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Abstracts of the 23rd workshop on

APPLIED STOCHASTIC PROCESSES

Shiraz University, Department of Statistics, February 15-17, 2022

دانشگاه شیراز
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The 23rd workshop on Applied Stochastic Processes

Workshop

Abstract Booklet

Department of Statistics

Shiraz University, Iran

February 15-17, 2022

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Preface

The 23rd Workshop on Applied Stochastic Processes (WASP, 2022) is held virtually in the department of Statistics, Shiraz University, from 15 to 17 February, 2022.

The aim of this workshop is to bring together researchers working on the applied stochastic processes and is to update the current knowledge on this topic. It tries to provide a forum for discussion and debate on the application of the stochastic processes and the techniques used for the manipulation of such data.

We would like to thank the founder of this series of workshops, Professor Soltani, a distinguished professor of statistics at Shiraz University, for having brought us together here, without geographical border line, to share our findings with others.

We are also grateful to all members of the workshop committee, for providing insightful guidelines and support in preparing and organizing the workshop, and for the highly professional work done on all aspects of the local organization of this event. We thank all authors and participants for attending the workshop and bringing their expertise to our gathering.

A R Nematollahi

Head of Scientific Committee

Acknowledgement

The 23rd Workshop on Applied Stochastic Processes (WASP) is hosted by the Department of Statistics Shiraz University.

Top distinguish researchers did accept to present their recent contributions in this workshop. Thanks to all. Organizing Committee Members eagerly have worked hard to make this online gathering possible. The workshop also debts it's success to the Scientific Committee Members. The most important are the audience and participants that have kept WASP live and flourishing.

As the founder of WASP do thank all from bottom of my heart.

A R Soltani

Topics

The aim of the workshop is to provide a forum for presentation and discussion of scientific works in the field of applied stochastic processes in a wide range of areas:

- Infinite dimensional processes, Gaussian, stable, PC and simple.
- Simple processes, car processes, possible extensions to stable.
- Simple processes and car processes.
- Inferences on stochastic models.
- Structural representations for stable processes.
- Polynomials with random coefficients.
- Probability theory for random mixtures.
- Stable distributions and related distributions.
- Stochastic analysis and related topics.
- Markov and semi-Marcov processes and related topics.

Scientific Committee

- K. Alishahi, Sharif University of Technology
- K. Khorshidian, Shiraz University
- A. R. Nematollahi, Shiraz University (Chair)
- J. Nolan, American University
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- M. Sharafi, Shiraz University
- S. Zarezadeh, Shiraz University

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A Review on the Strong Gaussian Approximation of Empirical Processes and its Applications

V. Fakoor[1,*]

[1]Ferdowsi University of Mashhad

Abstract: Limit theorems are at the heart of the mathematical statistics and, in particular, of the theories of estimation and of statistical tests. Among the limit theorems, strong approximations play an important role. Here, we focus on the KomlosMajor-Tusnhdy (KMT) approximation, also known as Hungarian representation. The KMT approximation provides a remarkable, mathematically tractable representation of the empirical process by a Brownian bridge constructed on the same probability space. We describe the KMT approximation, particularly as it relates to other forms of approximation, and to review some of its applications, especially in the nonparametric inference.

[*]Presenter

Comparison of Portmanteau Tests for INAR(1) Model with Binomial Thinning Operator

M. Forughi[1,*], Z. Shishebor[1]

[1]Shiraz University

Abstract: Recently, non-negative integer-valued time series have gained considerable attention. Such practical time series are widely used in medicine, meteorology, economics, and agriculture. Over the past few years, different models have been proposed for non-negative integer-valued time series, among which the first-order integer-valued Autoregressive, INAR(1), was presented by McKenzie (1985). Based on the research conducted by Du and Li (1991), we proposed three portmanteau tests: Box and Pierce (1970), QBP , Ljung and Box (1978), QLB, and McLeod and Li (1983), QLM. We compared the empirical size and power of the portmanteau test statistics QBP , QLB and QLM for (INAR(1)) while the thinning operator was binomial. The size and power of the statistics were obtained using the weighted sum of chi-square distributions, and the critical values were found using Imhofs (1961) algorithm. We witnessed that performance of the test statistics improved by increasing the number of samples and the value of parameter. Besides, the empirical size of QLB was closer to the nominal value of 5%, and, by increasing sample sizes (n), all three statistics performed almost the same. Moreover, For evaluating empirical power, three sets of parameters were considered. For all cases, by increasing n, the power improved. The test statistic QLB had the highest empirical power among the test statistics studied in this paper.

*Presenter

MRL in Semi-Markovian Reliability Systems

K. Khorshidian[1,*]

[1]Shiraz University

Abstract: On the basis of the prediction theory for semi-Markov reward processes, a formula for calculating the mean residual life (MRL) in repairable systems will has been presented. Nevertheless, there are a large amount of studies that have been carried out on the various aspects of other reliability systems in recent decades. Almost all of the above mentioned researches, emphasis on the significant importance and extensive applications of MRL function in investigating the ageing properties of technical systems. This huge amount of studies and applications motivated us to examine and calculate the MRL function for repairable systems.

[*]Presenter

Semi-Markov Modeling of Standby Systems with N Components and N Redundant Units

K. Khorshidian[1,*], M. Taheri[1]

[1]Shiraz University

Abstract: Consider a system which has an operating series subsystem consisting of N components, an identical stand-by subsystem and a replacing switch. Also, suppose that a technician is present on the site to repair or replace failed elements of subsystems in the event of a breakdown, each subsystem consists of N components. Grabski (2010), obtained a tedious closed form for calculating the Reliability parameter of the above system, in cold standby configuration. Because of the complicated forms of the introduced formulas, they are not applicable in practice. In this article an approximation technique and some simulation study is done for reliability analysis of certain similar system. So, a repairable cold standby system is considered, the corresponding semi-Markov model is defined and the reliability parameter is calculated approximately. A simulation has also been performed to show the goodness approximate calculations.

[*]Presenter

Moment Properties of Spatial Log Gaussian Cox Processes

F. Nasirzadeh[1,*], Z. Shishebor[2]

[1]Jahrom University

[2]Shiraz University

Abstract: Spatial Cox processes arise as the inhomogeneous Poisson point processes with a random intensity measure. They are useful applied models for aggregated spatial point patterns where the aggregation is due to stochastic environmental heterogeneity. In this presentation, we first describe some moment properties of the log Gaussian Cox processes that are the Cox processes where the logarithm of the intensity surface is a Gaussian process. Then, we explain the application and importance of these properties in determining the type of data pattern, complete randomness, clustering, or regularity behavior, testing the anisotropy, moment estimation of parameters, and assessing the goodness of fit.

[*]Presenter

Generalized Autoregressive Models

A.R. Nematollahi[1,*], T. Manouchehri[1], H. R. Khorshidi[1]

[1]Shiraz University

Abstract: In this work, a class of models known as generalized autoregressive models, recognizing by an additional parameter, has been proposed in order to reveal some hidden features which cannot be characterized by the standard autoregressive models. These models are reviewed and then extended to the vector-valued autoregressive models which provide a flexible framework for modelling of the dependent data.

*Presenter

Compressive Sensing in Impulsive Environments

J. Nolan[1,*]

[1]American University

Abstract: Traditional compressive sensing (CS) assumes light-tailed models for the underlying signal and/or noise. This assumption is not met in the case of highly impulsive environments, where non-Gaussian processes arise. In this case, traditional sparse reconstruction methods perform poorly, since they are incapable of suppressing the effects of heavy-tailed sampling noise. This talk will describe the use of heavy tailed stable distributions to design a robust algorithm for sparse signal reconstruction from linear random measurements corrupted by infinite-variance additive noise. We demonstrate the improved reconstruction performance of the proposed algorithm when compared against standard CS techniques for a broad range of impulsive environments.

[*]Presenter

Simulation of Tempered Stable Distributions

E. Salavati[1,*]

[1]Amirkabir University of Technology

Abstract: Tempered stable distributions are a large class of distributions which are obtained by a modification in the tail of the stable distributions. But the point that makes them useful is that this modification is not directly applied on the tail of the distribution, but instead is applied on the tail of the corresponding Levy measure. This construction makes them analytically useful but at the same time, their pdf is not computationally tractable. This fact makes them challenging both for estimation and simulation. In this talk, we review the state-of-the-art in simulation of tempered stable distributions and then propose a new method that solves some of the weaknesses of the existing methods.

[*]Presenter

A New Shape of Extremal Clusters for Certain Stationary Semi-Exponential Processes with Moderate Long Range Dependence

G. Samorodnitsky[1,*]

[1]Cornell University

Abstract: Extremal clusters of stationary processes can be quite intricate if the process has long memory affecting its tails. They can become random fractals, taking the shape of the stable regenerative set for certain stationary infinitely divisible processes with sub exponential tails, including both power-like tails, and certain lighter tails, of which lognormal-like tails are an example. In this work we show that if the tails of the process are even higher, specifically semi-exponential-like tails, then a new shape of extremal clusters arises, in which each stable regenerative set supports a random panoply of varying extremes.

[*]Presenter

Modeling Covid-19 Data

A.R. Soltani[1,*]

[1]Kuwait University

Abstract: In this talk, first we put light on the deficiencies in apply classical statistical modeling methods to model Covid-19 data. Then we look into certain Cox renewal processes to build up a class of renewal processes that act as a case for Covid-19 cases.

[*]Presenter

Local Limit Theorem for Linear Random Fields

Y. Xiao[1,*]

[1]Michigan State University

Abstract: We consider linear random fields when i.i.d. innovations that have infinite second moment and belong to the domain of attraction of a stable law with index $0<\alpha \leq 2$ and establish local limit theorems for their partial sums. When the coefficients of the linear random field are absolutely summable (the short memory case), the regions of summation for the partial sums can be taken arbitrarily. However, when the coefficients are not absolutely summable (the long memory case), the partial sums are defined over unions of rectangles. The main results are applicable to spatial fractional ARIMA models and linear random fields with isotropic or anisotropic coefficients. This talk is based on a joint paper with Magda Peligrad, Hailin Sang and Guangyu Yang.

[*]Presenter

Review of Some Asymptotic Theory for Unit Root Problem

M. Zarepour[1,*]

[1] Ottawa University

Abstract: In this talk we review some historical background on unit root time series. These autoregressive models are nonstationary but integrated of certain orders. The innovation in these models plays a crucial role in the derivations of their asymptotic theory. We discuss some of the asymptotic theory under the assumption that the innovations are in the domain of attraction of a stable law with index in (0, 2]. Of course, this review covers both finite and infinite variance cases. We then consider a generalization of a simple unit root problem to the cases with several unit roots. The idea can be considered to spatial autoregressive models and multivariate models. The review contains methods to estimates parameters of the model and find their asymptomatic distributions.

[*] Presenter

چکیده مقالات فارسی

فهرست

The 23rd workshop on
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معرفی چند آزمون برای وجود روند در داده های تابعی وابسته به زمان

ز. شیشه‌بر[۱]، س. م. نجیبی[۱]، س. رمضانی[۲،*]

[۱]دانشگاه شیراز

[۲]آموزش و پرورش فارس

چکیده: دنباله ای از توابع (منحنیها) که در طول زمان جمع آوری می شوند را یک سری زمانی تابعی گویند. فراوانی چنین مشاهداتی تحلیل سریهای زمانی تابعی را به یکی از شاخه های محبوب تحقیقاتی در علم آمار تبدیل کرده است. هدف اصلی از تجزیه و تحلیل سری زمانی تابعی، پیش بینی و توصیف می مکانیزم های تصادفی است که منجر به تولید توابع شده است. در این راستا نیاز است سری زمانی تابعی به مؤلفه های روند، دوره های زمانی و خطا تجزیه شود. اما قبل از تجزیه نیاز به شناسایی و تشخیص اینگونه مؤلفه ها داریم. از اینرو در این مقاله یک روش ناپارامتری برای بررسی و تشخیص وجود روند در یک سری زمانی تابعی با استفاده از توابع رکورد معرفی شده است. سپس با پیاده سازی و استفاده از این روش در یک سری زمانی تابعی نحوه کاربرد آن مورد تحقیق قرار گرفته است.در پایان نیزکارایی این روش برای تشخیص روند در یک مجموعه از داده های واقعی نرخ باروری مورد بررسی قرار گرفته است.

*سخنران

نگاهی گذرا به آنالیز تصادفی

ب. ظهوری زنگنه[1,*]

[1]دانشگاه صنعتی شریف

در این سخنرانی ، با نگاهی به جایگاه احتمال و فرایند تصادفی در میان رشته های ریاضی و رشد و پیدا کردن جایگاه محکم و رفیع در بین زمینه های ریاضی.به پیدایش آنالیز تصادفی به عنوان یکی از شاخه های مطرح این زمینه می پردازیم.

[*]سخنران

رگرسیون دم‌بریده برای داده‌های دم‌کلفت

رضا علیزاده نوقابی[1]، عادل محمدپور[1,*]

[1]دانشگاه صنعتی امیرکبیر

چکیده: روش‌های سنتی رگرسیون نسبت به داده‌های دورافتاده یا اصطلاحاً دم‌کلفت استوار نیستند. وجود داده‌های دورافتاده ناشی از دم‌کلفت بودن توزیع خطای مدل رگرسیون است. تاکنون روش‌های متنوعی با عنوان رگرسیون استوار ارائه شده است. برخی از آن‌ها با فرض غیرگاوسی بودن خطای مدل سعی به حل پارامتری مسئله کرده‌اند. ولی هیچ‌یک از آن‌ها به‌صورت تحلیلی نتوانسته‌اند مسئله را در حالت کلی حل کنند یا آنکه برای همه‌ی بخش‌های الگوریتم ارائه شده دلایل ریاضی ارائه کنند. هدف ما در این سخنرانی ارائه راه‌حلی تحلیلی برای مسئله رگرسیون پایدار است. به‌نحوی که همه اجزاء الگوریتم ارائه شده را به‌صورت ریاضی اثبات کنیم. برای این منظور ما از خواص جالب آمارهای ترکیبی توزیع‌های پایدار بهره گرفته‌ایم، که به ما اجازه می‌دهد امید ریاضی یا واریانس بسیاری از آن‌ها را محاسبه کنیم. در صورتی که واریانس توزیع پایدار غیر گاوسی اصلاً وجود ندارد. برای این کار ابتدا یک رگرسیون معمولی با استفاده از داده‌ها محاسبه و داده‌ها را بر اساس مانده‌ها مرتب می‌کنیم. سپس داده‌هایی را در نظر می‌گیریم که واریانس آمارهای ترتیبی آن‌ها متناهی است. حال با استفاده از تابع چگالی آمارهای ترتیبی، به برآورد پارامترها می‌پردازیم و بهترین برآوردگر خطی نااریب را محاسبه می‌کنیم. این راه حل را می‌توانیم به حالت چند متغیر نیز توسعه دهیم.

*سخنران