu)

美国奥本大学

Abstract: In this talk we will first introduce a discrete-time lottery model for ecological species in a single habitat competing for a limited number of sites. Then a diffusion approximation is derived for the discrete system when the birth and death rate parameters are stochastic processes. Long term dynamics for a two-species model in non-stationary environments will be presented first. Then dynamics for an n-species model in stationary environments will be discussed.

个人简介: 韩晓莹, 美国奥本大学 (Auburn University) 数学与统计学系教授。2009 年获得 Northrop Grumman Research Award, 2012 年获得 Associate of the Society of Actuaries, 并且获得 Educational Institution ASA Grant, 2013 年获得 NSF Travel Award, 2014 年获得 AWM-NSF Travel Award, 2015 年获得 Jack B. Brown Endowed Faculty Award, 并且获得 Simon's Collaboration Grants for Mathematicians 等。主要从事随机非自治动力系统及其应用领域研究, 尤其是随机微分方程的建模、分析和模拟。已在 SIAM Journal on Mathematical Analysis、Journal of Differential Equations、Journal of Computational Physics 等国际知名杂志发表论文三十余篇, 出版专著三部。

Time-Fractional SPDE

刘伟 (E-mail: weiliu@jsnu.edu.cn)

江苏师范大学

Abstract: In this talk we present a method to solve (stochastic) evolution equations on Gelfand triples with general time-fractional derivative based on pseudo-monotonicity techniques. In particular, the strong dissipativity of generalized time-fractional derivatives on Gelfand triples of properly in time weighted L^2 -path spaces is proved. As a consequence one obtains existence and uniqueness of solutions to semilinear and quasilinear evolution equations with generalized time-fractional derivatives. This talk is mainly based on the joint works with Michael Rockner and Jose Luis da Silva.

个人简介: 刘伟, 江苏师范大学数学与统计学院教授、院长, 南开大学兼职教授、博导。2009 年博士毕业于德国比勒菲尔德大学数学系, 先后获得德国 WLUG 优秀博士论文、英国剑桥大学 Visiting Fellowship、教育部自然科学二等奖、江苏省数学成就奖和江苏省青年科技奖, 入选江苏省特聘教授、江苏省“333 工程”中青年科技领军人才和江苏省“青蓝工程”科技创新团队带头人。主要从事随机偏微分方程和随机动力系统等领域的研究, 在 Springer 出版英文专著一部, 在《Stochastic Process. Appl.》, 《J. Funct. Anal.》, 《J. Differential Equations》, 《SIAM J. Math. Anal》等国际期刊发表论文三十余篇, 主持国家自然科学基金“优青”项目、重点项目子课题和江苏省杰出青年基金等科研项目。现任中国概率统计学会理事, 《应用概率统计》等杂志编委。

Branching Processes in Varying Environments

李增沪 (E-mail: lizh@bnu.edu.cn)

北京师范大学

Abstract: Branching structures have been discovered in the study of a number of physical systems. Scaling limit theorems establish connections between discrete-state and continuous-state branching models. In this talk, we present a direct construction for the continuous-state branching process in varying environment introduced by Bansaye and Simatos (2015, EJP) as the pathwise unique solution to a stochastic equation. A scaling limit theorem for the related discrete-state models is proved. The results clarify the behavior of the continuous-state process at the “bottlenecks” and settle a problem left open in Bansaye and Simatos (2015, EJP). This is based on the joint work with Rongjuan Fang and Jiawei Liu.

个人简介: 李增沪，北京师范大学数学科学学院教授、博士生导师，北京师范大学数学与复杂系统教育部重点实验室主任，国家级人才项目获得者，Fellow of Institute of Mathematical Statistics (美国)。主要从事测度值过程、分枝过程、仿射过程、迷向随机流、随机环境模型、随机金融模型等领域的研究。担任中国概率统计学会副理事长(2006-2014)、Bernoulli Society for Mathematical Statistics and Probability 理事(2009-2013)、De Gruyter Studies in Mathematics 丛书编委、Acta Mathematica Sinica (English Series) 等刊物编委。多次受邀在国际会议作报告，受邀在国际学术会议“随机过程及其应用国际会议”(第31届，2006年巴黎)上作1小时大会报告。研究成果多次受到国际一流学者的引用。

Positivity Preserving Truncated Euler-Maruyama Method for Stochastic Lotka-Volterra Model

毛学荣 (E-mail: x.mao@strath.ac.uk)

英国思克莱德大学

Abstract: Most of SDE models in epidemics, ecology, biology, finance etc. are highly nonlinear and do not have explicit solutions. Monte Carlo simulations have played a more and more important role. This talk will point out several well-known numerical schemes may fail to preserve the positivity or moment of the solutions to SDE models. Reliable numerical schemes are therefore required to be designed so that the corresponding Monte Carlo simulations can be trusted. The talk will then concentrate on new numerical schemes for the well-known stochastic Lotka-Volterra model for interacting multi-species. This model has some typical features: highly nonlinear, positive solution and multi-dimensional. The known numerical methods including the tamed/truncated Euler-Maruyama (EM) applied to it do not preserve its positivity. The aim of this talk is to modify the truncated EM to establish a new positive preserving truncated EM (PPTM).

个人简介: 毛学荣, 英国思克莱德大学(University of Strathclyde)教授, 爱丁堡皇家协会会士。2015 年获英国 Leverhulme 研究奖, 2016 年度英国皇家协会 Wolfson 研究功勋奖。主要从事随机系统稳定性、时滞随机系统的稳定性与控制、随机微分方程数值解等领域的研究。发表学术论文 300 余篇, 被引用超过 23000 次, 其中 H-index 指标为 73, i10-index 指标为 208, 发表论文 35 篇次进入 Science Direct 最热门文献 (TOP 25 Hottest Articles)。出版学术专著 5 部, 学术专著《Stochastic Differential Equations and Applications》在 Google 被引 4300 余次。

The Euler Scheme for Caputo Fractional Stochastic Differential Equations

Peter E. Kloeden (E-mail: kloeden@math.uni-frankfurt.de)

德国图宾根大学

Abstract: We construct and investigate an Euler-Maruyama type scheme for Caputo stochastic fractional differential equations (for short Caputo SFDE) of order $\alpha \in (1/2, 1)$ with coefficients satisfying standard Lipschitz and linear growth bound conditions. The strong convergence rate of this scheme is established. In particular, it is $\alpha - 1/2$ when the coefficients of the SFDE are independent of time. In addition, the convergence and stability of an exponential Euler-Maruyama scheme for bilinear scalar Caputo SFDEs is considered.

个人简介: Peter E. Kloeden, 德国图宾根 (Tuebingen University) 大学数学研究所教授, 华中科技大学教授、博士生导师。主要从事随机微分方程数值解和随机动力系统等领域的研究, 著作《Numerical solution of stochastic differential equations》在 Google 学术中的引用超过 6000 次。曾任 SIAM J. Numerical Analysis、Foundation of Computational Mathematics、Nonlinear Analysis: Theory, Methods and Applications 等国际期刊编委。现任 Discrete and Continuous Dynamical Systems-Series B 期刊主编以及 Journal of Difference Equations and Applications、Stochastics & Dynamics、Advanced Nonlinear Studies 等十余种期刊编委。

Optimal Stopping Problem for Jump-diffusion Processes with Regime-switching

邵井海 (E-mail: shaojh@bnu.edu.cn)

天津大学

Abstract: This talk concerns the optimal stopping problem in an infinite time horizon for jump-diffusion processes with regime-switching. It is found that the jumps of the studied process have important impact on the existence of the optimal stopping times. We provide certain sufficient conditions to ensure the existence of optimal stopping times. Also, an illustrative example is given to show the sharpness of these conditions. Moreover, the associated value function is characterized to be a unique viscosity solution to a coupled system of Hamilton-Jacobi-Bellman equations. This talk is based on the joint works with Taoran Tian.

个人简介: 邵井海, 天津大学应用数学中心教授、博士生导师。2006 年获得北京师范大学与法国第戎大学 (Dijon University) 的理学博士学位, 同年在北京师范大学留校任教。2007 年, 赴德国伯恩大学跟随 K. Sturm 教授做两年博士后研究, 同年获得中国数学学会“钟家庆数学奖”, 2008 年, 获得“全国百篇优秀博士学位论文奖”。主要从事概率论遍历性理论、随机分析、随机微分方程等领域的研究工作, 在 *Journal of Functional Analysis*、*Probability Theory and Related Fields*、*SIAM Journal on Control and Optimization*、*SIAM Journal on Mathematical Analysis*、*Stochastic Processes and their Applications* 等期刊发表论文多篇。

**Stochastic Functional Differential Equations with Infinite Delay under
Non-Lipschitz Coefficients: Existence and Uniqueness, Markov Property,
Ergodicity, and Asymptotic Log-Harnack Inequality**

吴付科 (E-mail: wufuke@hust.edu.cn)

华中科技大学

Abstract: This paper focuses on a class of stochastic functional differential equations with infinite delay and non-Lipschitz coefficients. Under one-sided linear growth and non-Lipschitz conditions, this paper establishes the existence and uniqueness of strong solutions and strong Markov properties of the segment processes. Under additional assumption on non-degeneracy of the diffusion coefficient, exponential ergodicity for the segment process is derived by using asymptotic coupling method. In addition, the asymptotic log-Harnack inequality is established for the associated Markovian semigroup using coupling and change of measures, which implies the asymptotically strong Feller property. Finally, an example is given to demonstrate these results.

个人简介: 吴付科，华中科技大学数学与统计学院教授、博士生导师，国家优秀青年基金获得者，SCI 期刊 IET Control Theory & Applications 编委。2011 年入选教育部新世纪优秀人才支持计划，2012 年入选华中科技大学“华中学者”，2015 年获得湖北省自然科学二等奖，2017 年获得英国皇家学会“牛顿高级学者”基金。主持五项国家自然科学基金，一项教育部新世纪优秀人才基金，一项英国皇家学会“高级牛顿学者”基金和一项美国数学学会（AMS）访问基金，出版一部专著和一部译著。主要从事随机微分方程以及相关领域的研究，在 SIAM Journal on Numerical Analysis、SIAM Journal on Control and Optimization、Journal of Differential Equations、Automatica 和 IEEE Transactions on Automatic Control 等国际期刊发表论文九十余篇。

Distribution Dependent Reflecting SDEs

王凤雨 (E-mail: wangfy@tju.edu.cn)

天津大学

Abstract: To characterize the Neumann problem for nonlinear Fokker-Planck equations, we investigate distribution dependent reflecting SDEs (DDRSDEs) in a domain. We prove the well-posedness and establish functional inequalities for reflecting SDEs with singular drifts. By establishing a criterion deducing the well-posedness of DDRSDEs from that of reflecting SDEs, and by using coupling methods, these results are extended to DDRSDEs with singular or monotone coefficients. Moreover, three different types of exponential ergodicity are derived for DDRSDEs under dissipative, partially dissipative, and fully non-dissipative conditions respectively.

个人简介: 王凤雨, 天津大学数学学院教授、博士生导师, 国家级人才项目获得者。曾获国家自然科学三等奖、教育部科技进步一等奖、教育部自然科学一等奖。主要从事概率统计研究, 在 *The Annals of Probability*、*Probability Theory and Related Fields*、*Stochastic Processes and their Applications*、*Bernoulli*、*Journal of Functional Analysis*、*Journal of Differential Equations* 等国际期刊发表论文二百余篇。现任 *Electronic Journal of Probability*、*Electronic Communications in Probability*、*Journal of Theoretical Probability*、*Science China. Mathematics* 和 *Frontiers of Mathematics in China* 等期刊编委。

Distribution Dependent SDEs Driven by Fractional Brownian Motions

袁成桂 (E-mail:c.yuan@swansea.ac.uk)

英国斯旺西大学

Abstract: In this talk, a class of distribution dependent stochastic differential equations driven by fractional Brownian motions with Hurst parameter $H \in (1/2, 1)$ is investigated. The well-posedness of this type equations is proved, and a general result on the Bismut formula for the Lions derivative is established. As applications, we provide the Bismut formulas of this kind for both non-degenerate and degenerate cases, and obtain the estimates of the Lions derivative and the total variation distance between the laws of two solutions. This is a joint work with Xiliang Fan, Xing Huang and Yongqiang Suo.

个人简介: 袁成桂, 英国斯旺西大学 (Swansea University) 教授。1994 年获得中南大学数学专业博士学位, 2003 年获得英国斯特莱斯克莱德大学 (University of Strathclyde) 博士学位。主要从事随机混合系统控制、SDE 和 SPDE 的稳定性、SDE 数值分析、金融数学及人口动态学等领域的研究, 在 *Stochastic Processes and their Applications*、*SIAM Journal on Numerical Analysis*、*SIAM Journal on Control and Optimization* 国际期刊上发表学术论文百余篇, 出版学术专著多部。

Stochastic Kolmogorov Systems: Some Recent Progress and Applications

殷刚 (E-mail: gyin@uconn.edu)

美国康涅狄格大学

Abstract: We present some of our recent work on stochastic Kolmogorov systems. The motivation stems from dealing with important issues of ecological and biological systems. Focusing on environmental noise, we will address such fundamental questions: "what are the minimal conditions for long-term persistence of a population, or long-term coexistence of interacting species". [The talk reports some of our joint work with D.H. Nguyen, N.T. Dieu, N.H. Du, and N.N Nguyen.]

个人简介: 殷刚 (Gang George Yin), 美国康涅狄格大学数学系教授。2001 年获得 Charles H. Gershenson Distinguished Faculty Fellowships, 2002 年当选 IEEE Fellow, 2011 年任 SIAM 举办的控制论及其应用组织委员会主席, 2015 年当选 SIAM Fellow, 2017 年评为杰出教授。主要从事随机控制、应用概率和随机过程、随机近似与优化、奇异摄动、随机系统的理论和数值解等领域的研究。发表论文四百余篇, 出版专著九部。现任 SIAM Journal on Control and Optimization 期刊主编以及 Applied Mathematics & Optimization 等期刊的副主编和编委。

Cauchy Problem of Stochastic Kinetic Equations

张希承 (E-mail: xichengzhang@gmail.com)

武汉大学

Abstract: In this paper we establish the optimal regularity estimates for the Cauchy problem of stochastic kinetic equations with random coefficients in anisotropic Besov spaces. As applications, we study the nonlinear filtering problem for a degenerate diffusion process, and obtain the existence and regularity of conditional probability densities under a few assumptions. Moreover, we also show the well-posedness for a class of super-linear growth stochastic kinetic equations driven by velocity-time white noises. (This is a joint work with Xiaolong Zhang)

个人简介: 张希承, 武汉大学数学与统计学院教授、博士生导师。2001 年至 2009 年先后在葡萄牙里斯本大学 (University of Lisboa)、法国拉罗谢尔大学 (University of La Rochelle)、澳大利亚新南威尔士大学 (The University of New South Wales) 从事博士后研究。2006 年至 2007 年, 受德国洪堡奖学金资助, 于德国比勒费尔德大学 (Bielefeld University) 从事随机分析研究。先后主持国家自然科学基金项目四项, 2010 年、2013 年、2016 年均获得国家级人才项目。主要研究领域包括 Wiener 泛函以及 Poisson 泛函的 Malliavin 分析, 随机流, 随机偏微分方程, 动力系统随机扰动的大偏差, Navier-Stokes 方程的概率方法等。迄今, 已在 The Annals of Probability、Probability Theory and Related Fields、Stochastic Processes and their Applications、Journal of Functional Analysis、Journal of Differential Equation、Potential Analysis、The Annals of Applied Probability、Communications in Mathematical Physics 等期刊上发表论文百余篇。