

**3rd International Symposium on Stochastic
Models in Reliability Engineering, Life
Sciences and Operations Management
(SMRLO-2019)**

Conference

Handbook

Beijing, China, May 28-31, 2019

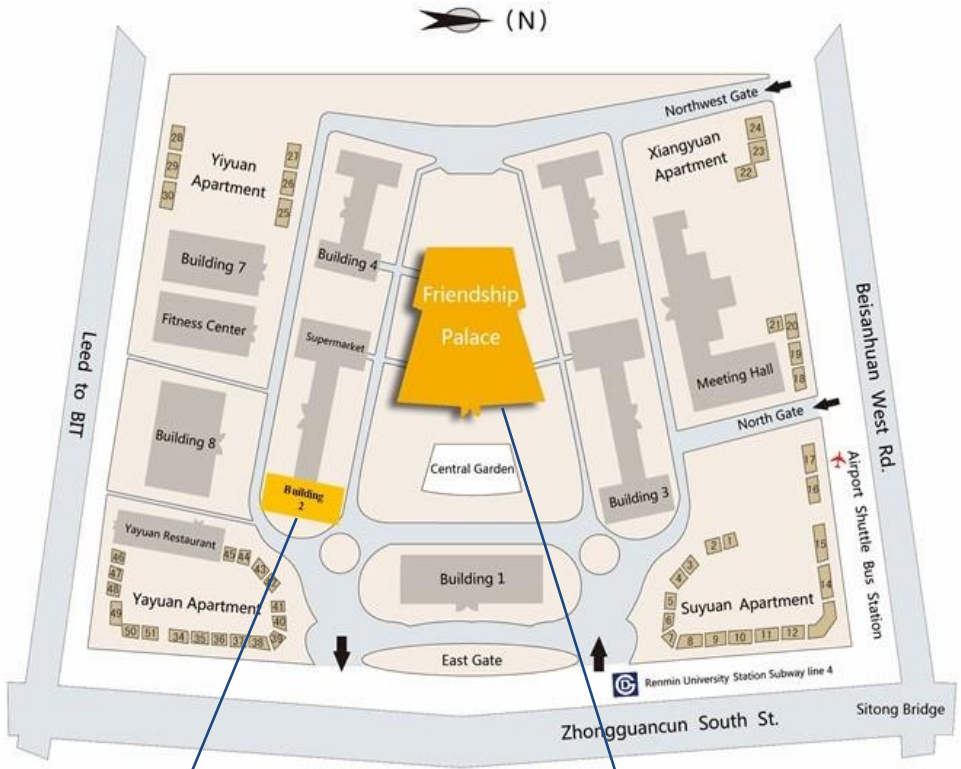
Organized by:

Industrial Engineering Committee of Chinese
Society of Optimization, Overall Planning and
Economic Mathematics

School of Management and Economics, Beijing
Institute of Technology

友谊宾馆平面图

Map of Beijing Friendship Hotel



注册地点：2号楼

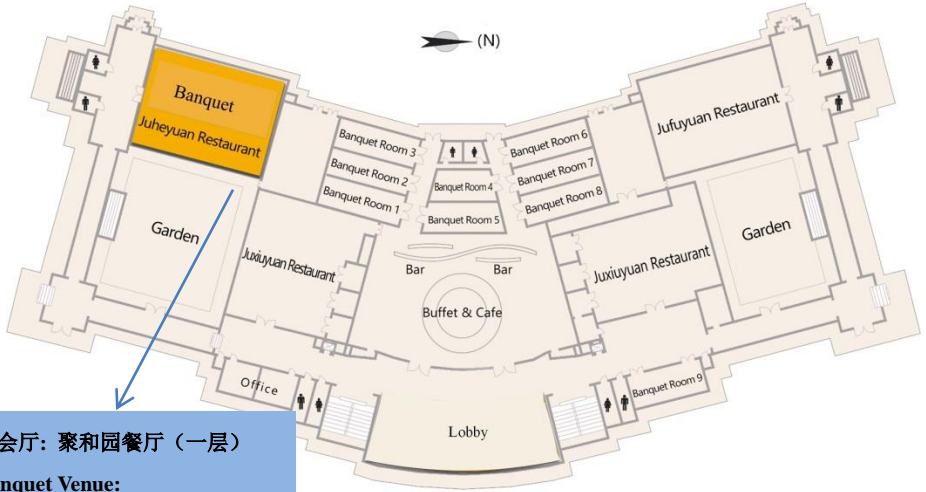
Place of Registration: Building 2

会议地点：友谊宫

Conference Venue: Friendship Palace

友谊宫 1 层平面图

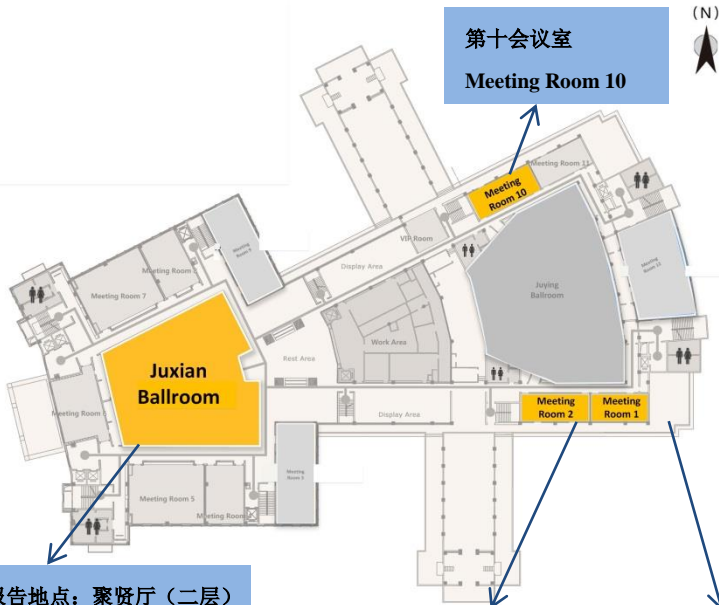
Friendship Palace, 1st Floor



宴会厅：聚和园餐厅（一层）
Banquet Venue:
Jufuyuan Restaurant

友谊宫 2 层平面图

Friendship Palace, 2nd Floor



大会报告地点：聚贤厅（二层）
Plenary Talks Venue:
Juxian Ballroom

第二会议室
Meeting Room 2

第一会议室
Meeting Room 1

Welcome from Conference Co-Chairs

On behalf of the third international symposium on stochastic models in reliability engineering, life sciences and operations management (SMRLO-2019), we sincerely welcome you to attend this important conference that will be held during May 28-31, 2019, in Beijing.

The SMRLO-2019 is one of the most influential academic conferences on stochastic modeling and methods. It aims to provide a forum for researchers, scholars and practitioners on the research and applications on stochastic modelling, special in reliability engineering, life sciences and operations management. The conference was firstly held in Beer Sheva, Israel, on February 15-17, 2005, named as “International Symposium on Stochastic Models in Reliability, Safety, Security and Logistics”. Later it was renamed in 2010 as “The First International Symposium on Stochastic Models in Reliability Engineering, Life Sciences and Operations Management” (SMRLO-2010) and held in Beer Sheva, Israel, on February 8-11, 2010. The second symposium (SMRLO-2016) was held in Beer Sheva, Israel, on February 15-18, 2016. Now it is the third international symposium on stochastic models in reliability engineering, life sciences and operations management (SMRLO-2019). The proceedings and books were published for the past conferences. For this conference SMRLO-2019, one book and three special issues in SCI journals will be published.

The SMRLO-2019 has been supported from various sides, special on School of Management & Economics, Beijing Institute of Technology, and National Natural Science Foundation of China. We sincerely thank them for their great positive support.

We believe that this conference will provide a chance to let you meet friends, to exchange academic ideas and enrich your professional knowledge. Hope you have a wonderful journey in Beijing.

Thank you very much.

Conference Co-Chairs:

Lirong Cui (China)

Anatoly Lisnianski (Israel)

The Organization of the Conference

Conference Co-Chair

Lirong Cui (Beijing institute of Technology, China)

Anatoly Lisnianski (Israel Electric Corporation, Israel)

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Yu Liu (University of Electronic Science and Technology of China, China)

Ilia Frenkel (Sami Shamoon College of Engineering, Israel)

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Executive Co-Chair

Xian Zhao (Beijing institute of Technology, China)

Jiancai Wang (Beijing institute of Technology, China)

Jingyuan Shen (Nanjing University of Science and Technology)

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Tongdan Jin (USA)	Shey-Huei Sheu (China)	Xian Zhao (China)
		Xufeng Zhao (China)

Plenary Talks

Reliability Modelling and Assessment of a Heterogeneously Repaired System with Partially Relevant Recurrence Data

Narayanaswamy Balakrishnan

(Department of Mathematics & Statistics, McMaster University, Hamilton, Ontario, Canada)

(Email: bala@mcmaster.ca)

Abstract

In this talk, I will first consider a reliability data to provide a basic motivation for the reliability problem considered in this work. Next, I will explain the stochastic modelling of the reliability problem and then describe the assessment methods for reliability. I will then revisit the data and illustrate the model and the assessment methods developed here. Finally, I will conclude the talk with some brief remarks and further suggestions!

Biography

Narayanaswamy Balakrishnan is a Distinguished Professor in Department of Mathematics & Statistics, in McMaster University. He received his PhD degree in Statistics from Indian Institute of Technology in 1981. He was Elected Member of the International Statistical Institute in 1992, Fellow of American Statistical Association in 1995, Fellow of Turkish Statistical Association in 2003, Fellow of Institute of Mathematics Statistics in 2006, Elected Honorary Member of the Greek Statistical Institute in 2007, etc. He was awarded Don Owen Award winner by the American Association in 2008, and was awarded Valuable Service Award winner by the International Statistical Association in 2010. He was Visiting Professor in University of Waterloo (Canada) in 1996, in Universite de Le Havre (France) in 2001, in University of Texas (USA) in 2006, in Ren-Min University (China) in 2007, and Visiting Distinguished Professor in Bowling Green State University (USA), etc. He has authored more than 40 books and published more than 200 papers. He has also completed 51 PhD. Thesis Supervisions and over 50 M.Sc. Project/Thesis Supervisions. In the past, he was Associate Editor for Journal of Statistics Planning and Inference, IEEE Transaction on Reliability, Naval Research Logistics and many others. At present, he is Editor in Chief for Communications in Statistics-Theory and Methods, Communications in Statistics-Simulation and Computation, Communications in Statistics-Case Studies, Data Analysis and Applications, the Revised Edition of Encyclopedia of Statistical Sciences, the Series Statistics for Industry and Technology of books and volumes, the Series Handbooks on Methods and Applications of Statistics, the Series Statistics of books and monographs, etc.

Approximations with Error Bounds in Applied Probability Models: Exponential and Geometric Approximations

Mark Brown

(Department of Statistics, Columbia University, New York, USA)

(Email: mb2484@columbia.edu)

Abstract

Frequently in probability work simple approximations are sought for mathematically intractable probability distributions. Limit theorems often supply the approximating distribution, but what is really needed are error bounds for fixed n or t . In this talk I'll discuss some of my work over the years in error bounds for exponential and geometric distribution approximations. Points of interest include:

- (1) The waiting time for patterns in multinomial trials.
- (2) The first passage time to a set, A , for time reversible Markov chains.
- (3) The approximate exponentiality of geometric convolutions, with various applications.
- (4) The reliability of repairable systems.
- (5) Hazard function based bounds and inequalities.

Biography

Mark Brown received his BS in Mathematics from City College, CUNY (1964), and an MS (1965) and PhD (1968) in Statistics from Stanford University. He was elected as a Fellow of the ASA in 1975 and of the IMS in 1980. He is a Professor of Statistics at Columbia University, and previously has held faculty appointments at Cornell University, (IE-OR), CUNY, (Mathematics), and Florida State University, (Statistics), as well as visiting appointments at Stanford, GWU, NYU, IBM Thomas J Watson Research Center and the Memorial Sloan Kettering Cancer Center. His research has been in applied probability models, reliability theory, inequalities, and theoretical and applied statistics. He is part of the group at Georgia Tech which developed the LRMC algorithm for ranking college basketball teams. These rankings are posted and updated daily on the Georgia Tech LRMC website, and has attracted significant media attention. He also co-developed with Frank Proschan a widely used model for imperfect repair in reliability. Some of his coauthors have been David Aldous, Joel Cohen, Daryl Daley, Victor de la Pena, Joop Kemperman, George Nemhauser, Erol Pekoz, Frank Proschan, Sheldon Ross, George Shanthikumar, and Herbert Solomon.

RAMS Optimization

Yan-Fu Li

(Department of Industrial Engineering, Tsinghua University, Beijing, China)

(Email: liyanfu@tsinghua.edu.cn)

Abstract

In this fast changing world, reliability, availability, maintainability and safety (RAMS) are becoming the fundamental attributes for the evaluation of any modern technological system's capabilities to sustain its normal operation under the threads of random failures or malicious attacks. The demands from various industry sectors for the quantification of system RAMS date back to the early 20th century and steadily grow till our times. Furthermore, the search for optimal system design, operation, maintenance, protection and recovery strategies, which minimizes expense and maintain RAMS at optimal levels, has become an increasingly relevant task since the 1960s. These tendencies render the system RAMS optimization an important topic in academic research and a necessary task in industrial applications. Consequently, a number of models and methods have been developed. Yet, new challenges emerge from the latest technological systems, such as smart grids and nuclear power plants, mainly characterized by the complex and possibly intelligent behaviors of the components and the uncertain and dynamic operation conditions. This presentation will deliver some key research results in this direction made by the Reliability & Risk Management Laboratory (RRML) at Institute for Quality and Reliability in Tsinghua University.

Biography

Yan-Fu Li is currently a full professor at the Department of Industrial Engineering, Tsinghua University, Beijing, P.R. China. His current research areas include RAMS2 (reliability, availability, maintainability, safety and security) assessment and optimization with the applications onto energy systems, transportation systems, computing systems, etc. He is the Principal Investigator (PI) of several government projects including one key project funded by National Natural Science Foundation of China, one project in National Key R&D Program of China, and the projects supported by EU and French funding bodies. He is also experienced in industrial research, and the partners include Huawei, Mitsubishi Heavy Industry, Southern China Grid, EDF, ALSTOM, etc. Dr. Li has published more than 90 research papers, including more than 40 peer-reviewed international journal papers. Dr. Li is currently an Associate Editor of IEEE Transactions on Reliability, a senior member of IEEE and a member of INFORMS. He is a member of the Executive Committee of the Reliability Chapter of Chinese Operations Research Society; Executive Committee of Industrial Engineering Chapter of Chinese Society of Optimization, Overall Planning and Economic Mathematics; Committee of Uncertainty Chapter of Chinese Artificial Intelligence Society.

Interval Reliability and Related Measures: Modeling and Estimation

Nikolaos Limnios

(Universit_e de Technologie de Compi_egne, Sorbonne University, Paris, France)

(Email: nlimnios@utc.fr)

Abstract

We present here the interval reliability, i.e., the reliability in an arbitrary interval of time where introduced by Barlow and Hunter (1961). While this notion seems to be adapted very well with real problems, as production systems, transport, etc., only a few works were done since then on this topic in the literature (see in references hereby). We will present here the formulation of the interval reliability in different levels: in alternating renewal process, in discrete state space, in general state spaces for Markov and semi-Markov in continuous and discrete-time and discuss its relation with reliability and availability functions. We will also estimate the interval reliability in the semi-Markov setting.

References

- [1] R. E. Barlow, L. C. Hunter, "Reliability analysis of one unit system", Operations Res., 1961, Vol. 9, No. 2, pp. 200-208.
- [2] S. Georgiadis, N. Limnios, "Interval reliability of discrete-time semi-Markov systems", Journal de la Societe Franaise de Statistique, 2014, Vol. 153, No. 3, pp. 152-166.
- [3] N. Limnios, "Reliability measures of semi-Markov systems with general state space", Meth. Comput. Appl. Probab., 2012, Vol. 14, No. 4, pp. 895-917.
- [4] N. Limnios, "Interval reliability, corrections and developments of reliability measures of semi-Markov systems with general state space", Meth. Comput. Appl. Probab., 2014, Vol. 16, No. 3, pp. 765-770.
- [5] V.S. Koroliuk and N. Limnios, Stochastic systems in merging phase space, World Scientific, 2005.

Biography

Nikolaos Limnios is Professor (Exceptional class) at University of Technology of Compi_egne (UTC) Sorbonne University, and former Director of the Laboratory of Applied Mathematics. He has obtained his diploma in 1979 at AUTH Greece, PhD in 1983, and Doctorat d'Etat in 1991 at UTC France. In 1988 he was appointed assistant professor (Maitre de conferences), and in 1993 a Professor at UTC in the Laboratory of Applied Mathematics. His research interests include stochastic processes and statistics with applications in reliability, statistical seismology, biology, etc. He published more than 150 journal papers and 10 books on theory and applications of stochastic processes.

Dynamic Reliability Analysis for Multi-State Systems. Challenge for Researchers and Practitioners

Anatoly Lisnianski

(The Israel Electric Corporation, Haifa, Israel)

(Emails: anatoly.lisnianski@iec.co.il, lisnianski@bezeqint.net)

Abstract

Dynamic analysis of multi-state system reliability considers such important issues as MSS reliability analysis under stochastic demand, reliability and availability analysis of aging MSS, initial conditions impact on MSS reliability and availability in transient periods, components importance changing (variety) when MSS is aging over the time, etc. Such problems in MSS context till now are a challenge for researchers and practitioners. In the paper are considered modifications of traditional methods (such as Markov processes with rewards) as well as a modern mathematical method, which is based on extended universal generating function technique (so-called, L_z -transform). Using traditional methods for solving such problems for real-world MSS often is leading to explosion of number of states that should be analyzed. In order to avoid this obstacle at last time was introduced a special type of transform for Markov stochastic process that is called L_z -transform. By using this transform universal generating function technique (that is widely used previously for steady-state MSS reliability analysis) were extended to dynamic reliability analysis and applied to random processes not only to random variables. In the paper presented overview of many successive applications of L_z -transform method for determining age replacement policy in MSS, dynamic reliability analysis for different industrial MSSs such as power systems, refrigerating systems, air conditioning systems, different technical systems in ships and helicopters. In addition, in the paper presented important industrial (real-world) case study.

Biography

Anatoly Lisnianski is a Senior Engineering Expert in The Israel Electric Corporation. He got his PhD in Reliability in Federal Scientific & Production Center “Avrora” in Sankt-Petersburg in Russia. He has published over 200 scientific papers, 3 books and 3 inventions. He is Member of Editorial Board of International Journal of Performability Engineering and Guest Editor of Special Issue of International Journal of Reliability & Quality Assurance. He was listed in The Marquis “Who’s Who in the World” from 22nd edition and The Marquis “Who’s Who in Science and Engineering” from 8th edition.

Selective Maintenance Strategy under Uncertainty

Yu Liu

(Center for System Reliability and Safety, University of Electronic Science
and Technology of China, Chengdu, Sichuan, China)

(Email: yuliu@uestc.edu.cn)

Abstract

Due to limited maintenance resources, such as budget, time, manpower, etc., selective maintenance has widespread applications in both industry and military environments. By selective maintenance strategy, a subset of feasible maintenance actions for a repairable system can be chosen to be performed so as to ensure the success of the subsequent mission. However, in reality, various uncertainties are inevitable in selective maintenance optimization. In addition to a comprehensive review on the existing selective maintenance models under uncertainties, this talk will introduce two new selective maintenance models by taking account of the uncertainty of the durations of breaks and maintenance actions and the uncertainty caused by imperfect observations. Two illustrative examples are presented to demonstrate the effectiveness of the proposed models.

Biography

Yu Liu is a Full Professor in the Center for System Reliability and Safety, at the University of Electronic Science and Technology of China. He received his PhD degree in Mechatronics Engineering from the University of Electronic Science and Technology of China in 2010. He was a Visiting Pre-doctoral Fellow in the Department of Mechanical Engineering at Northwestern University, Evanston, U.S.A. from 2008 to 2010, and a Postdoctoral Research Fellow in the Department of Mechanical Engineering, at the University of Alberta, Edmonton, Canada from 2012 to 2013. His research interests include reliability modeling and analysis, maintenance decisions, prognostics and health management, and design under uncertainty. He has published over 50 peer-reviewed papers in international journals and conferences. He was awarded twice the Second Prize of Natural Science Award of Ministry of Education in 2013 and 2018, the Second Prize of Scientific and Technological Award of National Defense in 2014, and the Third Prize of Scientific and Technological Award of National Defense in 2012. In most recent years, he was named as one of the Most Cited Chinese Researchers of 2016 and 2017 by the Elsevier. He was a recipient of the HIWIN Doctoral Dissertation Award sponsored by HIWIN Technologies Corporation and Chinese Society of Mechanical Engineers. He also received the “Youth Science and Technology Award” from the Operations Research Society of China in 2018.

An Evidential Reasoning Approach for Safety and Reliability Management of Large Engineering Systems under Uncertainties

Jin Wang

(Liverpool John Moores University, Liverpool, UK)

(Email: J.Wang@ljmu.ac.uk)

Abstract

This presentation focuses on an evidential reasoning (ER) rule and its application to safety and reliability assessment of large engineering systems under uncertainties. ER takes Dempster's rule of the Dempster-Shafer theory of evidence as a special case. It enhances Dempster's rule by identifying its missing parts for combination of highly or completely conflicting evidence. ER provides analysts with a generic evidence-based multi-criteria decision analysis (MCDA) approach for dealing with problems having both quantitative and qualitative criteria under various uncertainties. It is based on an evidence-based reasoning principle that if more pieces of evidence support a hypothesis, then it is more likely that the hypothesis is true. It has been widely used to support decision analysis, reliability assessment, and safety assessment over the past two decades. Examples will be used in this presentation to demonstrate the usefulness and potential of ER with the help of the Intelligent Decision System (IDS) software.

Biography

Jin Wang is Director of Liverpool Logistics, Offshore and Marine (LOOM) Research Institute at Liverpool John Moores University (LJMU), UK. He is also Associate Dean (Research and Scholarship) of the Faculty of Engineering and Technology at LJMU. His research areas are in risk-based design and operation of large engineering systems such as ships and offshore installations. He has successfully completed supervision of more than 70 doctoral/postdoctoral researchers. Prof. Wang's publications include 2 research monographs and more than 130 SCI cited journal papers. He has won several prestigious research awards including a 2017 RINA – Lloyd's Register Maritime Safety Award for Lifetime Achievement from the Royal Institution of Naval Architects, and an "Outstanding Contribution to Marine Safety" award for 2017 from the Institute of Marine Engineering, Science and Technology. He is the 64th annual winner of the prestigious "Award for Risk Reduction in Mechanical Engineering" for his outstanding contribution in risk reduction of maritime/mechanical systems from the Institute of Mechanical Engineers (IMEchE) in 2018. He has been a member of IMO's formal safety assessment experts group since 2009 and the chairman of the marine transportation safety committee of European Safety and Reliability Society since 2010.

Degradation in Common Dynamic Environments

Zhisheng Ye

(Department of Industrial Systems Engineering & Management,

National University of Singapore, Singapore)

(Email: yez@nus.edu.sg)

Abstract

Degradation studies are often used to assess reliability of products subject to degradation-induced soft failures. Because of limited test resources, several test subjects may have to share a test rig and have their degradation measured by the same operator. The common environments experienced by subjects in the same group introduce significant inter-individual correlations in their degradation, which is known as the block effect. In the present paper, the Wiener process is used to model product degradation, and the group-specific random environments are captured using a stochastic time scale. Both semiparametric and parametric estimation procedures are developed for the model. Maximum likelihood estimations of the model parameters for both the semiparametric and parametric models are obtained using an inexact block coordinate descent algorithm. Performance of the maximum likelihood estimators is validated through large sample asymptotics and small sample simulations. The proposed models are illustrated by an application to lumen maintenance data of blue light-emitting diodes, and emerging contaminant degradation data.

Biography

Zhisheng Ye received a joint B.E. in Material Science & Engineering, and Economics from Tsinghua University. He received his Ph.D. degree from National University of Singapore. He is currently an Assistant Professor in the Department of Industrial Systems Engineering & Management, National University of Singapore. Dr Ye has developed fundamental degradation models for products with monotone degradation, an advancement that sparked many applications of the inverse Gaussian process. In addition, he also contributes to important developments of the Wiener process for prediction of residual useful life, condition-based maintenance modelling and degradation-based burn-in. He is also working on statistical models and theory for survival data and recurrent event data for repairable systems.

Inspection Optimization Problems in One-Shot Systems

Won Young Yun

(Department of Industrial Engineering, Pusan National University, Pusan, Korea)

(Email: wonyun@pusan.ac.kr)

Abstract

This talk considers one-shot systems such as missiles, that consist of a number of electronic and chemical components and operate only once at most after long-term storage. In general, we can know the system state only by inspection and need to inspect the one-shot systems periodically to keep high system availability on demand. Most of one-shot systems have two types of components; the electronic parts can be tested by specific instruments but chemical parts require a destructive test to know the exact condition. We assume that there are two types of components; the failures of type 1 components can be analyzed by failure distributions and the degradation of type 2 components can be modelled by some stochastic processes.

We consider two optimization problems. First, we find the optimal inspection intervals and the preventive maintenance limit of one-shot systems. Second, we consider the optimal inspection scheduling problem to smooth the inspection loads. The life cycle cost and system availability are used as optimization criteria. Simulation is used to estimate the system performances (optimization criteria) and meta-heuristics are proposed to find the optimal solutions. Numerical examples are studied to investigate the effect of model and cost parameters on the optimal inspection intervals. Finally, we suggest promising further studies in modelling and optimization techniques.

Biography

Won Young Yun is a Professor in Department of Industrial Engineering, Pusan National University, Korea. He received his BS degree in Industrial Engineering from Seoul National University, Korea, in 1982 and his MS and PhD degrees in Industrial Engineering from KAIST, Korea, in 1984 and 1988, respectively. His research interests include maintenance optimization of complex systems, spare-parts problems and simulation applications in reliability and maintenance. He has published his papers in international journals of reliability and operations research, for example, IEEE Transactions on Reliability, Reliability and System Safety, IIE Transactions, International Journal of Production Economics, etc.

Developments of Finite Markov Chain Imbedding Approach in Reliability

Xian Zhao

(School of Management & Economics, Beijing Institute of Technology, Beijing, China)

(Email: zhaoxian@bit.edu.cn)

Abstract

Finite Markov chain imbedding approach is a useful tool to solve the related problems on runs and patterns and has been widely applied in the research fields, such as reliability, biological information and quality management. This presentation gives a detailed review on the latest developments and applications of finite Markov chain imbedding approach in system reliability, start-up demonstration tests, reliability analysis for shock models and reliability analysis for balanced systems.

Biography

Xian Zhao is currently a full professor at the School of Management and Economics, Beijing Institute of Technology, Beijing, P.R. China. His current research focuses on system reliability and management. He is the Principal Investigator (PI) of three government projects funded by National Natural Science Foundation of China and one program for New Century Excellent Talents in University (2012). He received 14th Higher Education Young Teachers Fund of the Fok Ying Tung Education Foundation in 2014. He has published his papers in journals of reliability and operations research, such as European Journal of Operational Research, Reliability Engineering & System Safety, IEEE Transactions on Reliability, Renewable & Sustainable Energy Reviews, Annals of Operations Research and Computers & Industrial Engineering.

SCIENTIFIC PROGRAMME

	May 28, 2019 Tuesday	May 29, 2019 Wednesday	May 30, 2019 Thursday	May 31, 2019 Friday
Venue	Building 2 (2 号楼)	Juxian Ballroom, 2nd Floor, Friendship Palace (友谊宫二层, 聚贤厅)	Meeting Rooms #1, 2, 10, 2nd Floor, Friendship Palace (友谊宫二层, 第一、二、十会议室)	
8:30-8:50		Opening Ceremony	Sections I, II, III (8:40-10:10)	Sections I, II, III (8:40-10:10)
8:50-10:10		Plenary Talks I, II		
10:10-10:30		Coffee Break	Coffee Break	Coffee Break
10:30-12:30		Plenary Talks III, IV, V	Sections I, II, III (10:30-12:30)	Sections I, II, III (10:30-12:30)
12:30-13:30		Lunch (Friendship Palace)	Lunch (Friendship Palace)	Lunch (Friendship Palace)
13:30-14:00		Break	Break	
14:00-15:20		Registration	Plenary Talks VI, VII	Sections I, II, III (14:00-15:30)
15:20-15:40	Coffee Break		Coffee Break	
15:40-17:40	Plenary Talks VIII, IX, X		Sections I, II, III (15:50-17:50)	
17:40-18:30	Break		Break	
18:30-20:00	Dinner (Friendship Palace)	Dinner (Friendship Palace)	Banquet (Juheyuan Restaurant, 1st Floor, Friendship Palace) 友谊宫一层, 聚和园餐厅	

May 29, 2019, Wednesday
Juxian Ballroom (聚贤厅), 2nd Floor, Friendship Palace

8:30-8:50	Opening Ceremony
8:50-9:30	Plenary Talk I: Prof. Narayanaswamy Balakrishnan Reliability Modelling and Assessment of a Heterogeneously Repaired System with Partially Relevant Recurrence Data Chair: Prof. Zhaojun Li
9:30-10:10	Plenary Talk II: Prof. Yan-Fu Li RAMS Optimization Chair: Prof. Hisashi Yamamoto
10:10-10:30	Coffee Break
10:30-11:10	Plenary Talk III: Prof. Won Young Yun Inspection Optimization Problems in One-Shot Systems Chair: Prof. Bo Guo
11:10-11:50	Plenary Talk IV: Prof. Nikolaos Linnios Interval Reliability and Related Measures: Modeling and Estimation Chair: Prof. David W. Coit
11:50-12:30	Plenary Talk V: Prof. Xian Zhao Developments of Finite Markov Chain Imbedding Approach in Reliability Chair: Prof. Rong Pan
12:30-13:30	Lunch
13:30-14:00	Break
14:00-14:40	Plenary Talk VI: Prof. Mark Brown Approximations with Error Bounds in Applied Probability Models: Exponential and Geometric Approximations Chair: Prof. Jinting Wang
14:40-15:20	Plenary Talk VII: Prof. Jin Wang An Evidential Reasoning Approach for Safety and Reliability Management of Large Engineering Systems under Uncertainties Chair: Prof. Suk Joo Bae
15:20-15:40	Coffee Break
15:40-16:20	Plenary Talk VIII: Prof. Yu Liu Selective Maintenance Strategy under Uncertainty Chair: Prof. Shubin Si
16:20-17:00	Plenary Talk IX: Prof. Anatoly Lisnianski Dynamic Reliability Analysis for Multi-State Systems. Challenge for Researchers and Practitioners Chair: Prof. Hongzhong Huang
17:00-17:40	Plenary Talk X: Prof. Zhisheng Ye Degradation in Common Dynamic Environments Chair: Prof. Haitao Liao
17:40-18:30	Break
18:30-20:00	Dinner

**May 30, 2019, Thursday,
Meeting Room #1, 2nd Floor, Friendship Palace**

Section I: Stochastic Modeling I (Meeting Room #1)	
8:40-10:10, Chair: Gaofeng Da, Xujie Jia	
Taishin Nakamura, Hisashi Yamamoto	Recursive Algorithm for the Reliability of the Toroidal Connected- (r,s) -out-of- (m,n) :F Lattice System
Dong Lyu, Shubin Si	Stress-Strength Interference Based Importance Measure for the Consecutive- k -out-of- n :G System
Lei Zhou, Hisashi Yamamoto, Taishin Nakamura, Xiao Xiao	Optimization Problems for Consecutive- k -out-of- n :G System Consisting of Number of Failed Components
Gaofeng Da	On Computation of Signatures of Monotone Systems
Xujie Jia, Fanqi Xu, Xueying Song	Analysis of Dynamic Signature and Residual Lifetime for Multi-State Reliability Systems
He Yi, Lirong Cui	System Signatures for Some Multi-State Consecutive- k Systems with Binary Components
10:10-10:30	Coffee Break
10:30-12:30, Chair: Hongyan Dui, Wen Yao	
Huiying Cao, Pan Zhang, Zhiqiang Cai	The Study on Epidemic Spreading with Complex Network: A Review
Chao Zhang, Xin Xu, Hongyan Dui	Topology-Based Resilience Measure in Network Systems
Hongyan Dui, Chi Zhang, Guanghan Bai	Complex Weighted Network-Based Reliability Analysis and Optimization of Urban Taxi Sharing Systems
Byeong Kwan Son, Won Young Yun	The System Reliability of the Mobile Communication Network
Xu Wang, Yincai Tang	Rolling Bearing Fault Diagnosis Based on Bayesian Convolutional Neural Networks
Xiaohu Zheng, Wen Yao, Yingchun Xu, Xiaoqian Chen	A Method for Complex Multistate Systems Reliability Analysis Based on Compression Inference Algorithm and Bayesian Network
Peng Su, Guanjun Wang	Reliability Evaluation of Network Systems Subject to Dependent Probabilistic Propagation Failures
Xiang Li, Tudi Huang, Hongzhong Huang	An Algorithm for Discrete-Time Bayesian Network Applied on C^4 ISR with Standby Gates
12:30-13:30	Lunch
13:30-14:00	Break

**May 30, 2019, Thursday,
Meeting Room #1, 2nd Floor, Friendship Palace**

Section I: Stochastic Modeling I (Meeting Room #1)	
14:00-15:30, Chair: Rui Peng, Yuanpeng Ruan	
Yuanpeng Ruan, Zhongliang Zhang	Two-Dimensional Warranty Cost Analysis for a Complex Multi-Component Product Considering Imperfect Preventive Maintenance
Kunxiang Yi, Hui Xiao, Chen Lin, Rui Peng	Trade-off Between Maintenance and Protection for Multi-State Performance Sharing Systems with Transmission Loss
Simiao Du, Jinting Wang	Analysis of the Preventive Maintenance Strategy in Two-Dimensional L-Shaped Warranty
Chiming Guo, Yongsheng Bai, Zhiyuan Yang	Condition-Based Maintenance Optimization for Multi-Component Systems with Failure Dependence
Chenyang Ma, Wei Wang, Zhiqiang Cai	Maintenance Optimization of Reconfigurable System Based on Non-Dominated Sorting Genetic Algorithm
Wenjie Dong, Sifeng Liu, Suk Joo Bae	Which Maintenance Policy is Better for Multi-State Degradation Systems: Policy T or Policy N?
15:30-15:50	Coffee Break
15:50-17:50, Chair: Ancha Xu, Pingping Wang	
Qiang Guan, Yincai Tang, Ancha Xu	Interval Modeling for a Gamma Process Degradation Model
Junyu Guo, Tudi Huang, Hongzhong Huang	Bayesian Information Fusion Method for Reliability Analysis with Heterogeneous Data
Ancha Xu, Jiawen Hu	Inverse Gaussian Degradation Model with Heterogeneous Effect
Pingping Wang, Ancha Xu, Yincai Tang	Degradation Data Analysis Based on a Two-Phase Gamma Process: A Bayesian Perspective
Jiangbin Zhao, Shubin Si, Zhiqiang Cai	A Multi-Objective Reliability Optimization for Reconfigurable Systems Considering Components Degradation
Qinglai Dong, Lirong Cui	Reliability Analysis of a Two-Stage Degradation System Subject to Competing Failures
Zhiyuan Yang, Jianmin Zhao, Chiming Guo, Liying Li	Reliability Modeling for the System with Multiple Dependent Degradation Processes and Random Shocks
Jie Zhou, Yanfeng Li, Hongzhong Huang	An Approach for Reliability Analysis with High-Pressure Turbine Blades
17:50-18:30	Break
18:30-20:00	Banquet

**May 30, 2019, Thursday,
Meeting Room #2, 2nd Floor, Friendship Palace**

Section II: Stochastic Modeling II (Meeting Room #2)	
8:40-10:10, Chair: Shan Jiang, Junjun Zheng	
Shan Jiang, Yan-Fu Li	Time-Variant Fatigue Reliability Evaluation of Riveted Lap Joint under Arbitrary Tension Loading
Yan Li, Xiaofeng Wang, Xia Cai	Dynamic Reliability Assessment for Discrete Time Redundant Systems under Multiple Working Condition
Chen Fang, Lirong Cui	Reliability Analysis for Balanced Engine Systems with m Sectors by Considering Start-up Probability
Siqi Wang, Xian Zhao, Jinglei Sun, Shuai Cao, Leping Sun	Start-up Demonstration Tests with Multiple Attributes and Sparse Connection
Junjun Zheng, Hiroyuki Okamura, Tadashi Dohi	A Note on a Phase Expansion Approach for Availability Analysis of Database Systems
Huaming Qian, Hongzhong Huang, Yanfeng Li	An Improved Model for Computing Time-variant Reliability Based on the Outcrossing Rate
10:10-10:30	Coffee Break
10:30-12:30, Chair: Xiaoyue Wu, Jingyuan Shen	
Nooshin Yousefi, David W. Coit	Reliability Analysis of Degrading Systems with Individually Repairable and Replaceable Components
Jingyuan Shen, Yizhong Ma	Reliability Modelling and Optimal Maintenance Policy for Degradation Systems with Load-Sharing Auxiliary Components
Yifan Li, Hongzhong Huang, Xiang Li	A New Ordering Method of Basic Events for Sequential Binary Decision Diagram
Guanqi Fang, Rong Pan	System Reliability Assessment with Multivariate Dependence Models
Bei Wu, Lirong Cui	Reliability Analysis of Shock Models with Cumulative Effects
Haiyue Yu, Xiaoyue Wu	A Method for Model Transformation from DFT to BDD
Kaiye Gao, Hui Xiao, Rui Peng	Reliability Modeling of Multi-Phased Linear Consecutively Connected Systems
Congshan Wu, Xian Zhao, Yu Fan, Leping Sun	Acceptance Sampling Plans for Products with Multiple Reliability Attributes
12:30-13:30	Lunch
13:30-14:00	Break

**May 30, 2019, Thursday,
Meeting Room #2, 2nd Floor, Friendship Palace**

Section II: Stochastic Modeling II (Meeting Room #2)	
14:00-15:30, Chair: Yi Ding, Lev Khvatskin	
Chaonan Wang, Liudong Xing	Multi-State Reliability Modeling of Phased-Mission k -out-of- n Systems
Heping Jia, Yi Ding	Reliability Analysis of a Multi-State Demand-Based Warm Standby System with Common Bus Performance Sharing
Lev Khvatskin, Iliia Frenkel, Anatoly Lisnianski	Reliability and Fault Tolerance Assessment of the Redundant Multi-State Air Conditioning System for Chemical Laboratory
Qinzheng Liu, Yu Liu	Reliability Evaluation of Partially Observed Multi-State Systems with State Transition Dependency
Thomas Markopoulos, Agapios N. Platis	A Comparative Reliability Analysis of a Ship's Main Propulsion Based on Multistate Systems
Chao Zhang, Guanghan Bai, Rentong Chen	An Improved Reliability Bounds for Multistate Networks
15:30-15:50	Coffee Break
15:50-17:50, Chair: Qingpei Hu, Zhenlu Chen	
Bolvashenkov Igor, Kammermann Jörg, Iliia Frenkel, Wenbin Zeng, Herzog Hans-Georg	Comparative Reliability Analysis of Different Traction Drive Topologies for a Search-and-Rescue Helicopter
Dongmin Li, Qingpei Hu, Dan Yu	Statistical Inference and Prediction for $M(t)/G/\infty$ Systems Under Incomplete Observations
Peng Huang, Yanfeng Li, Hongzhong Huang	A New Algorithm Based on Conjugate Search Direction and Saddlepoint Approximation for Structural Reliability Analysis
Yufang Fu, Bojun Gu, Jun Ye and Bin Cao	Game Theoretic Analysis of Structure Selection and Differential Pricing Strategy in Dual Channel E-Retail
Min Li	Research on the Antecedents That Influence the Box Office of Chinese Movies in North America Based on the Foreignness Theory
Nan Zhang, Guangjun Jiang, Qingchao Zhang	Design and Discussion on Durability Test Conditions of Special Vehicles
Yingchun Xu, Wen Yao, Xiaohu Zheng, Xiaoqian Chen	Multi-Prior Integration and Updating Method for Complex System Reliability Analysis Based on Bayesian Melding Method and Bayesian Network
Zhenlu Chen	Selection of On-Line Inspection Policies Based on Product Complexity and Human Inspection Skill in a Manufacturing Line
17:50-18:30	Break
18:30-20:00	Banquet

**May 30, 2019, Thursday,
Meeting Room #10, 2nd Floor, Friendship Palace**

Section III: Stochastic Modeling III (Meeting Room #10)	
8:40-10:10, Chair: Renyan Jiang, Koshkin Gennady	
Renyan Jiang	A CV-Based Approach for Estimating Weibull Shape Parameter and MTF of a Component for Heavily Censored Data
Congcong Cheng, Yun-An Zhang, Guanghan Bai, Junyong Tao	Strength Prediction of Micro-Scale Brittle Materials Based on an Improved Estimation Method of Weibull Parameters
Qian Zhao, Xiang Jia, Zhiyun Cheng, Bo Guo	An Approximate Calculation Method for Residual Life Estimation of Cold Standby Systems
Smagin Valery, Koshkin Gennady, Kim Konstantin	Robust Extrapolation in Stochastic Systems with Fault-Detections of Jump Parameters Using Non-Parametric Smoothing Estimators
Xiang Xiao, Yincai Tang, Ancha Xu	Bayesian Inference for Zero-and-One-Inflated Geometric Distribution Regression Model Using Polya-Gamma Latent Variables
Yanbin Ma, Wenhao Gui	Point Estimation and Two New Goodness of Fit Tests for the Scale Family Based on General Progressively Type-II Censored Samples
10:10-10:30	Coffee Break
10:30-12:30, Chair: Wenbin Zeng, Mansoor Shaukat Khan	
Xiang Jia, Zhiyun Cheng, Bo Guo	Reliability Analysis for Weibull Distribution by Fusing Expert Judgements and Censored Data
Samira Karimi, Haitao Liao	Reliability Analysis of Censored Aggregate Failure Time Data with Covariates
Mansoor Shaukat Khan, Saqlain Raza	A Study on Incomplete Data for Competing Risk Regression
Zhiqian Lu, Li Zhang, Guanghan Bai, Junyong Tao	Effects of Parameter Uncertainty on Dynamic Characteristics of Wear-Involved Mechanism
Xiaofang Dong, Liangyong Zhang	Estimation of System Reliability for Exponential Distribution Based on Extreme Ranked Set Sampling
Wenbin Zeng, Guixiang Shen, Ilia Frenkel, Kammermann Jörg, Bolvashenkov Igor, Herzog Hans-Georg	On Markov Reward Approach to Availability and Failure Critical Importance Evaluation for CNC Machine Tools
Dmitriev Yuri, Koshkin Gennady	On Nonparametric Estimation of Distribution Functionals Using Auxiliary Information of Parametric Type
Liang Wang, Huanyu Li, Yogesh Mani Tripathi	Inference for Dependence Competing Risks with Partially Masked Failure Mode from Bivariate Rayleigh Distribution under Generalized Progressive Hybrid Censoring
12:30-13:30	Lunch
13:30-14:00	Break

**May 30, 2019, Thursday,
Meeting Room #10, 2nd Floor, Friendship Palace**

Section III: Stochastic Modeling III (Meeting Room #10)	
14:00-15:30, Chair: Kodo Ito, Linhan Ouyang	
Kodo Ito, Naoya Wada, Toshio Nakagawa	Optimal Training Plans on Physical Performance Considering Supercompensation
Junyuan Wang, Jimin Ye	An Extended Optimal Replacement Model for a Simple Repairable System
Young Jin Han, Qianqian Zhao, Won Young Yun	Optimal Inspection and Replacement Strategy of 145kV GIS
Yan Ma, Jianjun Wang, Lina Tang	Multi-Response Optimization Using an Integrated Bayesian Desirability Function
Linhan Ouyang, Yizhong Ma, Chanseok Park	Robust Stochastic Kriging for Simulation Optimization
Mingli Liu, Shubin Si	Importance Measure-Based Reliability Optimization Method for Multi-State Systems
15:30-15:50	Coffee Break
15:50-17:50, Chair: Yincai Tang, Hongming Zhou	
Fangyun Hu, Yan Shen	The Multivariate Exponentially Weighted Moving Average Charts based on Copula and the Performances
Yini Jin, Jihong Pang, Hongming Zhou	A Priority Evaluation Method for Inspection Tasks of Assembly Process Quality Control Based on Entropy Weight and TOPSIS
Yincai Tang, Yudong Wang	Objective Bayesian Analysis for Accelerated Temperature Cycling Test Based on Coffin-Manson Model
Gangjin Huang, Hongkun Li, Yuanliang Zhang, Chaoge Wang, Jiayu Ou	Research on Fault Feature Extraction of Rolling Bearing Based on DEMD and Teager Energy Operator
Junru Ren, Wenhao Gui	Goodness-of-Fit Test for Rayleigh Distribution Based on Progressively Type-II Censored Sample
Shirong Zhou, Yongqiang Lian, Yincai Tang, Ancha Xu	Early Warning Strategy of Sparse Failures for High Reliable Products Based on Bayesian Method
Yutai Su, Guicui Fu	Multi-Mechanism Failure Probability Distribution Fusion for Semiconductor Devices Based on Maximum Entropy Theory
Yijun Wang, Jiajia Zhang, Yincai Tang	Bayesian Approach for Proportional Hazards Mixture Cure Model Allowing Non-Curable Competing Risk
17:50-18:30	Break
18:30-20:00	Banquet

**May 31, 2019, Friday,
Meeting Room #1, 2nd Floor, Friendship Palace**

Section I: Stochastic Modeling I (Meeting Room #1)	
8:40-10:10, Chair: Xufeng Zhao, Liying Wang	
Xufeng Zhao, Cunhua Qian, Toshio Nakagawa	Maintenance Modellings with Random Mission Intervals
Caiyun Niu, Jiang Jiang, Bingfeng Ge, Yingwu Chen	Preventive Maintenance Model based on the Renewal-Geometric Process
Quan Shi, Juan Li	Statistical Modeling and Analysis of Equipment Maintenance Workload with Small Samples
Wei Xia, Quan Shi, Yadong Wang, Yansong Ai	Network-Maintenance Support Scheme Generation Technology Based on Model
Revaz Kakubava, Revaz Mikadze	New Type Queuing Models for Network Maintenance Problem
Liying Wang, Yanmei Yang, Huihui Zhu, Baoyou Liu	Maintenance Optimization of a 2-Component Swappable Series System Using the Delay-Time Concept
10:10-10:30	Coffee Break
10:30-12:15, Chair: Shey-Huei Sheu, Wenjin Zhu	
Longxiang Fang, Qing Jin	Optimal Grouping of Heterogeneous Components in Series Systems under Dependence Structure
Shey-Huei Sheu	An Optimal Age Replacement Policy for Multi-State k -out-of n System
Renu, Soni Bisht, S. B. Singh	Interval-Valued Reliability of Repairable Multi-State Systems
Zhengcheng Zhang, Yonghong Yang, Zhitu Guo	Reliability Analysis for Repairable Standby Systems
Wenjin Zhu, Shubin Si	First Passage Time of a Balanced System with Tolerance
Armen Stepanyants, Valentina Viktorova	A Software Tool for Reliability Analysis of Multi-State Systems
Hongda Gao, Lirong Cui	A Study of Two-Phase Degradation Models under Hybrid Stochastic Processes with a Change Point
12:15-13:30	Break
12:30-13:30	Lunch

**May 31, 2019, Friday,
Meeting Room #2, 2nd Floor, Friendship Palace**

Section II: Stochastic Modeling II (Meeting Room #2)	
8:40-10:10, Chair: Man Ho Ling, Xinggang Luo	
Zhaojun (Steven) Li, Gongyu Wu, Christian Salmon	Risk-Informed Reliability Design Method Through Optimal Design Verification and Validation (V&V) Planning
Man Ho Ling	Optimal Design of Simple Step Stress Accelerated Life Tests for One-Shot Devices under Weibull Distributions
Xiangxiang Zhang, Jun Yang, Xuefeng Kong	Design of Multi-Stress Accelerated Life Testing Plans Based on D-optimal Experimental Design
Qianqian Zhao, Alfonso J. Endharta, Won Young Yun	Inspection Scheduling Problem of One-Shot Systems with Nondestructive and Destructive Inspections
Cesar Ruiz, Ed Pohl, Haitao Liao	Bayesian Degradation Modeling for Spare Parts Inventory Management
Xinggang Luo, Huichang Chen, Yang Yu, Menwei Zhu	Routing and Scheduling of Home Care Service Under the E-Business Environment
10:10-10:30	Coffee Break
10:30-12:30, Chair: Xi Zhang, Chi Zhang	
Li Zhang, Zhiqian Lu, Shufeng Zhang, Junyong Tao	Nonlinear Dynamic Behavior of Slider-Crank Mechanism with Three-Dimension Revolute Joint Considering Wear-Involved Clearance
Liudong Xing, Gregory Levitin, Chaonan Wang, Yujie Wang	Recent Developments in Reliability Modeling of Dynamic and Dependent Behaviors
Yu Zhou, Yang Bai, Hualin Xu	Combining MCDM with Data Streams Clustering in Equipment Health State Evaluation
Chenyu Zhang, Taijie Tang	The Innovation-Driven Mechanism of College-Based 1 st Largest Shareholder Companies—Based on Propensity Score Matching (PSM) Method
Xi Zhang, Chi Zhang, Haotian Liu	Research of Aeroengine Fault Prediction and Health Management
Zhongliang Zhang, Xinggang Luo, Yuanpeng Ruan, Ya Li	A Powerful One-versus-One Decomposition Scheme Integrating Dynamic Ensemble Selection with the Management of Non-Competent Classifiers for Sentiment Analysis
Bojun Gu, Yufang Fu, Yanling Li	Quality Improvement and Fresh-Keeping Effort for Fresh-Product Supply Chain with Power Structures
Chunyu Teng, Cong Lin, Zhanyong Ren, Yun Fu, Xichang Wang	Life Prediction of a Device Based on Material's Microstructure Evolution by Means of Computational Materials Science
12:30-13:30	Lunch

**May 31, 2019, Friday,
Meeting Room #10, 2nd Floor, Friendship Palace**

Section III: Stochastic Modeling III (Meeting Room #10)	
8:40-10:10, Chair: Jun Yang, Jiancai Wang	
Ying Wang, Zaizai Yan	Statistical Inference on Accelerated Competing Failure Model from Inverse Weibull Distribution under Progressively Type-II Censored Data
Yue Zhang, Wenhao Gui	A Goodness of Fit Test for the Pareto Distribution with Progressive Type II Censored Data Based on the Cumulative Hazard Function
Fanbing Meng, Shuo Huang, Jun Yang	A New Method of Process Capability Analysis for Manufacturing Processes Based on the Quality Data of Supplier Products
Zhongping Li, Lirong Cui	A Numerical Method for Mean of Linear Hawkes Processes
Ning Ma, Jimin Ye, Junyuan Wang	A Generalized Geometric Process Based Repairable System Model with Bivariate Policy
Jiancai Wang, Wensi Zhang, Yaoyu Wang	Lagrangian Relaxation Approach for Distribution-Free Multi-Product Newsvendor Problem with Quantity Discounts and Resource Constraint
10:10-10:30	Coffee Break
10:30-12:15, Chair: Ning Wang, Xiaoliang Ling	
Zirui Jia, Xiaoyan Gu, Jingqian Wen	Simulation Reliability Evaluation Model of Integrated Electronic System from the Perspective of Risk
Dmitriev Yury, Koshkin Gennady, Smagin Valery	Estimation of the Present Values of Life Annuities for Actuarial Models Using Auxiliary Information about Characteristics of Lifetime
Ning Wang, Ruoning Lv, Yangming Guo, Peican Zhu	An Investigation of Reliability Optimization in Standby Systems
Juan Li, Quan Shi	Analysis of the Compound Damage by Fragments and Shock Waves on Antenna Equivalent Target Plates in Different Time Series
Zhaoqiang Wang, Changhua Hu, Hongdong Fan, Xiaoxiang Hu	Remaining Useful Life Prediction Method Considering the Volatility of the Degradation Data
Xiaoliang Ling, Yazhou Zhang, Ping Li	Optimal Allocation of Components in Series-Parallel and Parallel-Series Systems Subject to Random Shocks
Xiaoyue Wang, Xian Zhao, Yanbo Song	Start-up Demonstration Tests Considering Multi-Attribute of Start-up Result
12:15-12:30	Break
12:30-13:30	Lunch

酒店及交通 Accommodation & Travelling

酒店信息 Hotel Information:

名称: 北京友谊宾馆 Name: Beijing Friendship Hotel

地址: 北京市海淀区中关村南大街 1 号

Add: 1, Zhongguancun South Street, Haidian District, Beijing ,China

北京友谊宾馆公共交通乘车路线图 Hotel Public Transportation

Starting	Distance/Km	Type of Transportation
首都国际机场 Capital International Airport	34	<p>乘坐到公主坟的机场大巴，在友谊宾馆站下车，步行至友谊宾馆。</p> <p>Take the shuttle bus (Capital Airport to Gongzhufen), get off at the stop of Friendship Hotel.</p> <p>乘坐机场快线到三元桥，转成地铁 10 号线到海淀黄庄，换乘 4 号线到人民大学站，出 D 口，往南步行 180 米至友谊宾馆东门。</p> <p>Take Airport Express to Sanyuanqiao station, then Subway line 10 to Haidianhuangzhuang station, transfer to Subway line 4 to Renmin University station, exit D, then walk 180 meters south to the east gate of Friendship Hotel.</p>
北京站 Beijing Railway Station	18	<p>乘坐 814 路公交车至中国农业科学院站下车，过天桥至马路对面，然后往北步行 500 米至友谊宾馆东门。</p> <p>Take Bus 814 to Chinese Academy of Agricultural Sciences. Cross the overpass to the other side of the road, then walk 500 meters north to the east gate of Friendship Hotel.</p> <p>乘坐 2 号线到西直门站，换乘 4 号线到人民大学站，出 D 口，往南步行 180 米至友谊宾馆东门。</p> <p>Take subway line 2 to Xizhimen station and transfer to line 4 to Renmin University station, exit D, then walk 180 meters south to the east gate of Friendship Hotel.</p>
北京南站 Beijing South Railway Station	25	<p>乘坐 4 号线到人民大学站，出 D 口，往南步行 180 米至友谊宾馆东门。</p> <p>Take line 4 to Renmin university station, exit D, then walk 180 meters south to the east gate of Friendship Hotel.</p>

<p>北京北站 Beijing North Railway Station</p>	<p>5</p>	<p>到西直门站乘坐4号线到人民大学站，出D口，往南步行180米至友谊宾馆东门。 Take line 4 at Xizhimen Station to Renmin university station, exit D, then walk 180 meters south to the east gate of Friendship Hotel.</p>
<p>北京西站 Beijing West Railway Station</p>	<p>8</p>	<p>乘坐320/695路公交车或6路双层公交到中国农业科学院站下车，过天桥至马路对面，然后往北步行500米至友谊宾馆东门。 Take 320/695/6 to Chinese Academy of Agricultural Sciences. Cross the overpass to the other side of the road, then walk 500 meters north to the east gate of Friendship Hotel.</p> <p>乘坐地铁9号线至国家图书馆站，换乘4号线，到人民大学站，出D口，往南步行180米至友谊宾馆东门。 Take subway line 9 to National Library station, transfer to line 4 to Renmin University station, exit D, then walk 180 meters south to the east gate of Friendship Hotel.</p>

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