The 2nd Sino-Russian Seminar on Asymptotic Methods in Probability Theory and Mathematical Statistics

The 10th Chinese Symposium on Probability Limit Theory and Statistical Large Sample Theory

2017

September 23—27，2017

Changchun · China

Preface

The 2nd Sino-Russian Seminar on Asymptotic Methods in Probability Theory and Mathematical Statistics & The 10th Chinese Symposium on Probability Limit Theory and Statistical Large Sample Theory will take place on September 23-27, 2017. The conference is organized by the "Chinese Association for Applied Statistics (CAAS)", "China Society of Probability and Statistics" and "Specialized Committee of Probability Limit Theory and Statistical Large Sample Theory", and undertaken by School of Mathematics and Statistics, Northeast Normal University (NENU). It will be held in the campus of NENU in Changchun, Jilin, China. The purpose of the conference is to promote the research and application of the limit theory, large sample theory and other related fields and create collaboration opportunities for all researchers to communicate the latest research findings.

The conference will include invited sessions and contributed sessions. International renowned probability and statistics experts will present their most current cutting-edge research work in the limit theory, large sample theory and other related fields.

Academic Committee

- Zhidong BAI (Northeast Normal University, baizd@nenu.edu.cn)
- Mufa Chen (Beijing Normal University, mfchen@bnu.edu.cn)
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- Shurong ZHENG (Northeast Normal University, zhengsr@nenu.edu.cn)

Guidance

1. Hotel Check in

Date: September 23

Location: Hainan Airline (HNA) Noble Hotel

Address: No. 4501 Renmin Street, Changchun

Telephone: 400-6886-687

2. Catering Arrangement

September 23 Dinner Buffet (1st floor of Lin Ye Hotel)

September 24 Luncheon Buffet (1st floor of Lin Ye Hotel)

Conference Banquet (Noble Palace Chinese Restaurant, 2nd floor of HNA Noble Hotel)

September 25 Luncheon Buffet (1st floor of Lin Ye Hotel)

Dinner Buffet (1st floor of Lin Ye Hotel)

September 26 Luncheon Buffet (1st floor of Lin Ye Hotel)

Dinner Buffet (1st floor of Lin Ye Hotel)

3. Contact Information

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Conference Program

Day One: Sunday, September 24, 2017 Academic Hall of Library, NENU		
9:00 – 9:30		Opening speeches : Zhengyan Lin (Zhejiang University) Mikhail Lifshits (St.Petersburg State University and Linkoping University) Jianhua Guo (Northeast Normal University)
9:30 – 9:45		Photographing
9:45– 10:15		Tea Break
Session 1 Chair: Baiqi Miao	10:15 – 10:45	Speaker: Mufa Chen (Beijing Normal University) Trilogy on computing maximal eigenpair
	10:45 – 11:15	Speaker: Mikhail Lifshits (St.Petersburg State University and Linkoping University) On small deviation probabilities related to stationary sequences and processes
	11:15 – 11:45	Speaker: Guangming Pan (Nanyang Technological University of Singapore) High dimension unit root test
11:45 – 14:00		Lunch (Lin Ye Hotel)
Session 2 Chair: Zhonggen Su	14:00 – 14:30	Speaker: Qihua Wang (Academy of Mathematics and Systems Science Chinese Academy of Sciences) LPRE criterion based estimating equation approaches for the error-in-covariables multiplicative regression models

	14:30 – 15:00	Speaker: Anatoly Mogulskiy (Sobolev Institute of Mathematics of Russian Academy of Sciences and Novosibirsk State University) Large deviation principle for trajectories of processes with independent increments
	15:00 – 15:30	Speaker: Zhao Dong (Academy of Mathematics and Systems Science Chinese Academy of Sciences) Limiting behavior of stationary measures for stochastic evolution systems
15:30 – 16:00		Tea Break
Session 3 Chair: Anatoly Mogulskiy	16:00 – 16:30	Speaker: Zhonggen Su (Zhejiang University) A law of iterated logarithm for longest increasing subsequences
	16:30 – 17:00	Speaker: Alexander Tikhomirov (Komi Science Center of Ural Division of Russian Academy of Sciences) On the local semicircular law for random matrices under weak moment conditions
	17:00 – 17:30	Speaker: Lihu Xu (UM Zhuhai Research Institute) Non-normal approximations by Stein's method
18:30 – 20:30		Conference Banquet (HNA Noble Hotel)

Day Two: Monday, September 25, 2017 Academic Hall of Library, NENU		
Session 4 Chair: Lixin Zhang	8:30 – 9:00	Speaker: Shige Peng (Shandong University) Nonlinear distribution constructed by phi-max-mean algorithm
	9:00 – 9:30	Speaker: Yury Khokhlov (Moscow State University) Multivariate analogs of some discrete distributions
	9:30 – 10:00	Speaker: Zengjing Chen (Shandong University) Central limit theorem for a set of probability measures
10:00 – 10:30		Tea break
Session 5 Chair: Yury Khokhlov	10:30 – 11:00	Speaker: Vladimir Ulyanov (Moscow State University) Asymptotic analysis of the generalized random graphs with random vertex weights
	11:00 – 11:30	Speaker: Lixin Zhang (Zhejiang University) Powerful Covariate-Adaptive Design with Minimize Selection Bias
	11:30 – 12:00	Speaker: Andrei Zaitsev (St.Petersburg Department of Mathematical Institute of Russian Academy of Sciences) Estimates of the concentration functions in the Littlwood-Offord problem
12:00 – 14:00		Lunch (Lin Ye Hotel)
Session 6 Chair: Shurong Zheng	14:00 – 14:30	Speaker: Alexander Nazarov (St.Petersburg State University and PDMI RAS) The small ball probabilities for Gaussian random fields and the eigenvalues of the operators tensor product
	14:30 – 15:00	Speaker: Yijun Hu (Wuhan University) Time consistency for set-valued dynamic risk measures for bounded discrete-time processes

	15:00 – 15:30	Speaker: Dmitry Zaporozhets (St.Petersburg Department of Mathematical Institute of Russian Academy of Sciences) Random convex hulls
15:30 – 16:00		Tea break
Session 7 Chair: Alexander Nazarov	16:00 – 16:30	Speaker: Irina Shevtsova (Moscow State University) Convergence rate estimates in the global central limit theorem for Poisson-binomial, Poisson, and Mixed Poisson random sums
	16:30 – 17:00	Speaker: Alexey Naumov (Skolkovo Institute of Science and Technology) Gaussian comparison and anti-concentration inequalities for norms of Gaussian random elements
	17:00 – 17:30	Speaker: Shurong Zheng (Northeast Normal University) CLT for Linear Spectral Statistics of Large Dimensional Sample Covariance Matrices with Dependent Data
After 17:30		Dinner (Lin Ye Hotel)

Day Three: Tuesday, September 26, 2017 Room 403, School of Mathematics and Statistics, NENU		
Session 8 Chair: Qunying Wu	8:30 – 8:50	Speaker: Xia Chen (Shaanxi Normal University) Penalized empirical likelihood for partially linear models with errors in all variables
	8:50 – 9:10	Speaker: Yuping Song (Shanghai Normal University) One-step Local M-estimator for Integrated Jump-diffusion Models with Application to Financial High-Frequency Data
	9:10 – 9:30	Speaker: Min Xiao (Zhejiang Gongshang University) Geometric Shrinkage Estimation of Variances
9:30-10:00		Tea Break
Session 9 Chair: Xia Chen	10:00 – 10:20	Speaker: Qibing Gao (Nanjing Normal University) Asymptotic properties of maximum quasi-likelihood estimators in generalized linear models with diverging number of covariates
	10:20 – 10:40	Speaker: Xin Deng (Anhui University) An exponential inequality for WOD sequences and its application to M estimators in linear models
	10:40 – 11:00	Speaker: Yi Wu (Anhui University) Strong convergence theorems for widely orthant dependent random variables under sub-linear expectations and its statistical applications
11:00 – 14:00		Lunch (Lin Ye Hotel)
14:00 – 18:00		Trip to Jingyuetan
After 18:00		Dinner (Lin Ye Hotel)

Day Three: Tuesday, September 26, 2017 Room 501, School of Mathematics and Statistics, NENU		
Session 10 Chair: Zuoxiang Peng	8:30 – 8:50	Speaker: Yongsheng Song (Academy of Mathematics and Systems Science Chinese Academy of Sciences) Normal Approximation by Stein's Method under Sublinear Expectations
	8:50 – 9:10	Speaker: Pingyan Chen (Jinan university) Strong laws for weighted sums of ψ-mixing random variables and applications in errors-in-variables
	9:10 – 9:30	Speaker: Ting Cai (Hubei Normal University) Probability inequalities for sums of NSD random variables and applications
9:30 – 10:00		Tea break
Session 11 Chair: Yongsheng Song	10:00 – 10:20	Speaker: Zuoxiang Peng (Southwest University) Extremes on bivariate Gaussian triangular arrays
	10:20 – 10:40	Speaker: Junfeng Liu (Nanjing Audit University) Central limit theorem for the solution to the heat equation with moving time
	10:40 – 11:00	Speaker: Yingyin Lu (Southwest University) Asymptotics of maxima and minima of discrete and continuous time stationary Gaussian processes
11:00 – 14:00		Lunch (Lin Ye Hotel)
14:00 – 18:00		Trip to Jingyuetan
After 18:00		Dinner (Lin Ye Hotel)

Day Three: Tuesday, September 26, 2017 Room 415, School of Mathematics and Statistics, NENU		
Session 12 Chair: Yuebao Wang	8:30 – 8:50	Speaker: Jinghai Shao (Tianjin University) Invariant Measures for Path-Dependent Random Diffusions
	8:50 – 9:10	Speaker: Lin Xie (Northwest Normal University) Asymptotic ruin probability of a dependent renewal risk model based on entrance processes with investment under interest force
	9:10 – 9:30	Speaker: Shengzhi Wu (Soochow University) Pricing Timer Options in a Perturbed Stochastic Volatility Model
9:30 – 10:00		Tea Break
Session 13 Chair: Jinghai Shao	10:00 – 10:20	Speaker: Yuebao Wang (Soochow University) The uniform local asymptotics of the total net loss process in a time-dependent bidimensional renewal modelA necessary and sufficient condition for subexponentiality of the product
	10:20 – 10:40	Speaker: Xiequan Fan (Tianjin University) Self-normalized Cramer-type large deviations for martingales
	10:40 – 11:00	Speaker: Zhiyan Shi (Jiangsu University) The Shannon-McMillan Theorem for Markov Chains Indexed By a Cayley Tree in Random Environment
	11:00 – 11:20	Speaker: Weiguo Yang (Jiangsu University) Hidden Markov tree models: definition, properities and SLLN
11:20 – 14:00		Lunch (Lin Ye Hotel)
14:00 – 18:00		Trip to Jingyuetan
After 18:00		Dinner (Lin Ye Hotel)

Speech 1

Trilogy on Computing Maximal Eigenpair
Mufa Chen (Beijing Normal University)

Abstract: The eigenpair here means the twins of eigenvalue and corresponding eigenvector. The talk introduces three steps of our study on computing the maximal eigenpair. In the first two steps, we construct efficient initials for a known but dangerous algorithm, first for tridiagonal matrices and then for the irreducible matrices, having nonnegative off-diagonal elements. In the third step, we present two global algorithms which are still efficient and work well for a quite large class of matrices, even complex for instance. The eigenpair is mainly used in describing various stability speed, for instance, to describe the phase transitions in statistical physics, where the author's original motivation comes from. Actually, the topic has a large range of applications: the Google's search (the PageRank), the input--output method in economy, the stability speed in stochastic systems, the principal component analysis in BigData, the image recognition, the random algorithm (MCMC), et al.

Speech 2

On small deviation probabilities related to stationary sequences and processes
Mikhail Lifshits (St.Petersburg State University and Linkoping University)

Abstract: We study asymptotics of small deviation probabilities in l_2-norm for weighted sums of a centered Gaussian stationary sequence satisfying some minor regularity condition and describe the difference with the well-studied case of the i.i.d. sequences. In a similar way, we find logarithmic asymptotics of L_2-small deviation probabilities for weighted stationary Gaussian processes (both for real and complex-valued) having power-type discrete or continuous spectrum. Our main arguments come from the spectral theory of pseudo-differential operators by M. Birman and M. Solomyak.

Speech 3

High dimension unit root test
Guangming Pan (Nanyang Technological University of Singapore)

Abstract: This talk is to first discuss the first few largest eigenvalues of sample covariance matrices generated from nonstationary data. We then propose a test for high dimensional unit root.

Speech 4

LPRE criterion based estimating equation approaches for the error-in-covariables multiplicative regression models
Qihua Wang(Academy of Mathematics and Systems Science Chinese Academy of Sciences)

Abstract: In this paper, we propose two estimating equation based methods to estimate the regression parameter vector in the multiplicative regression model when a subset of covariates are subject to measurement error but replicate measurements of their surrogates are available. Both methods allow the number of replicate measurements to vary between subjects. No parametric assumption is imposed on the measurement error term and he true covariates which are not observed in the data set. Under some regularity conditions, the asymptotic normality is established for both methods. Furthermore, our two proposed error corrected methods is com-pared in theory when the distribution of the measurement error followed from the normal distribution. Some simulation studies are conducted to assess the performances of the proposed methods. Real data analysis is used to illustrate our methods.

Speech 5

Large deviation principle for trajectories of processes with independent increments

Anatoly Mogulskiy
(Sobolev Institute of Mathematics of Russian Academy of Sciences and Novosibirsk State University)

Abstract: The talk is devoted to the large deviation principles for processes with independent increments. The results include so-called local and extended large deviation principles that hold in those cases where the "usual" (classical) large deviation principle is unapplicable.

Speech 6

Limiting Behavior of Stationary Measures for Stochastic Evolution Systems

Zhao Dong (Academy of Mathematics and Systems Science Chinese Academy of Sciences)

Abstract: The limiting behavior of stochastic evolution processes with small noise intensity ε is investigated in distribution-based approach. Le μ^{ε} tbe stationary measure for stochastic process X^{ε} with small ε and X^{0} be a semiflow on a Polish space. Assume that $\{\mu^{\varepsilon}:0<\varepsilon<\varepsilon_0\}$ is tight. Then all their weak* - limits are X^{0}-invariant and their supports are contained in Birkhoff center of X0. Applications are made to various stochastic evolution systems, including stochastic partial differential equations, stochastic functional differential equations, stochastic ordinary differential equations driven by Brownian motion or Levy process, as well as stochastic approximation with constant step.

Speech 7

A law of iterated logarithm for longest increasing subsequences

Zhonggen Su (Zhejiang University)

Abstract: The longest increasing subsequences is a well-studied object in combinatorial probability dated back to Erdos in 1930s, but there have been a lot of activities and progresses in the past decades.

In particular, people have established a number of limit theorems such as the law of large numbers, Tracy -Widom law, asymptotic tails in literature. In this talk I shall report a new result about the length of longest increasing subsequences, that is a law of the iterated logarithm. It is based on a nice observation due to M. Ledoux (2016).

Speech 8

On the local semicircular law for random matrices under weak moment conditions

Alexander Tikhomirov
(Komi Science Center of Ural Division of Russian Academy of Sciences)

Abstract: We prove a local version of the semicircular law for Wigner matrices under weak moment conditions. We apply Stein's method and some new ideas which help to simplify the proof of the local laws. The talk will be based on joint results with F. Goetze and A. Naumov.

Speech 9

Non-normal approximations by Stein's method

Lihu Xu (UM Zhuhai Research Institute)

Abstract: We shall talk two type of non normal approximations: stable law approximation and diffusion approximation. For the first approximation, we prove a general inequality of Wasserstein distance between the approximation sequence and the target stable distribution, in which Stein kernel and Stein discrepancy are involved. For the second approximation, we shall use a Malliavin calculus and exchangeable pair to build a framework, which can be applied to study the rate of Langevin sampling.

Speech 10

Nonlinear distribution constructed by phi-max-mean algorithm

Shige Peng (Shandong University)

Abstract: As a natural generalization of the framework of probability theory, we have introduced notions of nonlinear distributions and nonlinear independence. They are foundamentally important in nonlinear expectation theory. In fact, a wide class random data sequence for which of the probability and distribution uncertainties are non-negligible, but they are still identically distributed and independent (i.i.d.) in the sense of sublinear expectation. Thus the elegant (nonlinear) law of large numbers (LLN) and nonlinear central limit theorem (CLT) can be applied. In this talk we explain how one can apply our nonlinear LLN to construct the sub-linear distribution of a random vector by using its sample data and then how to apply this new phi-max-mean algorithm in practice.

Speech 11

Multivariate analogs of some discrete distributions
Yury Khokhlov (Moscow State University)

Abstract: It is well known the role of some discrete distributions such as Bernoulli, binomial, geometric, negative binomial, Poisson, Polya-Aeppli and others in applications of probability theory and mathematical statistics. We propose some variant of multivariate distribution whose components has a given univariate discrete distributions. In fact we consider some very general variant of so called reduction method. We find the explicit form of mass function and generating function of such distribution, investigate its properties. We prove that our construction is the unique in natural exponential families of distributions. Our results are the generalization and unification of many results of other authors.

Speech 12

Central limit theorem for a set of probability measures
Zengjing Chen (Shandong University)

Abstract: In this paper, we present a Central Limit Theorem (CLT) for models where random events are describable by nonsingleton sets of probability measures. Such sets arise in economics and finance as the subjective prior beliefs of an agent within a model who does not have sufficient information to justify reliance on a single probability measure and in mathematical statistics and econometrics where they represent the multivalued predictions of the theory being tested or estimated empirically and where predictions are multivalued because the theory is incomplete, and as representations of indeterminate objective realities. Joint work with Larry Epstein

Speech 13

Asymptotic analysis of the generalized random graphs with random vertex weights
Vladimir Ulyanov (Moscow State University)

Abstract: We state asymptotic results for different features of the generalized random graphs with random vertex weights: in particular for the total number of edges and node degrees under mild moment conditions on the distributions of the weights. A unified approach will be suggested as well for constructing the non-asymptotic approximations on the basis of the general result on approximation accuracy for symmetric functions of several variables. The talk is based on the recent joint results with Hu Z.S. and Feng Q.Q. (University of Science and Technology of China, Hefei, China), F.Goetze (Bielefeld University, Germany) and A.A.Naumov(Skoltech, Moscow, Russia).

Speech 14

Powerful Covariate-Adaptive Design with Minimize Selection Bias

Lixin Zhang (Zhejiang University)

Abstract: Pocock and Simon's procedure (Pocock and Simon, 1975) is extensively implemented for balancing treatment allocation over influential covariates in clinical trials, attempting to minimize the weighted sum of marginal differences between numbers of patients for covariates.. However, the theoretical properties of Pocock and Simion's procedure have remained largely elusive for decades. We propose a new framework of covariate-adaptive design and establish the corresponding asymptotic theorems under widely satisfied conditions. In particular, the allocation imbalances over covariate values are showed to be bounded in probability for Pocock and Simion's procedure. But the selection bias of the procedure cannot be ignored. A new covariate-adaptive design is defined by choosing suitable allocation function so that the selection bias is asymptotically the same as the complete randomization and the covariate imbalances considered are of the order of $o(n^{1/2})$ in probability for which the loss of power is asymptotically the same as the Pocock and Simon's procedure.

Speech 15

Estimates of the concentration functions in the Littlwood-Offord problem

Andrei Zaitsev
(St.Petersburg Department of Mathematical Institute of Russian Academy of Sciences)

Abstract: We discuss the results of Zaitsev (2015, 2016), Eliseeva, G$\ddot{o}$tze and Zaitsev (2015), G$\ddot{o}$tze and Zaitsev (2016).Let $X, X_1, \cdots, X_n$ be independent identically distributed random variables. We study the behavior of concentration functions of weighted sums $\sum_{k=1}^{n} X_k a_k$ with respect to the arithmetic structure of coefficients a_k in the context of the Littlewood-Offord problem. Concentration results of this type received renewed interest in connection with distributions of singular values of random matrices. Recently, Tao and Vu proposed an Inverse Principle in the Littlewood-Offord problem. We discuss the relations between the Inverse Principle of Tao and Vu as well as that of Nguyen and Vu and a similar principle formulated for sums of arbitrary independent random variables in the work of Arak from the 1980's.

Speech 16

The small ball probabilities for Gaussian random fields and the eigenvalues of the operators tensor product

Alexander Nazarov (St.Petersburg State University and PDMI RAS)

Abstract: We discuss the problem of L2-small ball probabilities for multiparameter Gaussian fields of "tensor product" type. To solve it, we consider spectral asymptotics for the compact operators with

regularly varying or almost regularly varying marginal asymptotics. Two different convolutions of slowly varying functions arise in this connection.

Speech 17

Time consistency for set-valued dynamic risk measures for bounded discrete-time processes
Yijun Hu (Wuhan University)

Abstract: In this talk, we will introduce two kinds of time consistent properties for set-valued dynamic risk measures for discrete-time processes that are adapted to a given filtration, named time consistency and multi-portfolio time consistency. Equivalent characterizations of multi-portfolio time consistency are deduced for normalized dynamic risk measures. In the normalized case, multi-portfolio time consistency is equivalent to the recursive form for risk measures as well as a decomposition property for the acceptance sets. The relations between time consistency and multi-portfolio time consistency are addressed. We also provide a way to construct multi-portfolio time consistent versions of any dynamic risk measure. Finally, we will investigate the relationship about time consistency and multi-portfolio time consistency between risk measures for processes and risk measures for random vectors on some product space. This talk is based on a joint work with Dr. Yanhong Chen at Wuhan University.

Speech 18

Random convex hulls
Dmitry Zaporozhets (St.Petersburg Department of Mathematical Institute of Russian Academy of Sciences)

Abstract: A basic object of Stochastic geometry is a random convex polytope. We will discuss several models including convex hulls of random walks and Gaussian polytopes.

Speech 19

Convergence rate estimates in the global central limit theorem for Poisson-binomial, Poisson, and Mixed Poisson random sums
Irina Shevtsova(Moscow State University)

Abstract: We present convergence rate estimates in the global form of the central limit theorem (i.e. for the mean metrics), for random sums of independent random variables possessing finite third-order moments, where the number of summands follows the Poisson-binomial, Poisson, and mixed Poisson distributions. As a corollary, we give the estimates of the accuracy of the approximation to the negative-binomial random sums by the normal law (with infinite growth of the shape parameter) and by the variance-gamma mixed normal distribution (with infinite growth of the scale parameter), and also to the geometric random sums by the Laplace distribution.

Speech 20

Gaussian comparison and anti-concentration inequalities for norms of Gaussian random elements

Alexey Naumov(Skolkovo Institute of Science and Technology)

Abstract: We derive a bound on the Kolmogorov distance between the probabilities of two Gaussian elements to hit a ball in a Hilbert space. The key property of these bounds is that they are dimensional-free and depend on the Schatten 1-norm of the difference between the covariance operators of the elements. We are also interested in the anti-concentration bound for the squared norm of a non-centered Gaussian element in a Hilbert space. All bounds are sharp and cannot be improved in general. We provide a list of motivation examples and applications for the derived results as well. The talk will be based on the joint work with F. Goetze, V. Spokoiny and V. Ulyanov.

Speech 21

CLT for Linear Spectral Statistics of Large Dimensional Sample Covariance Matrices with Dependent Data

Shurong Zheng (Northeast Normal University)

Abstract: This paper investigates the central limit theorem for linear spectral statistics of high dimensional sample covariance matrices of the form

$$B_n=n^{-1}\sum_{j=1}^{n}Qx_jx_j^{*}Q^{*}$$

where Q is a nonrandom matrix of dimension $p\times k$, and $\{x_j\}$ is a sequence of independent k-dimensional random vector with independent entries, under the assumption that $p/n\to y>0$. A key novelty here is that the dimension $k\ge p$ can be arbitrary, possibly infinity.

This new model of sample covariance matrices B_n covers most of the known models as its special cases. For example, standard sample covariance matrices are obtained with $k=p$ and $Q=T_n^{1/2}$ for some positive definite Hermitian matrix T_n. Also with $k=\infty$ our model covers the case of repeated linear processes considered in recent high-dimensional time series literature. The CLT found in this paper substantially generalizes the seminal CLT in Bai and Silverstein (2004). Applications of this new CLT are proposed for testing the structure of a high-dimensional covariance matrix.

Speech 22

Penalized empirical likelihood for partially linear models with errors in all variables

Xia Chen (Shaanxi Normal University)

Abstract: We develop penalized empirical likelihood for parameter estimation and variable selection in partially linear models with errors in all possible variables. By using adaptive lasso penalty function, we show that the proposed estimator has the oracle property. Also, we consider the problem of testing

hypothesis, and the penalized empirical likelihood ratio statistic has asymptotic chi-square distribution. Some simulations and an application are given to illustrate the performance of the proposed method.

Speech 23

One-step Local M-estimator for Integrated Jump-diffusion Models with Application to Financial High-Frequency Data

Yuping Song (Shanghai Normal University)

Abstract: In this paper, robust nonparametric estimators, instead of local linear estimators, are adapted for infinitesimal coefficients associated with integrated jump-diffusion models to avoid the impact of outliers on accuracy. Furthermore, consider the complexity of iteration of the solution for local M-estimator, we propose the one-step local M-estimators to release the computation burden. Under appropriate regularity conditions, we prove that one-step local M-estimators and the fully iterative M-estimators have the same performance in consistency and asymptotic normality . Through simulation, our method presents advantages in bias reduction, robustness and reducing computation cost. In addition, the estimators are illustrated empirically through stock index under different sampling frequency.

Speech 24

Geometric Shrinkage Estimation of Variances

Min Xiao (Zhejiang Gongshang University)

Abstract: In this paper, we propose a geometric type shrinkage estimator for variances when the number of samples is substantially fewer than the number of variables by shrinking individual variance estimator towards the arithmetic mean and the geometric mean. We derive and estimate the optimal shrinkage parameter under the Log-Euclidean loss function. Simulation studies and real data analysis indicate that the proposed estimator outperforms existing methods under the Log-Euclidean loss function .

Speech 25

Asymptotic properties of maximum quasi-likelihood estimators in generalized linear models with diverging number of covariates

Qibing Gao (Nanjing Normal University)

Abstract: In this paper, for the generalized linear models (GLMs) with diverging number of covariates, the asymptotic properties of maximum quasi-likelihood estimators (MQLEs) under some regular conditions are developed. The existence of MQLEs in maximum quasi-likelihood equation, weak convergence and the rate of convergence of MQLEs and asymptotic normality of linear combination of MQLEs and asymptotic distribution of single linear hypothesis test statistics are presented. The results are illustrated by Monte-Carlo simulations.

Speech 26

An exponential inequality for WOD sequences and its application to M estimators in linear models

Xin Deng (Anhui University)

Abstract: In the paper, an exponential inequality for widely orthant dependent random variables is established without bounded condition. By using the inequality, we further investigate the strong linear representation for the M estimators of the regression parameter vector in linear regression models with widely orthant dependent random errors under some general conditions.

Speech 27

Strong convergence theorems for widely orthant dependent random variables under sub-linear expectations and its statistical applications

Yi Wu (Anhui University)

Abstract: In this paper, we first study the complete convergence for arrays of rowwise widely orthant dependent random variables under sub-linear expectations. The complete convergence theorems are established in sense of sub-additive capacities under some mild conditions. As an application of the main results, we investigate the strong consistency for the weighted estimator in a nonparametric regression model based on widely orthant dependent errors under sub-linear expectations. In addition, we also obtain the rate of strong consistency for the estimator in a nonparametric regression model based on widely orthant dependent errors under sub-linear expectations.

Speech 28

Normal Approximation by Stein's Method under Sublinear Expectations

Yongsheng Song (Academy of Mathematics and Systems Science Chinese Academy of Sciences)

Abstract: Peng (2007) proved the Central Limit Theorem under a sublinear expectation. In this talk, we shall give an estimate to the rate of convergence of this CLT by Stein's method under sublinear expectations.

Speech 29

Strong laws for weighted sums of ψ-mixing random variables and applications in errors-in-variables

Pingyan Chen (Jinan university)

Abstract: In this paper, we establish strong laws for weighted sums of identically distributed ψ-mixing random variables without any conditions on mixing rate. The classical Kolmogorov strong law

of large numbers is extended to weighted sums of ψ-mixing random variables. Two types of weights are considered for the weighted sums. These results are applied to the least-squares estimators in the simple linear errors-in-variables regression model when the errors are ψ-mixing random vectors.

Speech 30

Probability inequalities for sums of NSD random variables and applications

Ting Cai (Hubei Normal University)

Abstract: In this paper, we obtain the exponential-type inequalities for maximal partial sums of negatively superadditive dependent(NSD) random variables, which extends the results for independent random variables and negatively associated(NA) random variables. Using these inequalities, we further investigate the weak convergence of the M-estimators in the generalized linear model with NSD errors,which generalize and improve the corresponding results of the independent random errors to that of NSD random errors.

Speech 31

Extremes on bivariate Gaussian triangular arrays

Zuoxiang Peng (Southwest University)

Abstract: In this talk, we summarize our recent work on asymptotics of extremes of bivariate Gaussian triangular arrays. The seminal work of Husler and Reiss (1989) showed that the limit distribution of maxima of bivariate Gaussian triangular arrays is a max-stable distribution provided that the Husler-Reiss condition holds. Our attention is on the asymptotic expansions and uniform convergence rates of the distributions of extremes. Hashorva et al. (2016) established the higher-order expansions of the distribution of maxima under the refined Husler-Reiss condition. Liao and Peng (2014) derived the uniform convergence rate of maxima under the Husler-Reiss condition. Liao and Peng (2015) also showed the higher-order expansions of the joint distribution of maxima and minima. For the asymptotics of maxima of independent and non-identically distributed bivariate Gaussian triangular arrays, Liao and Peng (2017) established the higher-order expansions of the distribution of linear normalized maxima as the coefficient satisfies some regular conditions, and the asymptotics of maxima and minima were derived by Lu and Peng (2017). The limit distribution in copula form was studied by Liao et al. (2016) and distributional higher-order expansions were considered by Wang et al. (2017). Further work related to the Husler-Reiss model and its extensions will also be mentioned.

Speech 32

Central limit theorem for the solution to the heat equation with moving time

Junfeng Liu (Nanjing Audit University)

Abstract: In this talk, we consider the solution to the stochastic heat equation driven by the time-space white noise and study the asymptotic behavior of its spatial quadratic variations with "moving time", meaning that the time variable is not fixed and its values are allowed to be very big or very small. We investigate the limit distribution of these variations via Malliavin calculus.

Speech 33

Asymptotics of maxima and minima of discrete and continuous time stationary Gaussian processes

Yingyin Lu (Southwest University)

Abstract: Let X(t) be a stationary Gaussian process with mean zero, variance one and the correlation function r(t) satisfies

$$r(t) = 1 - |t|^{\alpha} + o\left(|t|^{\alpha}\right), \ t \to 0 \qquad (1)$$

for some $\alpha \in (0, 2]$. Further assume that

$$r(t) \log t \to 0 \ \text{ as } \ t \to \infty. \qquad (2)$$

Define $M_T = \max\{X(t), t \in [0,T]\}$, the maximum of $\{X(t), t \geq 0\}$ up to time T, and uniform grids $\Re = \Re(\delta) = \{k\delta, k = 0,1,2\ldots\}, \delta = \delta(T) > 0$ satisfying $\delta\left(2\log T\right)^{1/\alpha} \to D$ as $T \to \infty$. The grid is dense if $D = 0$, Pickands gride if $D \in (0,\infty)$ and sparse grid if $D = \infty$ for some $\delta_0 > 0$, $\delta(T) \leq \delta_0$. We define $M_T^{\delta} = \max\{X(t), t \in [0,T] \cap \Re(\delta)\}$, the maximum of X(t) in such a discrete time.

Under conditions (1) and (2), Piterbarg (2004) first studied the asymptotic relation between M_T and M_T^{δ}. H\"{u}sler (2004) and Turkman (2012) extended this results to locally stationary Gaussian processes and non-Gaussian processes, respectively. Tan and Wang (2013) and Tan and Tang (2014) studied the asymptotics of M_T and M_T^{δ} of weakly and strongly dependent Gaussian processes, respectively. Recent work on the asymptotics of M_T, M_T^{δ} and the partial sum, see Chen and Tan (2016).

In this paper, we consider the joint limit distributions of normalized maximum $\mathbf{M}_T$ and minimum $\mathbf{m}_T$ under mentioned three grids, where $\mathbf{M}_T$ and $\mathbf{m}_T$ are defined componentwise by

$$\mathbf{M}_T = (M_T, M_T^{\delta}) = \left(\max_{t\in[0,T]} X(t), \max_{t\in[0,T]\cap\Re(\delta)} X(t)\right),$$

$$\mathbf{m}_T = (m_T, m_T^{\delta}) = \left(\min_{t\in[0,T]} X(t), \min_{t\in[0,T]\cap\Re(\delta)} X(t)\right).$$

With a_T, b_T, b_T^{δ} and $b_{a,T}$ given by Piterbarg (2004), define

$$\mathbf{u}_T = \left(b_T + \frac{x_2}{a_T}, b_T^{*} + \frac{y_2}{a_T}\right), \quad \mathbf{v}_T = \left(-b_T + \frac{x_1}{a_T}, -b_T^{*} + \frac{y_1}{a_T}\right)$$

where $b_T^{*} = b_T^{\delta}$ for sparse grids, $b_T^{*} = b_{a,T}$ for Pickands grids, and $b_T^{*} = b_T$ for dense grids.

For the stationary Gaussian processes $\{X(t), t \geq 0\}$ satisfying (1) and (2), with $\Lambda(x) = \exp(-e^{-x})$ we have

(i) For any sparse grids $\Re$,

$$\lim_{T\to\infty} \mathrm{P}\left(\mathbf{M}_T \leq \mathbf{u}_T, \mathbf{m}_T \leq \mathbf{v}_T\right) = \exp\left(-e^{-x_2} - e^{-y_2}\right) \times \left[1 - \Lambda(-x_1)\right.$$

$$-\Lambda(-y_1)+\exp\left(-e^{x_1}-e^{y_1}\right)\Big].$$

(ii) For any Pickands grids $\Re$,

$$\lim_{T\to\infty}\mathrm{P}\left(\mathbf{M}_T\le\mathbf{u}_T,\mathbf{m}_T\le\mathbf{v}_T\right)=\exp\left(-e^{-x_2}-e^{-y_2}+H_{a,\alpha}^{\log H_{a,\alpha}+x_2,\log H_\alpha+y_2}\right)\Big[1-\Lambda(-x_1)$$

$$-\Lambda(-y_1)+\exp\left(-e^{x_1}-e^{y_1}+H_{a,\alpha}^{\log H_{a,\alpha}-x_1,\log H_\alpha-y_1}\right)\Big],$$

where positive constants $H_a, H_{a,\alpha}$ and $H_{a,\alpha}^{x,y}$ are given by Piterbarg（2004）

(iii) For any dense grids $\Re$,

$$\lim_{T\to\infty}\mathrm{P}\left(\mathbf{M}_T\le\mathbf{u}_T,\mathbf{m}_T\le\mathbf{v}_T\right)=\exp\left(-e^{-x_2\wedge y_2}\right)\Big[1-\Lambda(-x_1)\ -\Lambda(-y_1)+\exp\left(-e^{x_1\vee y_1}\right)\Big].$$

Speech 34

Invariant Measures for Path-Dependent Random Diffusions

Jinghai Shao (Tianjin University)

Abstract: In this talk, we are concerned with existence and uniqueness of invariant measures for path-dependent random diffusions and their time discretizations. The random diffusion here means a diffusion process living in a random environment characterized by a continuous time Markov chain. Under certain ergodic conditions, we show that the path-dependent random diffusion enjoys a unique invariant probability measure and converges exponentially to its equilibrium under the Wasserstein distance. Also, we demonstrate that the time discretization of the path-dependent random diffusion involved admits a unique invariant probability measure and shares the corresponding ergodic property when the stepsize is sufficiently small. During this procedure, the difficulty arose from the time-discretization of continuous time Markov chain has to be deal with, for which an estimate on its exponential functional is presented.

Speech 35

Asymptotic ruin probability of a dependent renewal risk model based on entrance processes with investment under interest force

Lin Xie (Northwest Normal University)

Abstract: In this article, we investigate the risk model based on an entrance process with investment under interest force, where insurance company invest risky stock market with a geometric Brownian motion, and risk-free market. Under the assumptions that the entrance process is a renewal process and the claims sizes are pairwise strong quasi-asymptotically independent, which belong to the different heavy-tailed distribution classes , the finite-time and infinite-time asymptotic estimate of the risk model with investment under interest force is obtained.

Speech 36

Pricing Timer Options in a Perturbed Stochastic Volatility Model

Shengzhi Wu (Soochow University)

Abstract: Timer option is an option with the feature of a random time to maturity. The expiration depends on the accumulated realized variance. When the variance budget is consumed out, the option expires. Timer-style options provide investors a simple way to combine directional bet and volatility bet within a single financial instrument. In this study, under a stochastic volatility model, we use perturbation techniques to derive approximated prices for timer-style options around the Black-Scholes prices for plain-vanilla options.

Speech 37

The uniform local asymptotics of the total net loss process in a time-dependent bidimensional renewal modelA necessary and sufficient condition for subexponentiality of the product distribution

Yuebao Wang (Soochow University)

Abstract: Let X and Y be two independent non-negative random variables with corresponding distributions F and G. Let H be the distribution of the product XY. Cline and Samorodnitsky (1994) proposed sufficient conditions for H to be subexponential, given subexponentiality of F. Taking into account a result of Tang (2008) for long-tailed distributions, we obtain a necessary and sufficient condition for subexponentiality of H to hold, under subexponentiality of F. Further, we show by example that one of the conditions in some existing results is not needed. We obtain also a result in the other direction, providing sufficient conditions for subexponentiality of F given that H is subexponential. Finally, we apply the obtained results to a discrete-time insurance risk model with random interest rates.

Speech 38

Self-normalized Cramer-type large deviations for martingales

Xiequan Fan (Tianjin University)

Abstract: Self-normalized Cramer-type large deviations for independent random variables has been well studied in recent year. One of the most interesting work is due to Jing, Shao and Wang (2003, Ann. Probab.). They proved that self-normalized Cramer-type large deviation results hold only under a finite $(2+\rho)$th moment, $0<\rho\leq 1.$ However, we are not aware of any such results in the literature regarding martingales. In this talk, we present some extensions for the results of Jing, Shao and Wang to the martingale case. An application to Student's t-statistic is also discussed. (This talk is based on join work with Ion Grama, Quansheng Liu and Qi-Man Shao)

Speech 39

The Shannon-McMillan Theorem for Markov Chains Indexed By a Cayley Tree in Random Environment

Zhiyan Shi (Jiangsu University)

Abstract: In this paper, we restate the definition of tree-indexed Markov chains in random environment with countable state space, and then study the realization of Markov chain indexed by a tree in random environment. Finally, We prove strong law of large numbers and Shannon-McMillan theorem for Markov chains indexed by a Cayley tree in a Markovian environment with countable state space.

Speech 40

Hidden Markov tree models: definition, properities and SLLN

Weiguo Yang (Jiangsu University)

Abstract: In this report, we are going to provide a rigorous definition of hidden Markov tree models, and obtain some properties and equivalent properties for them, as a corollary, we point out existence of hidden Markov tree models. Finally, we obtain a strong law of large numbers for hidden Markov tree models indexed by a Cayley tree.

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