

CONFERENCE PROGRAM  
24<sup>TH</sup> ISSAT INTERNATIONAL CONFERENCE  
RELIABILITY and QUALITY in DESIGN  
TORONTO, ONTARIO, CANADA ★ AUGUST 2 – 4, 2018

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## Best Paper Awards

### ISSAT RQD 2017 Best Paper Award

#### **Optimization and Reliability Analysis Tool Based on Multi-Dimensional Wiener Processes for Big Data on Cloud Computing**

Yoshinobu Tamura (*Tokyo City University, Japan*)

Shigeru Yamada (*Tottori University, Japan*)

### ISSAT RQD 2017 Best Student Paper Award

#### **Software Reliability Modeling with Considerations of Two-Phase Imperfect Debugging and Fault Removal**

Mengmeng Zhu (*Rutgers University, USA*)

Hoang Pham (*Rutgers University, USA*)

## Keynote Speech I

### **Adoption of Reliability Techniques for Smart Consumer Goods – Techniques and Implementation Difficulties**

**Alex Boussetta**

**Executive Consultant, Operational Excellence  
Abacus Team Inc.**

Smart consumer goods, such as smart TVs, tablets, smartphones, wearables, appliances, cars, have become a commodity from a consumer perspective. Consumers do not see the inherent difference in the complexity levels of these products.

On a regulatory perspective, safety is addressed in terms of minimum manufacturing and test process requirements. Surprisingly, although manufacturers usually go beyond these minimum requirement, the achieved products do not always meet the requirements from a point view of reliability, or quality over time. Recent examples from top innovative companies include Samsung smartphones, Samsung washer tops, LG and Samsung Smart TV signal, Toyota and Tesla recurring issues, to name a few. This presentation will go through what tools and techniques are typically used in these industries and why sometimes they are being ignored.

The emerging use of Artificial intelligence vs statistics in manufacturing or supply chain decision processes regarding quality will also be explored.

## Keynote Speech II

### **Machine Learning-enabled Predictive Modeling Technologies for PHM**

**Dr. Chunsheng Yang**

**Senior Research Officer  
The National Research Council Canada**

The need for higher equipment availability/reliability and lower maintenance cost is driving the development and integration of prognostic and health management (PHM) systems. Taking advantage of advances in sensor technologies, PHM systems enable a predictive maintenance strategy through continuously monitoring the health of complex systems. The core of PHM technology is prognostics which is able to predict the likelihood of a failure and estimate time to failure (TTF) using the predictive models. The predictive models could be either physics-based models or machine learning-based models. In this talk, I will talk about the emerging machine learning-enabled predictive modeling technologies for PHM, including classification, on-demand regression along with the real-world applications such as train prognostics which deployed the developed predictive models to perform the proactive maintenance for the train wheels.



## Conference at a Glance

THURSDAY, AUGUST 2	FRIDAY, AUGUST 3	SATURDAY, AUGUST 4
8:00 - 9:00 Registration / Continental Breakfast Chestnut Foyer	8:00 - 8:30 Registration / Continental Breakfast Chestnut Foyer	8:00 - 8:30 Registration / Continental Breakfast Chestnut Foyer
9:00 - 9:15 Welcome - Awards Presentation Chestnut Room	8:30 - 10:00 Technical Sessions Chestnut West & Maple Rooms	8:30 - 10:00 Technical Sessions Chestnut East & West Rooms
9:15 - 10:00 Keynote Speech I Chestnut Room	10:00 - 10:15 Coffee Break Chestnut Foyer	10:00 - 10:15 Coffee Break Chestnut Foyer
10:00 - 10:15 Coffee Break Chestnut Foyer	10:15 - 11:45 Technical Sessions Chestnut West & Maple Rooms	10:15 - 12:15 Technical Sessions Chestnut East & West Rooms
10:15 - 11:45 Technical Sessions Chestnut Room & Maple Room	12:00 - 1:00 Conference Luncheon Chestnut East	12:15 Adjourn!
1:00 - 1:45 Keynote Speech II Chestnut Room	1:30 - 3:00 Technical Sessions Chestnut West & Maple Rooms	
1:45 - 2:00 Coffee Break Chestnut Foyer	3:00 - 3:15 Coffee Break Chestnut Foyer	
2:00 - 3:30 Technical Sessions Chestnut Room & Maple Room	3:15 - 5:30 Technical Sessions Chestnut West & Maple Rooms	
3:45 - 5:15 Technical Sessions Chestnut Room & Maple Room		
5:30 - 7:00 Welcome Reception Churchill Room		

## Technical Sessions at a Glance

	CHESTNUT		MAPLE	
Thursday, Aug. 2	Session No.	Title	Session No.	Title
10:15 - 11:45	1	System Reliability Modeling & Predictions	2	Quality in Design & Optimization
2:00 - 3:30	3	Software Reliability Modeling and Assessment	4	Network Reliability & Modeling
3:45 - 5:15	5	Reliability, Safety and Risk Assessment	6	Reliability Modeling & Applications

	CHESTNUT WEST		MAPLE	
Friday, Aug. 3	Session No.	Title	Session No.	Title
8:30 - 10:00	7	Mechanical Reliability, Analysis and Applications	8	Reliability and Maintenance Optimization
10:15 - 11:45	9	Software Reliability Modeling and Prediction	10	Reliability and Performability Engineering & Applications
1:30 - 3:00	11	Maintenance Modeling & Applications	12	Reliability in Design and Optimization
3:15 - 5:30	13	Maintenance Optimization & Applications	14	Quality Engineering, Statistics and Applications

	CHESTNUT WEST		CHESTNUT EAST	
Saturday, Aug. 4	Session No.	Title	Session No.	Title
8:30 - 10:00	15	Engineering Reliability and Applications	16	Failure Analysis & Reliability Assessment
10:15 - 12:15	17	Statistical Reliability Modeling & Machine Learning	18	System Reliability, Durability and Optimization

## Technical Sessions

### SESSION 1: System Reliability Modeling & Predictions

**Chair: Prof. D. Gary Harlow** (*Lehigh University, USA*)

#### **Prognostic-Based Reliability Assessment of a Wafer Handling Robot Arm Using Wiener Stochastic Process Model and Monte Carlo Simulation**

Jian-Hua Huang (*National Changhua University of Education, Taiwan*)

Hui Min Cheng (*National Changhua University of Education, Taiwan*)

Yi-Ru Li (*National Changhua University of Education, Taiwan*)

Kuan-Jung Chung (*National Changhua University of Education, Taiwan*)

#### **A Geometric Brownian Motion Degradation Model for Ink Fading of Printed Images**

Ziyi Wang (*Rutgers University, USA*)

E. A. Elsayed (*Rutgers University, USA*)

#### **Statistical Characterization of Wire and Arc Additive Manufactured Stainless Steel 304: Microstructure and Fatigue**

Jerard V. Gordon (*Lehigh University, USA*)

D. Gary Harlow (*Lehigh University, USA*)

### SESSION 2: Quality in Design & Optimization

**Chair: Prof. Gordon J. Savage** (*University of Waterloo, Canada*)

#### **Optimization Design of Welding Quality Effect Parameters of Box Girder Flange Weld Seam**

Jia Li (*Northeastern University, China*)

Fei Zhao (*Northeastern University, China*)

Ying Guo (*Northeastern University, China*)

Hao Wang (*Northeastern University, China*)

#### **Outsourcing Partner Selection for Process with Two-Sided Specification Based on Capability Index $C_{pm}$ and Manufacturing Time**

Kuen-Suan Chen (*National Chin-Yi University of Technology, Taiwan*)

Yun-Tsan Lin (*National Chin-Yi University of Technology, Taiwan*)

Tsang-Chuan Chang (*Metal Industries Research and Development Centre, Taiwan*)

#### **Second-Moment Design of Dynamic Systems with Uncertain Excitations and Uncertain Parameters via Differentiable Meta-Models**

Gordon J. Savage (*University of Waterloo, Canada*)

Young Kap Son (*Andong National University, Korea*)

### SESSION 3: Software Reliability Modeling and Assessment

**Chair: Prof. Shinji Inoue** (*Kansai University, Japan*)

#### **A Survey of Changepoint Software Reliability Growth Models**

Vidhyashree Nagaraju (*University of Massachusetts Dartmouth, USA*)

Lance Fiondella (*University of Massachusetts Dartmouth, USA*)

Thierry Wandji (*Naval Air Systems Command, USA*)

#### **A Generalized Martingale-based Software Reliability Model Considering Multiple Environmental Factors**

Mengmeng Zhu (*Rutgers University, USA*)

Hoang Pham (*Rutgers University, USA*)

#### **Bivariate Software Reliability Models Depending on a Cobb-Douglas Type Testing-Time Function and Their Applications**

Shunichi Sakaguchi (*Tottori University, Japan*)

Yuka Minamino (*Tottori University, Japan*)

Shinji Inoue (*Kansai University, Japan*)

Shigeru Yamada (*Tottori University, Japan*)

### SESSION 4: Network Reliability & Modeling

**Chair: Prof. Yi-Kuei Lin** (*National Taiwan University of Science and Technology, Taiwan*)

#### **Solar Power Output Forecasting Using Seasonal Deep Belief Network**

Ching-Hsin Wang (*National Chin-Yi University of Technology, Taiwan*)

Kuo-Ping Lin (*Asia University, Taiwan*)

Yu-Ming Lu (*Lunghwa University of Science and Technology, Taiwan*)

Chih-Feng Wu (*Wenzao Ursuline University of Languages, Taiwan*)

## **Backup Reliability Evaluation for a Stochastic Computer Network with the Retransmission and Time**

### **Considerations**

Cheng-Fu Huang (*Feng Chia University, Taiwan*)  
Yi-Kuei Lin (*National Taiwan University of Science and Technology, Taiwan*)  
Ping-Cheng Chang (*National Quemoy University, Taiwan*)

## **A Novel Approach to Search for All Solutions of a Non-Negative Linear Diophantine Equation**

Shin-Guang Chen (*Kaohsiung Medical University, Taiwan*)

## **SESSION 5: Reliability, Safety and Risk Assessment**

**Chair: Dr. Mingxiao Jiang** (*Medtronic Plc., USA*)

## **Clustering Algorithms for Deductive FMEA and Failure Identification in Complex Production Systems**

Riccardo Accorsi (*University of Bologna, Italy*)  
Emilio Ferrari (*University of Bologna, Italy*)  
Andrea Gallo (*University of Bologna, Italy*)  
Riccardo Manzini (*University of Bologna, Italy*)

## **A New Damage Correlation Model for Customer and Proving Ground Roads**

Songlin Zheng (*University of Shanghai for Science and Technology, China*)  
Lei Dai (*University of Shanghai for Science and Technology, China*)  
Jiawei Yu (*University of Shanghai for Science and Technology, China*)  
Jinzhi Feng (*University of Shanghai for Science and Technology, China*)  
Lihui Zhao (*University of Shanghai for Science and Technology, China*)

## **Risk Based Bayesian Design for Fatigue Reliability for Implantable Medical Devices**

Mingxiao Jiang (*Medtronic Plc., USA*)  
Haitao Zhang (*Medtronic Plc., USA*)

## **SESSION 6: Reliability Modeling & Applications**

**Chair: Prof. Mitsutaka Kimura** (*Gifu City Women's College, Japan*)

## **Reliability Modelling of Window Flow Control Scheme based on Packet Transmission Interval with Explicit Congestion Notification**

Mitsutaka Kimura (*Gifu City Women's College, Japan*)  
Mitsuhiro Imaizumi (*Aichi Gakusen University, Japan*)  
Toshio Nakagawa (*Aichi Institute of Technology, Japan*)

## **Parameter Estimation for an $n$ -variate FGM Copula and Its Application to Dependent Failure Analysis**

Shuhei Ota (*Hosei University, Japan*)  
Mitsuhiro Kimura (*Hosei University, Japan*)

## **Reliability Evaluations of a System with Multiple-Stage Policy**

Mitsuhiro Imaizumi (*Aichi Gakusen University, Japan*)  
Mitsutaka Kimura (*Gifu City Women's College, Japan*)

## **SESSION 7: Mechanical Reliability, Analysis and Applications**

**Chair: Prof. B. S. Dhillon** (*University of Ottawa, Canada*)

## **Quantitative Risk Assessment with Bayesian Reliability Improvement**

Mingxiao Jiang (*Medtronic Plc., USA*)

## **Study on Bearing Life Distribution Estimation Based on Super-Small Size Sample of Censoring Data**

Ningxiang Wu (*Northeastern University, China*)  
Liyang Xie (*Northeastern University, China*)  
Haiyang Li (*Northeastern University, China*)

## **Robot Reliability: An Investigative Study**

B. S. Dhillon (*University of Ottawa, Canada*)

## **SESSION 8: Reliability and Maintenance Optimization**

**Chair: Prof. E. A. Elsayed** (*Rutgers University, USA*)

## **Reliability Analysis of Superlift Counterweight Structure of Crawler Crane**

Jia Li (*Northeastern University, China*)  
Lei Wang (*Northeastern University, China*)  
Li Li (*Northeastern University, China*)  
Zhibo Liu (*Northeastern University, China*)  
Yue Sun (*Northeastern University, China*)

## **Reliability Evaluation with Heterogeneous Sequential Order Statistics for the Burr Type XII Distribution**

Jyun-You Chiang (*Southwestern University of Finance and Economics, China*)  
Y. L. Lio (*University of South Dakota, USA*)  
Tzong-Ru Tsai (*Tamkang University, Taiwan*)



**A Multi-Objective Optimization of Preventive Maintenance for Multi-State Aging Systems**

Chun-Ho Wang (*National Defense University, Taiwan*)  
Chao-Hui Huang (*R.O.C. Naval Academy, Taiwan*)

**SESSION 9: Software Reliability Modeling and Prediction**

**Chair: Prof. Kodo Ito** (*Tottori University, Japan*)

**Feature Selection Analysis for Quantitative Fault Prediction**

Naeem Seliya (*Ohio Northern University, USA*)  
Taghi M. Khoshgoftaar (*Florida Atlantic University, USA*)

**Interval Estimations of Optimal Software Release Time Based on MCMC Method**

Shinji Inoue (*Kansai University, Japan*)  
Shigeru Yamada (*Tottori University, Japan*)

**Effort Management Based on Jump Diffusion Model for OSS Project**

Shigeru Yamada (*Tottori University, Japan*)  
Yoshinobu Tamura (*Tokyo City University, Japan*)

**SESSION 10: Reliability and Performability Engineering & Applications**

**Chair: Dr. Cheng-Fu Huang** (*Feng-Chia University, Taiwan*)

**Expediting Joint Innovation: Achieving Reliability Requirements for Processing Manufacturers by Latent Class Analysis**

Taichih Huang (*Yuan Ze University, Taiwan*)  
Chieh Lee (*Yuan Ze University, Taiwan*)

**A Study About Optimization in Fine Pitch Copper Wire Bonding Process**

Chiao-Tzu Huang (*National Chinyi Univ of Technology, Taiwan*)  
Wei-Ling Wang (*National Chinyi Univ of Technology, Taiwan*)  
He-Yau Kang (*National Chinyi Univ of Technology, Taiwan*)  
Kun-I Cheng (*National Chinyi Univ of Technology, Taiwan*)

**Moderation and Mediation Effect of Distance to Windows and Employees' Mood between Indoor**

**Environment and Task Performance**

Erni Rawati (*Tunghai University, Taiwan*)  
Ying-Chyi Chou (*Tunghai University, Taiwan*)  
Ching-Hua Lu (*Tunghai University, Taiwan*)

**SESSION 11: Maintenance Modeling & Applications**

**Chair: Prof. Xufeng Zhao** (*Nanjing University of Aeronautics and Astronautics, China*)

**Inspection Thresholds under Multi-state system**

Takashi Satow (*Kobe Gakuin University, Japan*)

**Analysis of Damage Induced by Two Types of Shocks**

Hiroaki Mohri (*Waseda University, Japan*)  
Jun-ichi Takeshita (*National Institute of Advanced Industrial Science and Technology, Japan*)

**Age Replacement Policy with Repair Time Threshold for Repairable Product**

Minjae Park (*Hongik University, Korea*)  
Ki Mun Jung (*Kyungsung University, Korea*)  
Dong Ho Park (*Hallym University, Korea*)

**SESSION 12: Reliability in Design and Optimization**

**Chair: Prof. Nasser Fard** (*Northeastern University, USA*)

**An Optimal Device Control with Contract Demand**

Junji Koyanagi (*Tottori University, Japan*)  
Yuuki Furubayashi (*Tottori University, Japan*)

**Reliability-Equivalent Field Reference Usage Level for Distributed Field Usage**

Fengbin Sun (*Tesla Inc., USA*)

**A Statistical Method for Predicting Inpatient Bed Demand**

Samuel R. Davis (*Northeastern University, USA*)  
Nasser Fard (*Northeastern University, USA*)

**SESSION 13: Maintenance Optimization & Applications**

**Chair: Prof. Minjae Park** (*Hongik University, Korea*)

**Random Age Replacement Policies at Periodic Times**

Satoshi Mizutani (*Aichi Institute of Technology, Japan*)  
Toshio Nakagawa (*Aichi Institute of Technology, Japan*)

#### **Qualification Methodology for Concrete Durability**

Nadare Matoiri Chaibati (*University of Angers, France*)  
David Bigaud (*University of Angers, France*)  
Abdessamad Kobi (*University of Angers, France*)  
Horacio Colina (*University of Angers, France*)

#### **Optimal Maintenance Policy of Coastal Protection Systems**

Kodo Ito (*Tottori University, Japan*)  
Yoshiyuki Higuchi (*Fukushima University, Japan*)  
Toshio Nakagawa (*Aichi Institute of Technology, Japan*)

#### **Managerial Models with Phased Maintenance Policies**

Xufeng Zhao (*Nanjing University of Aeronautics and Astronautics, China*)  
Cunhua Qian (*Nanjing Tech University, China*)  
Toshio Nakagawa (*Aichi Institute of Technology, Japan*)

#### **SESSION 14: Quality Engineering, Statistics and Applications**

**Chair: Prof. M. Z. Anis** (*Indian Statistical Institute, India*)

#### **Detection of Slowloris Attacks Using Netflow Traffic**

Chad Calvert (*Florida Atlantic University, USA*)  
Taghi M. Khoshgoftaar (*Florida Atlantic University, USA*)  
Clifford Kemp (*Florida Atlantic University, USA*)  
Maryam M. Najafabadi (*Florida Atlantic University, USA*)

#### **Optimal Design of the Synthetic Median Chart Based on Average Run Length and Expected Average Run Length**

XueLong Hu (*Nanjing University of Posts and Telecommunications, China*)  
Shu Wu (*Wuhan University of Technology, China*)  
JianLan Zhong (*Fujian Agriculture and Forestry University, China*)

#### **The Efficiency of the VSI Exponentially Weighted Moving Average Median Control Chart**

Kim Phuc Tran (*Université de Bretagne-Sud, France*)  
Philippe Castagliola (*Université de Nantes & LS2N UMR CNRS 6004, France*)  
Thi Hien Nguyen (*Université de Bretagne-Sud, France*)  
Anne Cuzol (*Université de Bretagne-Sud, France*)

#### **Inference on $C_p$ Index For Auto-correlated Data Contaminated With Random Measurement Errors**

M. Z. Anis (*Indian Statistical Institute, India*)

#### **SESSION 15: Engineering Reliability and Applications**

**Chair: Dr. Mengmeng Zhu** (*North Carolina State University, USA*)

#### **Operation and Maintenance Planning Optimization of Wind Energy Farms: Under-Researched Areas**

Mahmood Shafiee (*Cranfield University, United Kingdom*)

#### **Reliability Demonstration Method for Competing Failure Systems**

Hao-Wei Wang (*Naval Aviation University, China*)  
Fei Teng (*Naval Aviation University, China*)

#### **Numerical Simulation Model of Wear Reliability of Spiral Bevel Gear Based on Complex Working Condition**

Yanzhong Wang (*Beihang University, China*)  
Wei Zhang (*Beihang University, China*)  
Yang Liu (*Beihang University, China*)  
Yuhuan Song (*Beihang University, China*)  
Yanyan Chen (*Beihang University, China*)  
Jingbo Guo (*Shijiazhuang Tiedao University, China*)

#### **SESSION 16: Failure Analysis & Reliability Assessment**

**Chair: Prof. Liyang Xie** (*Northeastern University, China*)

#### **Knowledge-Based Risk Processes Associated with Risk Analysis for an Information Systems Projects Success**

Amine Nehari Talet (*King Fahd University of Petroleum & Minerals, Saudi Arabia*)

#### **Fatigue Reliability Assessment of a Metro-Train Bolster**

Jiexin Hu (*Northeastern University, China*)  
Liyang Xie (*Northeastern University, China*)  
Haiyang Yu (*CRRC Qingdao Sifang CO. LTD, China*)  
Longxi Liu (*CRRC Qingdao Sifang CO. LTD, China*)  
Weiguang Sun (*CRRC Qingdao Sifang CO. LTD, China*)

#### **Packet Transport Network Recovery System based on Failure Pattern**

Toshiaki Suzuki (*Hitachi, Ltd., Japan*)  
Hiroyuki Kubo (*Hitachi, Ltd., Japan*)  
Hayato Hoshihara (*Hitachi, Ltd., Japan*)  
Taro Ogawa (*Hitachi, Ltd., Japan*)

**SESSION 17: Statistical Reliability Modeling & Machine Learning**

**Chair: Dr. Majid Forghani-elahabad** (*University of Sao Paulo, Brazil*)

**A Framework For Selecting a Subset of Metrics Considering Cost**

Vidhyashree Nagaraju (*University of Massachusetts Dartmouth, USA*)  
Donghui Yan (*University of Massachusetts Dartmouth, USA*)  
Lance Fiondella (*University of Massachusetts Dartmouth, USA*)

**Robust Facial Expression Recognition via Principal Component Analysis and AdaBoost Algorithm**

Cheng Fan (*Hong Kong Polytechnic University, Hong Kong*)  
Eric T.T. Wong (*Hong Kong Polytechnic University, Hong Kong*)

**A Stress-Strength Interval System Reliability Model and Its Applications in Heart Conditions**

Hoang Pham (*Rutgers University, USA*)

**A Simple Improved Algorithm for  $(d, c)$ -MC Problem**

Majid Forghani-elahabad (*University of Sao Paulo, Brazil*)  
Nelson Kagan (*University of Sao Paulo, Brazil*)

**SESSION 18: System Reliability, Durability and Optimization**

**Chair: Prof. Zhenmin Chen** (*Florida International University, USA*)

**DEMATEL-based Consensual Selection of Suitable Maintenance KPIs**

Silvia Carpitella (*Università degli Studi di Palermo, Italy*)  
Antonella Certa (*Università degli Studi di Palermo, Italy*)  
Joaquín Izquierdo (*Universitat Politècnica de València, Italy*)

**Similarity Analysis of Large Linear Vibrating Screen**

Zerong Zhang (*Qingdao University of Science and Technology, China*)  
Zhimin Fan (*Qingdao University of Science and Technology, China*)  
Yongyan Wang (*Qingdao University of Science and Technology, China*)

**Durability and Reliability Evaluation of Chute on the Floor of High-speed Train**

Wenxue Qian (*Northeastern University, China*)  
Yankai Yuan (*Northeastern University, China*)  
Xiaowei Yin (*Shenyang Institute of Engineering, China*)  
Liyang Xie (*Northeastern University, China*)  
Hoang Pham (*Rutgers University, USA*)

**Some Properties of the Pyramidal Distribution**

Zhenmin Chen (*Florida International University, USA*)  
Tong Sun (*University of Tulsa, USA*)

*Thank you for contributing and participating in the 24<sup>th</sup> ISSAT RQD conference*

*We hope you enjoy the entire program*

Please join us again next year  
to celebrate our 25th Anniversary

## **RQD 2019**

25<sup>th</sup> ISSAT International Conference  
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August 1–3, 2019

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