The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modelling

APARM 2020 VANCOUVER Vancouver, Canada August 20-23, 2020

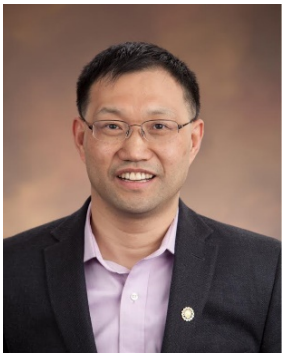
The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modelling (*APARM 2020*), Vancouver, Canada, August 20-23, 2020

Virtual Conference

Program Brochure

Table of Contents

MESSAGE FROM GENERAL CHAIR



It is my great pleasure to welcome you all to the virtual 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2020), August 20-23, 2020. The APARM conference series, held bi-annually, has been providing a friendly platform for synergistic exchanges of ideas and practices among academics and industry practitioners in the fields of reliability assurance, maintenance optimization, prognosis and health management of engineering systems. The opening of APARM 2020 this year in the virtual format is continuing this successful tradition and is providing timely exchanges of innovative R&D findings!

We have created an exciting conference program for all attendees of APARM 2020. It includes four keynote speeches from world leaders in the field of reliability and maintenance modeling, a panel discussion on R&D challenges of autonomous vehicles from a diverse group of experts, six tutorials from renowned researchers and educators, and 138 research presentations. A living EDAS conference program enables access of full papers, presentation files, video presentations, and recordings of Zoom or VooV sessions as they become available. A Wechat group called APARM2020 is available for attendees to have social interactions and share real-time experiences of participating in this virtual conference!

It is interesting to note that the theme of APARM 2020 is Reliability and Maintenance in the Connected Era. Not only there are many research presentations that address decision making in reliability and maintenance in the connected era by utilizing real-time online condition monitoring data, but also our conference is being held virtually via internet connections. Given the challenges and the uncertainties caused by the on-going COVID-19 pandemic, I am very happy to see that our APARM 2020 is being held as scheduled, though in a different format. As many of us have been working at home (mostly alone), the virtual APARM 2020 has enabled us to see old friends and/or meet new friends online!

APARM 2020 would not have been able to go ahead as scheduled without the earnest efforts from all our organizing committee members. This conference is also indebted to hundreds of volunteers who contributed to paper reviews, managing the parallel tracks, and/or chairing various sessions. It has been a great privilege for me to serve as General Chair of APARM 2020. I hope that you will find the technical program stimulating and enjoy the exchange of research findings with like minds.

Thank you all for your participation in APARM 2020 and look forward to your remote presentations at the conference.

Be safe and stay healthy!

Ming J. Zuo, General Chair, APARM 2020
On behalf of the organizing committee

The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2020)

Vancouver, Canada

20-23 August 2020

Conference Website: www.aparm2020.org

Theme of APARM 2020: Reliability and Maintenance in the Connected Era

Organized by

- University of Alberta, Canada; https://www.ualberta.ca/
- University of Electronic Science and Technology of China (UESTC), China; https://en.uestc.edu.cn/
- Simon Fraser University, Canada; https://www.sfu.ca/

Sponsored by

- IEEE Reliability Society https://rs.ieee.org/

In Cooperation with

- System Reliability Division, Systems Engineering Society of China http://www.sesc.org.cn/htm/index.htm
- Reliability Committee, Operations Research Society of China http://www.orsc.org.cn/
- Industrial Engineering Division, Chinese Society of Optimization, Overall Planning and Economical Mathematics, China http://www.scope.org.cn:83/fzjg2mes.aspx?t=50&id=1410
- The Korean Reliability Society, Korea http://www.koras.or.kr/
- The Korea Society for Quality Management, Korea http://www.ksqm.org/
- The Operations Research Society of Japan, Japan http://www.orsj.or.jp/
- Reliability Engineering Association of Japan https://www.reaj.jp/
- Japan Industrial Management Association, Japan http://www.jimanet.jp/
- The Japanese Society for Quality Control, Japan http://www.jsqc.org/
- IEICE Technical Committee on Reliability, Japan http://www.ieice.org/ess/r/
- IEEE Reliability Society Japan Joint Chapter, Japan https://www.ieee-jp.org/section/tokyo/chapter/R-07/
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- IEEE Xplore

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- Email Distributor: Constant Contact, Inc.

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History of APARM:

- AIWARM 2004: Hiroshima, Japan
- AIWARM 2006: Busan, Korea
- AIWARM 2008: Taichung, Taiwan
- APARM 2010: Wellington, New Zealand
- APARM 2012: Nanjing, China
- APARM 2014: Sapporo, Japan
- APARM 2016: Seoul, Korea
- APARM 2018: Qingdao, China
- APARM 2020: Vancouver, Canada (Virtual Conference)

- AIWARM: Asian International Workshop on Advanced Reliability Modeling
- APARM: Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling

Instructions and FAQ for Presentations via Zoom/VooV

APARM 2020 Virtual Conference, August 20-23, 2020

1. The links for joining Zoom or VooV meetings are included in the conference program. The passcodes have been provided to all registrants via email.
2. To join the virtual conference through Zoom or VooV, a Zoom account or VooV account is not mandatory. Simply click the link or copy and paste the link to an internet browser and enter the passcode to get into the online meeting.
3. If you are a presenting author, please join the scheduled session at least 5 minutes before the session starts. Presenters will have 20 minutes for their presentation and are encouraged to use ~15 minutes presenting and ~5 minutes for questions and answers (Q&A).
4. When joining a Zoom/VooV presentation, all participants will enter the session as an "attendee" in listen-only mode and please do not turn on your mic or camera. Attendees may submit questions using the Chat function and the session chairs will choose questions for the presenter to address during the "Q&A" period.
5. Presenters will be promoted to "co-host" status when it is their turn to present. When prompted by the session chair, presenters will turn on their mic and camera and share their computer screen. When using PowerPoint or similar presentation tools, presenters are to make sure that the presentation is in "presentation mode" and that the screen being shared is the one showing the presentation (not the note pages or other).
6. Please follow the conference program schedule to attend the sessions you are interested in. The time slots of the sessions are shown in three major time zones, i.e., Beijing Time, America Mountain Daylight Time, and America Vancouver Time. **Please match the session times to your local time for on-time attendance and presentation**.
7. When joining a Zoom/VooV session, each attendee must display a recognizable name that matches the name used in your registration for the conference. Otherwise, an attendee may risk being logged out by the session chair. Forwarding a Zoom link to someone not registered for the conference is strictly prohibited.
8. **All accepted papers must be presented in order to be published in IEEE Xplore.** "No Show" papers are removed from the final submission of papers to IEEE Xplore. If you are unable to present your paper due to medical or other technical reasons, please upload your video presentation to EDAS and ask your session chair to play your pre-recorded video presentation for you. If all these are done properly, your paper will be considered as presented and will be sent to IEEE Xplore for publication.
9. Individual recording of a presentation is prohibited. However, the conference organizers will record sessions and share them in EDAS conference program for a limited time.
10. If you experience any technical issues with joining the meeting or submitting questions, please submit your question using the Chat function in Zoom/VooV or submit your questions in the Wechat group APARM2020. Fellow participants will be able to provide tips.
11. For general questions about using Zoom or VooV, please refer to the following links:
    https://support.zoom.us/hc/en-us/articles/206175806-Frequently-Asked-Questions
    https://main.qcloudimg.com/raw/document/intl/product/pdf/1054_35565_en.pdf

Instructions for Session Chairs

(APARM 2020, August 20-23, 2020)

(1) Please Log into your session at least 5 minutes before the scheduled starting time. Make sure that your real name is displayed in the virtual meeting platform.

(2) Please use the link in each session which you can find in the attached conference program that is posted at the conference website at http://www.aparm2020.org/program/program/prelim.html, to login using the passcode 202008. Session chairs will be promoted by track managers to co-host status after login to be able to chair the session. The names of all track managers are listed in the attached Word file.

(3) Track managers have been assigned to parallel tracks (See details in the attached APARM meeting platforms Word file). Track managers are to support session chairs for any unexpected technical issues, as well as to help session chairs identify presenting authors before each session starts.

(4) Session chairs should inform the presenting author that each paper will have 20 minutes in total and is encouraged to use ~15 minutes for presenting and ~5 minutes for questions and answers.

(5) We have invited two session chairs for each session, so one chair will be responsible for introducing the presenting author and the presentation title, monitoring time and giving reminders to presenting authors to balance session schedule. The other chair will be mainly responsible to collect and summarize/integrate any questions from the Chat function of the meeting platform, to be presented to the presenting author after each paper presentation during the Q&A period.

(6) As three major time zones are listed in the program, i.e., Beijing Time, North America Mountain Daylight Time (MDT), and Vancouver Time (PDT). **Please match the session times to your local time for on-time attendance**.

(7) If possible, please plan to attend the rehearsal session scheduled as follows: Beijing Time August 17 Monday evening 9pm-11pm, which corresponds to North America Mountain Daylight Time August 17 Monday 7am-9am. Use the same link for your sessions in the conference program to access this rehearsal session.

(8) All session chairs are granted access to the detailed conference program in EDAS which links to the full papers, presentation files, and/or presentation videos at https://edas.info/p26214. You will need to have an EDAS account and use the access key APARM2020 to access this link and the documents in this link. You will be able to read any paper of the conference that is to be published via IEEE Xplore at this link. The materials at this link will be updated as needed.

Instructions for Track Managers

APARM 2020, August 20-23, 2020

1. Login your track 15 minutes before the scheduled starting time. Make sure that you rename yourself in the list of participants so that your real name and your role are displayed, for example, Track-Manager-Junjie Liu.
2. We are not planning to use Track 6 anymore. Thus, I have assigned Meng Rao and Siyun Ge to the remaining tracks. We need to make sure that at least two track managers are in every session when it is in progress. Please communicate with one another if anyone needs a break. See the track listing and assignment of track managers at the end of this file. You may also switch with each other if you have a presentation in another track. The common objective to make sure that you manage all tracks and all sessions reliably.
3. Make sure that you get the co-host status from the track schedulers (Dr. Zuo, Dr. Tian, Dr. Liang, Dr. Liu, Dr. Guo for the 5 tracks, respectively).
4. Open your microphone and video. Set your virtual background as the updated conference logo image.
5. Check attendance of all presenters in the current session. You can find the names of the presenters which are underlined in the EDAS conference program at https://edas.info/p26214 with access key APARM2020. Assign them co-host status so that they are able to share screens.
6. Check attendance of session chairs in the current session. Their names are in the conference program. Assign them co-host status so that they are able to share screens.
7. If a presenter is unable to make live presentation, remind session chairs to play a presenter's video presentation if the presenter has uploaded the video presentation to EDAS, and has asked the session chairs to play the video on their behalf. Note that it has to be a video presentation and a simple PPT file does not count. Track managers need to be ready to play the video presentation following the chair's instructions.
8. Cover the following aspects:
   a. Greeting session chairs and all presenters.
   b. Report the attendance status of all presenters to session chairs.
   c. Tell session chairs that you are track managers and are here to help them.
   d. Remind session chairs to ask attendees to submit questions through the Chat function. The chairs will then read some questions for the presenter to answer.
   e. Mute all microphones except the session chairs and the current presenter.
9. Achieving proper recording of each session is very critical. It is better to record it in the cloud rather than on your own computer as I believe that the cloud computer is more reliable than your own computer. Make sure that it is clear that which track manager is the one to be responsible for doing recording. Press the Record button at the scheduled session starting time, press the Stop button at the end of each session. Terminate the meeting during extended break time (a few hours). When you terminate the meeting, don't turn off your computer, as Zoom/VooV is getting into the process of converting the multiple video files. I am saying multiple video files, because in a stretch, you may

have clicked Start/Stop recording a few times. For example, for the first morning Beijing time of the conference, please have three recorded files, one for the opening ceremony, one for keynote speech 1, and one for keynote speech 2. After the video files have been successfully converted, share them with one or more of the following conference committee chairs so that they can upload these video recordings to EDAS: Liudong Xing, Zhaojun Li, Xihui Liang, Zhigang Tian, Rui Peng, or Ming Zuo. You may use Dropbox links, off-line email attachments, etc. See the bottom of this page for the email addresses of these people.

10. Be prepared to address the following technical issues that may be encountered during a session:
    a. The image of PPT is missing. You need to politely coach the presenter to share screen correctly.
    b. Bad network connection. Be patient. Hope that the network can recover in a few seconds. If it is a true interruption, the whole session may have to be restarted. Remind session chairs for this possibility. Follow instructions from session chairs.
    c. A sudden disconnection of a presenter. In this case, session chairs may switch to the next presenter in line. You as track managers please contact the disrupted presenter so that he/she can come back into the meeting and do a presentation at a later time slot in the same session. Report other emergencies to conference committee chairs whose names are listed later in this file.
    d. Session chairs may be late joining the session. In this case, you may wait for 5 minutes. Contact the track schedulers and/or conference committee chairs. We may find alternative chairs to cover the session. You as track managers should also be ready to serve as session chairs after 5 minutes have passed from the scheduled session start time. Instructions for session chairs are to be shared with you.
    e. Both chairs lose connections from the meeting. In this case, allow the presentations to continue. Hope the chairs will join in soon. In the meantime, contact track schedulers for help and you assume the session chair role.
11. Make sure that you join the Wechat group called APARM2020. Set your alias in this Wechat group so that people can see that you are a track manager, for example, Track-Manager-Junjie Liu.

Conference Committee Chairs:

- Liudong Xing liudong.xing@umassd.edu
- Zhaojun Li zhaojun.li@wne.edu
- Zhigang (Will) Tian ztian@ualberta.ca
- Rui Peng pengrui1988@ustb.edu.cn
- Xihui Liang Xihui.Liang@umanitoba.ca
- Ming Zuo ming.zuo@ualberta.ca

APARM Meeting Platforms Updated August 18, 2020

Track 1: Ming Zuo: https://zoom.us/j/92493246918, Meeting ID: 924 9324 6918, Passcode: 202008
Managers: Dr. Yuejian Chen (Postdoc), Mr. Dongdong Wei (PhD student), Ms. Siyun Ge (MSc student)
Link with passcode:
https://zoom.us/j/92493246918?pwd=WGNLUldvRHRIWDBqRVFobUc0WmJ3dz09

Track 2: Zhigang Tian & Ming Zuo: https://zoom.us/j/99793633698, Meeting ID: 997 9363 3698, Passcode: 202008
Managers: Mr. Xingkai Yang (PhD student), Mr. Peng Zhou (Visiting PhD student), Mr. Han Zhang (PhD student)
Link with passcode:
https://zoom.us/j/99793633698?pwd=U3JETHdHSjlZQThXMm5ZWklmNlR5Zz09

Track 3: Xihui Liang: https://zoom.us/j/95536125725, Meeting ID: 955 3612 5725, Passcode: 202008
Managers: Dr. Xihui Liang (Faculty), Dr. Sajad Afshari (Postdoc), Mr. Meng Rao (PhD student)
Link with passcode:
https://zoom.us/j/95536125725?pwd=c0liRHNBeGpjOWE1cHhycG9NWlNsUT09

Track 4: Zhiliang Liu: https://meeting.tencent.com/s/Ru0AFmOz2akB, Meeting ID: 600 7396 4209, Passcode: 202008
Managers: Dr. Zhiliang Liu (Faculty), Mr. Yuhua Yin (PhD student), Mr. Junjie Liu (MSc student)

Track 5: Wei Guo: https://meeting.tencent.com/s/PE7l9zMSSSWW, Meeting ID: 976 4987 5476, Passcode: 202008
Managers: Dr. Wei Guo (Faculty), Mr. Xiaosong Xing (MSc student), Mr. Bo Ma (MSc student)

The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2020)
Virtual Meeting (August 20-23, 2020)

Final Conference Program (August 20, 2020)

Beijing Time Zone (Asia)		Activities Planned	North America		
Date	Time		Mountain Daylight Time	Date	Vancouver Time
Friday August 21	09:00-09:30	**Conference Opening Ceremony** **Ying Tsui, Associate Dean of Engineering, University of Alberta** **Jason Rupe, VP Meetings & Events, IEEE Reliability Society** **Way Kuo, President of City University of Hong Kong** **Yi-Kuei Lin, Chair of APARM Steering Committee** **Ming Zuo, General Chair of APARM 2020** **(Chair: Prof. Ming Zuo)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**	19:00-19:30	Thursday August 20	18:00-18:30
	09:30-10:30	**Keynote Speech #1: Data-driven Crisis Management** **Prof. Way Kuo (1 hour, 9:30am Hong Kong time)** **(Chair: Prof. Min Xie)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**	19:30-20:30		18:30-19:30
	10:30-11:30	**Keynote Speech #2: Reliability in the 21st Century** **Prof. William Q. Meeker (1 hour, 9:30pm US Central Time)** **(Chair: Prof. Min Xie)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**	20:30-21:30		19:30-20:30
	11:30-11:40	**Break**	21:30-21:40		20:30-20:40
	11:40-13:00	**Invited Session #7: Models and applications in network reliability** **(Session Chairs: Yi-Kuei Lin, Hansi Jiang)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)** **(4 papers)** 1570629167: Methodology for Integrating Conventional and Network Reliability Evaluation **(Cheng-Hao Huang; Ping-Chen Chang; Yi-Kuei Lin)** 1570630469: Reliability Applications on Business Management **(Shin-Guang Chen)** 1570638346: Reliability Analysis for Multi-state Projects by Decomposition Subsets **(Yi-Hao Chiu; Cheng-Fu Huang; Yi-Kuei Lin; Ding-Hsiang Huang)** 1570658194: Lifetime Performance Evaluation and Analysis Model of Passive Component Capacitor Products **(Kuen-Suan Chen; Chun-Min Yu)**	**Invited Session #3: Degradation analysis and remaining useful life prediction of components in aircraft utility systems** **(Session Chairs: Shaoping Wang, Chao Zhang)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)** **(4 papers)** 1570637825: Modeling and Optimization of Comb Electrodes Capacitive Three-Dimensional Force Tactile Sensor **(Jian Tie; Shaoping Wang; Chao Zhang; Jian Shi)** 1570638048: An Adaptive Control Method for Electro-hydrostatic Actuator Based on Virtual Decomposition Control **(Youhao Shen; Xingjian Wang; Shaoping Wang; Jouni Mattila)** 1570638168: Fault diagnosis of hydraulic actuator based on improved convolutional neural network **(Liwei Zhao; Shaoping Wang; Jian Shi; Chao Zhang)** 1570638239: A Multi-source Information Fusion Fault Diagnosis Method for Vectoring Nozzle Control System Based on Bayesian Network **(Youyou Zhang; Jian Shi; Shaoping Wang; Zhang Yang)**	**Regular Session #9: Random process** **(Session Chairs: Richard Arnold; Stefanka Chukova)** **Zoom Meeting Link: https://zoom.us/j/95536125725 (See email for passcode)** **(4 papers)** 1570619366: Mean and Variance of an Alternating Geometric Process **(Richard Arnold; Stefanka Chukova; Yu Hayakawa; Sarah Marshall)** 1570630063: A Bias-Corrected Kaplan-Meier Estimator **(Renyan Jiang)** 1570635760: Remaining Useful Life Estimation Based on Wiener Degradation Process With Mixed Random Effects **(Fengjun Duan; Guanjun Wang; Wanmeng Wei)** 1570638403: Nonparametric Bayesian Analysis of Hazard Rate Functions using the Gamma Process Prior **(Richard Arnold; Stefanka Chukova; Yu Hayakawa)**	**Regular Session #4: Machine health management** **(Session Chairs: Jian Guo, Hu-Chen Liu)** **VooV Meeting Link: https://meeting.tencent.com/s/Ru0AFmOz2akB** **(See email for passcode)** **(4 papers)** 1570630478: A Decision-Support Model to Select Forming Principle of Part for Sustainable Manufacturing **(Peipei Zhang)** 1570637846: Risk Assessment of Worn-out Failure of Transport Aircraft based on Monte Carlo Simulation **(Ziwen Zhang; Lei Huang; Zhong Lu)** 1570638276: Normal behavior of single-asperity contact of bcc iron: a molecular dynamics simulation study **(Wenzhen Xie; Chao Liu; Dongxiang Jiang)** 1570638475: Research on the layout of spare parts warehouse network based on wind power industry **(Bin Yan; Yifan Zhou)**	**Regular Session #12: Transfer learning** **(Session Chairs: Zhisheng Ye, Wei Guo)** **Voov Meeting Link: https://meeting.tencent.com/s/PE7I9zMSSSWW** **(See email for passcode)** **(4 papers)** 1570632348: Virtual Rotating Speed Meter: Extracting Machinery Rotating Speed from Vibration Signals Based on Deep Learning and Transfer Learning **(Meng Rao; Qing Li; Dongdong Wei; Ming Jian Zuo)** 1570635911: Composite Fault Diagnosis Based on Deep Convolutional Generative Adversarial Network **(Yonghong Zhang; Zhongyang Zhang; Fan Shao; Yifei Wang; Xiaoping Zhao; Kaiyang Lv)** 1570638199: Adversarial Domain Adaptation for Gear Crack Level Classification Under Variable Load **(Dongdong Wei; Te Han; Fulei Chu; Ming Jian Zuo)** 1570638594: Transferable Health Indicator of Rolling Bearings: A New Solution for Cross-Working Condition Monitoring of Degradation Process **(Jiaxian Chen; Wentao Mao; Yuejian Chen)**	21:40-23:00		20:40-22:00
	13:00-21:00	**Break**	23:00-07:00		22:00-06:00

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Virtual Meeting (August 20-23, 2020)

Final Conference Program (August 20, 2020)

Friday August 21	**21:00-23:00**	**Invited Session #1: Advanced reliability and safety management techniques in rail transits** **(Session Chairs: Wei Guo, Chengning Zhou)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)** **(6 papers)**	**Invited Session #6: Life analysis with deterioration with field applications** **(Session Chairs: Qingpei Hu, Lu Jin)** **Zoom Meeting Link: https://zoom.us/j/99793633698(See email for passcode)** **(6 papers)**	**Invited Session #5: Dynamic reliability analysis of complex structural and mechanical systems** **(Session Chairs: Xihui Liang, Sajad Afshari)** **Zoom Meeting Link: https://zoom.us/j/95536125725 (See email for passcode)** **(6 papers)**	**Regular Session #7: Nonstationary signal processing** **(Session Chairs: Ramin Moghaddass, Zhipeng Feng)** **VooV Meeting Link: https://meeting.tencent.com/s/Ru0AFmOz2akB (See email for passcode)** **(6 papers)**	**Regular Session #6: General** **(Session Chairs: Shaomin Wu, Jian Guo)** **Voov Meeting Link: https://meeting.tencent.com/s/PE7l9zMSSSWW (See email for passcode)** **(6 papers)**	**07:00-09:00**	**Friday August 21**	**06:00-08:00**
		1570629514: A Sparse FP-VAR Model for Representing Multichannel Non-Stationary Baseline Vibration Signals from a Gearbox **(Yuejian Chen; Qing Li; Dongdong Wei; Ming Jian Zuo)** 1570633646: An Optimal Band-pass Filter based on Adaptive Identification of Bearing Resonant Frequency Band **(Wei Guo)** 1570634478: Fault Feature Extraction based on Cyclic Correntropy for Train Axle Bearings in Impulsive Noise **(Xuejun Zhao; Yong Qin; Limin Jia; Zhiliang Liu)** 1570635433: An Intelligence Fault Diagnosis Approach for Rolling Bearings Based on Non-local Convolutional Neural Network **(Haoran Han; Huan Wang; Zhiliang Liu; Yijia Hao)** 1570636703: Multi-Scale CNN based on Attention Mechanism for Rolling Bearing Fault Diagnosis **(Yijia Hao; Huan Wang; Zhiliang Liu; Haoran Han)** 1570638413: Vibration Features of High-speed Train Gearbox Induced by Bearing Fault **(Jiufeng Cai; Yifan Li; Jianxin Liu)**	1570638603: Exponential Superimposed Renewal Processes **(Watalu Yamamoto)** 1570638567: Threshold Type Maintenance Policies for Systems Under Cumulative Damage From Random Shocks **(Jin Lu; Shoma Matoba)** 1570630354: Statistical Analysis and Correlation Study of Tool Wear in NC Machining **(Peipei Zhang)** 1570638916: Statistical Inference for Lifetime Delayed Degradation Process with Gamma Process **(Zan Li; Qingpei Hu; Dan Yu)** 1570638971: Wiener processes with random initial degradation values for step-stress accelerated degradation tests data **(Chengjie Wang; Qingpei Hu; Dan Yu)** 1570653467: Asset life assessment by utilizing Weibull analysis with application on tank bottom components **(Saif Eldin Mohamed Youssef)**	1570617298: The simulation and dynamic reliability estimation of multiple-crack system **(Shan Jiang; Yan-Fu Li)** 1570619815: Dynamic Modeling of a Planetary Gearbox with Sun Gear Crack and Bearing Clearance **(Xianhua Chen; Xingkai Yang; Ming Jian Zuo; Zhigang (Will) Tian)** 1570629937: A Novel Nonlinear Analysis Tool: Multi-scale Symbolic Sample Entropy and Its Application in Condition Monitoring of Rotary Machinery **(Shun Wang; Yongbo Li)** 1570632145: Analysis and Evaluation of Dynamic Reliability for Mechanical Structures Considering Mixed Uncertain Parameters **(Xueguang Yu; Xintian Liu; Jiachi Tong; Xu Wang; Xiaolan Wang)** 1570632406: Approximate Reliability Analysis for New Generation Avionics Network **(Lin Guo; Xiaodong Wang; Zhuqing Wang; Shuang Zhang; Yangming Guo)** 1570637790: Time-dependent Reliability Analysis of a Nonrepairable Multifunctional System Containing Multifunctional Components **(Jiangbin Zhao; Shubin Si; Zhiqiang Cai; Haitao Liao)**	1570629287: Normalization of Gearbox Vibration Signal for Tracking Tooth Crack Severity Progression Under Time-Varying Operating Conditions **(Xingkai Yang; Ming Jian Zuo; Zhigang (Will) Tian)** 1570638321: Varying Speed Bearing Fault Diagnosis Based on Synchroextracting Transform and Deep Residual Network **(Jie Shang; Tian Ran Lin)** 1570630226: A Fault Classification Method for Rotor under Fluctuating Condition based on COTHS-CNN **(Changjie Yue; Kesheng Wang)** 1570638108: Matching time-frequency enhancement and its application to bearing fault diagnosis under time-varying speed conditions **(Zehui Hua; Juanjuan Shi; Xingxing Jiang; Zhongkui Zhu)** 1570638147: Fault Diagnosis of Planetary Gearbox under Nonstationary Conditions Based on the Velocity Synchronous Chirplet Transform **(Yunpeng Guan; Zhipeng Feng)** 1570638540: Synchrosqueezing transform based general linear chirplet transform of instantaneous rotational frequency estimation for rotating machines with speed variations **(Yi Liu; Zhansi Jiang; Gang Wang; Jiawei Xiang)**	1570637445: A Segmented CRC-Aided PSS-SS-SCL Algorithm for Polar Codes **(Jianping Li; Huanhuan Liu)** 1570638528: A new switching model for sampling plan based on process yield **(Shih-Wen Liu; Chien-Wei Wu)** 1570638534: Developing a Variables Modified Chain Sampling Plan with Taguchi Capability Index **(Zih-Huei Wang; Chien-Wei Wu; Wei-Ren Lin)** 1570638624: A Creep Model For Pressure Sensitive Adhesives Under Shear Load **(Abhishek Deshpande; Zhichao Song; Swanand Vaidya)** 1570638664: On the Coverage Probability of Bias-Corrected Confidence Bounds **(Tamer Tevetoglu; Bernd Bertsche)** 1570635572: Machine learning approaches in reliability and maintenance **(Shaomin Wu; Di Wu; Rui Peng)**			
	23:00-08:00	**Break**					**09:00-18:00**		**08:00-17:00**
Saturday August 22	**08:00-9:00**	**Keynote Speech #3: An Analytic Tool Box for Optimizing CBM Decisions** **Prof. Andrew Jardine (1 hour, 8:00pm Eastern Time)** **(Chair: Prof. Tadashi Dohi)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**					**18:00-19:00**		**17:00-18:00**
	9:00-10:00	**Keynote Speech #4: Condition Monitoring and Fault Diagnosis of Technical Processes for Reliability Enhancement with Applications to Nuclear Power Plants** **Prof. Jing Jiang (1 hour, 9:00pm Eastern Time)** **(Chair: Prof. Tadashi Dohi)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**					**19:00-20:00**		**18:00-19:00**

The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2020)
Virtual Meeting (August 20-23, 2020)

Final Conference Program (August 20, 2020)

Saturday August 22	10:00-10:10	**Break**					20:00-20:10	Friday August 21	19:00-19:10
	10:10-12:10	**Regular Session #10: Rotating machinery diagnostics** **(Session Chairs: Guoliang Lu, Zhigang (Will) Tian)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)** **(6 papers)**	**Invited Session #10: Reliability modelling and optimal configuration of complex systems** **(Session Chairs: Hansi Jiang, Rui Peng)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)** **(6 papers)**	**Regular Session #2: Asset reliability analysis** **(Session Chairs: Zhiqiang Cai, Lin Zhu)** **Zoom Meeting Link: https://zoom.us/j/95536125725 (See email for passcode)** **(6 papers)**	**Regular Session #3: Degradation analysis** **(Session Chair: Tieling Zhang, Zhiliang Liu)** **VooV Meeting Link: https://meeting.tencent.com/s/Ru0AFmOz2akB (See email for passcode)** **(6 papers)**	**Regular Session #1: Advanced machine learning techniques** **(Session Chairs: Kesheng Wang, Chao Liu)** **Voov Meeting Link: https://meeting.tencent.com/s/PE7l9zMSSSWW (See email for passcode)** **(6 papers)**	20:10-22:10		19:10-21:10
		1570629520: Use of Autoregressive Conditional Heteroskedasticity Model to Assess Gear Tooth Surface Roughness **(Yuejian Chen; Ke Feng; Robert Randall; Pietro Borghesani; Ming Jian Zuo)** 1570630348: Hierarchical Graph Model Based Approach for Change Detection in Bearing Degradation Process **(Shaohua Yang; Zhenjie Zhu; Guoliang Lu)** 1570629517: Study on A Special Category of FM Signals with Applications to Planetary Gearbox Fault Diagnosis Under Non-stationary Conditions **(Peng Zhou; Zhike Peng; Zhigang (Will) Tian; Ming Jian Zuo)** 1570638414: Dynamic Modeling of Spur Gear with Spalling Fault Considering Manufacture Pitch Error **(Qiuyuan Chen; Liming Wang; Yimin Shao; Xiaoxi Ding; Guorong Long)** 1570638698: Vibration mechanism of gear system with angular misalignment error based on an improved meshing stiffness calculation method **(Guorong Long; Liming Wang; Yimin Shao; Qiuyuan Chen)** 1570638888: A Fault Feature Extraction Method for Rolling Bearing Based on Intrinsic Time-Scale Decomposition and AR Minimum Entropy Deconvolution **(Jiakai Ding; Dongming Xiao; Liangpei Huang)**	1570616305: Imperfect Maintenance Scheduling for High Pressure Feedwater Heater System in Nuclear Power Plant **(Mengyu Du; Chen Zhang; Taotao Zhou; Yan-Fu Li)** 1570616316: Degradation Assessment and Remaining Useful Life Prognostics of Centrifugal Pump Using Multi-Sensor Process Monitoring **(Taotao Zhou; Yan-Fu Li)** 1570616416: Prediction of Software Fault Detection and Correction Processes with Time Series Analysis **(Rui Peng; Yingchun Li; Kaiye Gao; Ye Ma)** 1570619603: Cascading Failures of Overload Behaviors on Interdependent Networks **(Ziyang Jin; Ning Wang; Jiao Zhao)** 1570632017: Modelling of Inspection Cycles for Power Distribution Transformers **(Sathishkumar Nachimuthu; Ming Jian Zuo; Stephen Seewald; Jebb Richard; Connor Thicke)** 1570637687: Research on the Technology to Build Safety Integration Model of Complex System Based on Relevant Failure **(Nie Guojian; Hongqi Yang; Yong Pan; Yujie Liu; Zhe Lai)**	1570625528: Positioning Accuracy and Reliability Analysis of Rigid-Flexible Coupling Model of Six-DOF Manipulator **(Jianmin Li)** 1570638223: Reliability assessment of corroded pipeline considering multiple defects interaction based on an artificial neural network method **(Han Zhang; Zhigang (Will) Tian)** 1570638480: Lindley Type Distributions and Software Reliability Assessment **(Qi Xiao; Tadashi Dohi; Hiroyuki Okamura)** 1570638484: Reliability Analysis of Manufacturing Machine with Degradation and Low-quality Feedstocks **(Zhenggeng Ye; Zhiqiang Cai; Hui Yang)** 1570638486: Reliability Analysis of Position Accuracy of Welding Robot **(Wenxue Qian; Shuai Song; Changhui Yao; Xiaowei Yin)** 1570638621: Reliability Analysis of Vacuum Circuit Breakers with Multiple Failure Modes **(Will C Wascom; Yisha Xiang)**	1570629644: Quantitative Method of Health State Assessment Inside the Safe Region **(Yuhua Yin; Zhiliang Liu; Zhe Cheng)** 1570634162: A Review of State-of-health Estimation of Lithium-ion Batteries: Experiments and Data **(Ruomei Zhou; Shasha Fu; Weiwen Peng)** 1570634563: A Particle-Filter-Based Online Method for Degradation Analysis with Exponential-Dispersion Process **(Ricong Huang; Weiwen Peng)** 1570636187: Bayesian-based Method for the Remaining useful life and reliability prediction of steel structure **(Teng Wang; Zheng Liu; Xiaoli Zhao; Min Liao; Nezih Mrad)** 1570638363: Life prediction for the tractor of an elevator based on the sliding displacement **(Yimin Wei; Jun Pan; Tong Li; Meide Wang; Bin Feng; Yonglei Dai)** 1570660464: Energy Pipeline Degradation Modeling **(Wenxu Li; Tieling Zhang; Richard Dwight)**	1570622900: Aero-engine Life Limit Parts Replacement Policy Optimization: Reinforcement Learning Method **(Lin Lin; Jie Liu; Jinshan Liu; Shisheng Zhong; Feng Guo)** 1570630155:A comparison study on the different SNR levels to the accuracy of two deep learning techniques in fault diagnosis of planetary gearbox **(Ruiyuan Wang; Kesheng Wang)** 1570631622: A Novel Anomaly Detection Method for Gas Turbines Using Weight Agnostic Neural Network Search **(Shisheng Zhong; Dan Liu; Lin Lin; Minghang Zhao; Xuyun Fu; Feng Guo)** 1570638393: Bearing Fault Diagnosis Based on Extreme Machine Learning Optimized by Differential Evolution **(Yongtao Hu; Jinfeng Gao; Qiang Zhou; Xiaoyu Chen)** 1570638409: A two-stage algorithm of railway sleeper crack detection based on edge detection and CNN **(Gang Wang; Yi Liu; Jiawei Xiang)** 1570638688: Unsupervised Fault Diagnosis of Machine via Multiple-Order Graphical Deep Extreme Learning Machine **(Xiaoli Zhao; Zheng Liu; Teng Wang; Junchi Bin; Minping Jia)**			
	12:10-21:00	**Break**					22:10-07:00		21:10-06:00
	21:00-22:00	**Tutorial #1: Building Multicriteria Decision Models for Risk, Reliability, and Maintenance Decision Analysis** **Profs. Cristiano Cavalcante and Alexandre Alberti (1 hour, 10-11am Brazil Time)** **(Chair: Prof. Steven Li)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**		Reserved slot Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)			07:00-08:00	Saturday August 22	06:00-07:00
	22:00-23:00	**Tutorial #2: History of System Reliability Optimization** **Prof. David Coit (1 hour, 10-11am Eastern Time)** **(Chair: Prof. Liudong Xing)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**		**Tutorial #3: Machine Learning in Data-Driven Prognostics and Health Management (PHM) for condition-based and predictive maintenance** **Prof. Enrico Zio (1 hour, 4-5pm Italy Time)** **(Chair: Prof. Tao Yuan)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)**			08:00-09:00		07:00-08:00
	23:00-08:00	**Break**					09:00-18:00		08:00-17:00

The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2020)
Virtual Meeting (August 20-23, 2020)

Final Conference Program (August 20, 2020)

Sunday August 23	**08:00-9:00**	**Tutorial #4: Mechanical Applications of Cepstrum Analysis in Machine and Structural Health Monitoring** **Prof. Robert Randall (1 hour, 10-11am Sydney Time)** **(Chair: Prof. Ming J Zuo)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**			**Tutorial #5: Design a Practical and Effective Reliability Test** **Dr. Harry Guo (1 hour, 8-9pm Eastern Time)** **(Chair: Prof. Jae-Hak Lim)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)**	**18:00-19:00**	**Saturday August 22**	**17:00-18:00**
	09:00-10:00	**Tutorial #6: Past, Present and Future Directions and Advances in Reliability** **Prof. Kailash Kapur (1 hour, 6-7pm Pacific Time)** **(Chair: Prof. Sukjoo Bae)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**			**Panel: Autonomous Vehicles** **Prof. Eric Wong (1 hour, 8-9pm Central Time)** **(Chair: Prof. Steven Li)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)**	**19:00-20:00**		**18:00-19:00**
	10:00-10:10	**Break**				**20:00-20:10**		**19:00-19:10**
	10:10-11:30	**Invited Session #8.1: New models and approaches for the reliability & quality** **(Session Chairs: Hisashi Yamamoto, Xufeng Zhao)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)** **(4 papers)**	**Invited Session #12.1: System reliability and maintenance modeling** **(Session Chairs: Zhigang Tian, Tongdan Jin)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)** **(4 papers)**	**Regular Session #11.1: Maintenance strategy** **(Session Chairs: Alexandre Ramalho Alberti, Alireza Khalilabad)** **Zoom Meeting Link: https://zoom.us/j/95536125725 (See email for passcode)** **(4 papers)**	**Invited Session #9.1: Reliability data analysis and decision making** **(Session Chairs: Rui Peng, Chi Zhang)** **VooV Meeting Link: https://meeting.tencent.com/s/Ru0AFmOz2akB (See email for passcode)** **(4 papers)**	**Regular Session #5.1: Fundamental reliability analysis theory** **(Session Chairs: Liyang Xie, Jian Guo)** **Voov Meeting Link: https://meeting.tencent.com/s/PE7I9zMSSSWW (See email for passcode)** **(4 papers)**	**20:10-21:30**		**19:10-20:30**
		1570636867: Periodic and Sequential Inspection Policies with Mission Failure Probabilities **(Xufeng Zhao; Xujie Jia; Mingchih Chen; Cunhua Qian; Toshio Nakagawa)** 1570636883: Algorithm for Finding the Optimal Arrangement of Consecutive-k-out-of-n:F Systems with Multiple Types of Components **(Taishin Nakamura; Sawa Murata; Hisashi Yamamoto)** 1570637287: A Simulation Study on Resilience of Systems with Simultaneous Failures **(Tetsushi Yuge)** 1570637603: A Study on Evaluation of Stability in Process Mean Using Bayesian Updating **(Yasuhiko Takemoto; Ikuo Arizono)**	1570638385: Joint optimization of maintenance and production scheduling for unrelated parallel-machine system **(Mageed Ghaleb; Sharareh Taghipour; Hossein Zolfagharinia)** 1570626355: Variance of Reliability Estimate for K-Out-Of-N System with Cold Standby Units **(Tingdan Jin; Jose Espiritu; Heidi Taboada)** 1570638640: Maintenance Decision Making using State Dependent Markov Analysis with Failure Couplings **(Xinyang Liu; Pingfeng Wang)** 1570638712: Optimal Maintenance Policies for degrading hydrocarbon pipelines using Markov Decision Process **(Eric Bediako; Suzan Alaswad; Yisha Xiang; Zhigang (Will) Tian)**	1570638711: An Alternative Maintenance Policy for Protection Systems Subject to Shocks Due to Demands **(Alexandre Ramalho Alberti; Cristiano Alexandre Virgínio Cavalcante)** 1570633011: Assessment of Maintenance Effectiveness for Repairable Systems: PM and CM Case Studies **(Syamsundar Annamraju; V. N. Achutha Naikan)** 1570636624: Expected Maintenance Actions for Imperfect Production Processes Using a Markovian Approach **(Wael I. Al Hajailan; David He)** 1570638032: Optimal Post-Warranty Maintenance Strategy For The Second-Hand Product **(Jak-Hak Lim; Dae Kyung Kim; Dong Ho Park)**	1570625390: Maintenance of a System with Increasing Energy Consumption Rate **(Di Wu; Rui Peng; Ye Ma; Li Yang)** 1570634148: Reliability of dynamic k-out-of-n systems with coupling components in power transmission systems **(Heping Jia; Yi Ding; Liudong Xing; Dunnan Liu)** 1570638468: Integrating Protection, Restoration, and Flow Redistribution for Building Resilient Networked Critical Infrastructures **(Huaxing Zhu; Su Wu; Chi Zhang; Raúl Monroy; Jose Ramirez-Marquez)** 1570631732: A New Compound Negative Binomial Distribution and Its Applications in Reliability **(Xiaoyue Wang; Xian Zhao; Jinglei Sun)**	1570627261: On Two New Quantum Lifetime Distributions **(Kunsong Lin; Jiaxiao Zhu; Yunxia Chen)** 1570635750: A sample truncation rule for product reliability estimation with multiple censoring data **(Liyang Xie; Ningxiang Wu)** 1570636699: Reliability analysis for competing failure processes with mutual dependence of system under the cumulative shock **(Lina Bian; Guanjun Wang)** 1570637284: Reliability evaluation based on historical batch information **(Wenda Kang; Houbao Xu; Huiling Zheng)**			
	11:30-11:40	**Break**				**21:30-21:40**		**20:30-20:40**
	11:40-13:00	**Invited Session #8.2: New models and approaches for the reliability & quality** **(Session Chairs: Sajad Afshari, Xufeng Zhao)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)** **(4 papers)**	**Invited Session #12.2: System reliability and maintenance modeling** **(Session Chair: Lin Zhu, Yu Liu)** **Zoom Meeting Link: https://zoom.us/j/99793633698 (See email for passcode)** **(4 papers)**	**Regular Session #11.2: Maintenance strategy** **(Session Chairs: Nobuyuki Tamura, Guangyu Chen)** **Zoom Meeting Link: https://zoom.us/j/95536125725 (See email for passcode)** **(4 papers)**	**Invited Session #9.2: Reliability data analysis and decision making** **(Session Chairs: Huimin Wang, Liyang Xie)** **VooV Meeting Link: https://meeting.tencent.com/s/Ru0AFmOz2akB (See email for passcode)** **(3 papers)**	**Regular Session #5.2: Fundamental reliability analysis theory** **(Session Chairs: Xiaoyang Li, Ning-cong Xiao)** **Voov Meeting Link: https://meeting.tencent.com/s/PE7I9zMSSSWW (See email for passcode)** **(3 papers)**	**21:40-23:00**		**20:40-22:00**
		1570637810: Optimization Problems for Consecutive-k-out-of-n:G Systems with Exchangeable Components **(Lei Zhou; Hisashi Yamamoto; Xiao Xiao)** 1570639951: Factor copula modeling of coherent systems with dependent components **(Shuhei Ota; Mitsuhiro Kimura)** 1570639996: Random Replacement Policies for Two Failure Modes **(Satoshi Mizutani; Xufeng Zhao; Toshio Nakagawa)** 1570640996: Bi-objective Optimization of Network Reliability by Genetic Algorithm **(Natsumi Takahashi; Tomoaki Akiba; Hisashi Yamamoto; Shao-Chin Sung)**	1570624408: A Multi-State k-out-of-n:F Balanced System with a Rebalancing Mechanism **(Siqi Wang; Xian Zhao; Ming Jian Zuo)** 1570629310: Optimal Maintenance Strategy for Second-Hand Product Considering Preventive Maintenance Actions **(Minjae Park; Ki Mun Jung; Dong Ho Park)** 1570637650: Maintenance Optimization of Multi-State Systems with Single Maintenance Capacity and Arbitrarily Distributed Maintenance Time **(Yiming Chen; Tao Jiang; Yu Liu)** 1570637698: Reliability analysis for competitive failure processes with multi-state degradation **(Aiping Jiang; Leqing Huang; Yisha Xiang)**	1570638730: Structure of an optimal maintenance policy for a Semi-Markovian deteriorating system with major and minor failures **(Nobuyuki Tamura)** 1570638765: Preventive maintenance optimization for large-scale systems under life cycle cost **(Ruiqi Wang; Guangyu Chen; Na Liang)** 1570638343: Predictive maintenance framework of the aircraft system based on PHM information **(Hongsheng Yan; Hongfu Zuo; Jianqi Tang; Ronghui Wang; Xiaojun Ma)** 1570638440: Maintenance task scheduling of wind turbine based on task priority **(Longfei Wang)**	1570635755: A Knowledge Synthesis Method for Weibull Distribution Estimation with Four Right-Censored Life Data **(Liyang Xie; Jungang Ren)** 1570635756: Reliability of a Star Configuration Power Grid System with Performance Sharing **(Peng Su; Guanjun Wang)** 1570637371: Bayesian Based Data Analysis Method for Reliability Prediction of Electronics **(Lixiang Zheng; Yu Di; Nie Guojian; Yang Yun; Lei Ting; Liu Yuke)**	1570637314: Adaptive sampling with neural networks for system reliability analysis **(Ning-cong Xiao; Hongyou Zhan; Kai Yuan)** 1570638260: Belief Reliability Evaluation with Limited Time-to-Failure Data under Uncertain Right Censoring **(Wenbin Chen; Xiaoyang Li; Fangrong Li; Rui Kang)** 1570638275: An effective Kriging-based Approach for System Reliability Analysis with Multiple Failure Modes **(Chengning Zhou; Ning-cong Xiao; Ming Jian Zuo; Wei Gao; Qing Li)**			

The 9th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2020)
Virtual Meeting (August 20-23, 2020)

Final Conference Program (August 20, 2020)

Sunday August 23	13:00-21:00	**Break**					23:00-07:00		22:00-06:00
	21:00-22:20	**Invited Session #2: Decision support systems for improving the construction and maintenance of wind farm projects** **(Session Chairs: Nima Seresht, Yuejian Chen)** **Zoom Meeting Link:** **https://zoom.us/j/92493246918 (See email for passcode)** **(4 papers)**	**Invited Session #11: Reliability tests and data analysis** **(Session Chairs: Tao Yuan, Alireza Khalilabad)** **Zoom Meeting Link:** **https://zoom.us/j/99793633698 (See email for passcode)** **(4 papers)**	**Regular Session #8: Optimization** **(Session Chairs: Zhe-George Zhang, Hiroyuki Okamura)** **Zoom Meeting Link:** **https://zoom.us/j/95536125725 (See email for passcode)** **(4 papers)**	**Regular Session #13: Stability analysis** **(Session Chairs:Junjun Zheng, Zhiyuan Wang)** **VooV Meeting Link:** **https://meeting.tencent.com/s/Ru0AFmOz2akB** **(See email for passcode)** **(4 papers)**	**Invited Session #4: Degradation modeling and Inference** **(Session Chairs: Zhiliang Liu, Jia Wang)** **Voov Meeting Link:** **https://meeting.tencent.com/s/PE7l9zMSSSWW** **(See email for passcode)** **(4 papers)**	07:00-08:20	Sunday August 23	06:00-07:20
		1570636632: Simulation-based approach for risk assessment in onshore wind farm construction projects **(Emad Mohamed; Nima Gerami Seresht; Stephen Hague; Simaan AbouRizk)** 1570636642: Framework for Risk Identification of Renewable Energy Projects Using Fuzzy Case-Based Reasoning **(Sahand Somi; Nima Gerami Seresht; Aminah Robinson Fayek)** 1570629844: Wind Turbine Power Output Estimation with Probabilistic Power Curves **(Siyun Ge; Ming Jian Zuo; Zhigang (Will) Tian)** 1570638655: A PdM framework Through the Event-based Genomics of Machine Breakdown **(Morad Danishvar; Alireza Mousavi; Veerendra C. Angadi)**	1570621081: Planning Accelerated Destructive Degradation Test with Block Effects **(Jiaxiang Cai; Zhisheng Ye)** 1570638378: Remaining useful life prediction using machine learning **(Xiaoyan Zhu; Ping Zhang; Min Xie)** 1570638397: A Differential Burn-in Policy Considering Nonhomogeneous Distribution of Spatial Defects in Semiconductor Manufacturing **(Tao Yuan; Yuan Chen; Yue Kuo)** 1570635836: A Bayesian Model Averaging Method for Software Reliability Assessment **(Qiumin Yu; Steven Li)**	1570633910: Optimum replacement last policy for a cumulative damage model **(Shey-Huei Sheu; Zhe-George Zhang; Tzu-Hsin Liu; Jau-Chuan Ke)** 1570637614: Electric Bus Charging Station's Location and Capacity Based on Routes and Grid AP Clustering Algorithm **(Fan Yanhong; He Chunhui; Fei Danxiong; Gu Jiu; Da Xie)** 1570638638: Formulation of Opportunity-Based Age Replacement Models with Markovian Arrival Process **(Hiroyuki Okamura; Junjun Zheng; Tadashi Dohi)** 1570638713: Inventory Control Optimization via Neural-Nets Based Demand Prediction **(Haoyu Wang; Xiaoyu Fan; Yan Zhang; Xiaoyue Du; Bohan Cui; Yingjun Deng)**	1570638438: A Note on Uncertainty Propagation for Availability Model of Mobile Cloud Computing Systems **(Junjun Zheng; Jiahao Zhang; Hiroyuki Okamura; Tadashi Dohi)** 1570629552: Stability Analysis of Wireless Powered Communication Networks **(Mingfu Li; Ching-Chieh Fang; Huei-Wen Ferng)** 1570637573: Structural Robustness-based SHM Point Arrangement Strategy for In-service Cable-stayed Bridge Subjected to Cable Damage Effect **(Qiwen Jin; Zheng Liu)** 1570638873: Effects of flow rate and silt particle on vibration of a double-suction centrifugal pump **(Zhiyuan Wang; Zhongdong Qian)**	1570639329: Optimal design of accelerated life tests for one-shot devices **(Chinuk Lee; Suk Joo Bae)** 1570634003: Optimal design of degradation testing and life testing based on Wiener process models **(Zhonghai Ma; Songlin Nie; Fanglong Yin; Hui Ji)** 1570638515: Modeling the degradation-shock dependence with the consideration of system resistance **(Jia Wang; Luyu Zhang; Guanghan Bai)** 1570638656: Planning of an Accelerated Degradation Test under Different Constraints of Operating Conditions **(I-Chen Lee; Zi-Yu Lin)**			
	22:20-23:00	**Closing Ceremony** **Zhigang Tian: Announcing Best Paper Awards** **Ming Zuo: Summary of APARM 2020** **Yi-Kuei Lin: Announcing Venue of APARM 2022** **APARM 2022 Hosting Team: Promotion of APARM 2022** **(Chair: Prof. Ming Zuo)** **Zoom Meeting Link: https://zoom.us/j/92493246918 (See email for passcode)**					08:20-09:00		07:20-08:00

Keynote Speeches

Keynote Speech #1: Data-driven Crisis Management

Way Kuo, City University of Hong Kong

Abstract:

Since the outbreak of Covid-19 at the end of 2019, little consolidated effort has been taken to deal with the epidemic worldwide. Misleading information are around. We list losses from recent major pandemic outbreaks and nuclear power plant accidents, together with air pollution, traffic accidents and suicides. Early simulations of possible scenarios by the Emergency Response Unit can prevent the negative impact on the general public, and hence reduce global losses.

Short Biography:

Way Kuo is the President of City University of Hong Kong. He is a member of the US National Academy of Engineering and Academia Sinica in Taiwan, A Foreign Member of the Chinese Academy of Engineering, and a Foreign Member of the Russian Academy of Engineering. A pioneer in reliability research of systems in their infant stage, He is renowned for his work in designing the reliability of electronics systems and nuclear energy, and has made breakthroughs in nano-reliability research.

Keynote Speech #2: Reliability in the 21st Century

William Q. Meeker, Department of Statistics, Center for Nondestructive Evaluation, Iowa State University, Ames, Iowa 50010, wqmeeker@iastate.edu

Abstract:

Reliability is an engineering discipline that relies heavily on the application of probability and statistics. Changes in sensor, communications, and storage technologies are changing the nature of reliability field data. An increasing number of modern systems are being outfitted with sensors that capture information about how and when and under what environmental and operating conditions individual systems are being used. In some cases, the physical/chemical state of critical system components can also be quantified and reported. For many systems such information is being downloaded continuously into data farms. In addition, improvements in computing capabilities and investment in developing physics-based models for failure provide another important dimension of reliability information. There are many potential applications for using such data to improve safety and reduce costs but existing statistical methods for reliability assessment and prediction are inadequate for the tasks. This talk reviews some particular applications where the modern field reliability data are used and explores some of the opportunities to use modern reliability data to provide stronger statistical/physical methods that can be used to operate and predict the performance of systems in the field. We also provide some examples of recent technical developments designed to be used in such applications and outline remaining challenges.

Short Biography:

William Q. Meeker is Professor of Statistics and Distinguished Professor of Liberal Arts and Sciences at Iowa State University. He has more than 40 years of experience working in the application of statistical methods to engineering applications including reliability and nondestructive evaluation. He has done research and consulted extensively on problems in reliability data analysis, warranty analysis, experimental design, accelerated testing, nondestructive evaluation, and statistical computing. His practical experience includes numerous long-term visits to AT&T Bell Laboratories, General Electric Global Research, and Los Alamos National Laboratory. He is a Fellow of the American Statistical Association (ASA), the American Society for Quality (ASQ), and the American Association for the Advancement of Science, and a past Editor of Technometrics. He is co-author of the books Statistical Methods for Reliability Data with Luis Escobar (1998), the second edition of Statistical Intervals with Luis Escobar and Gerald Hahn (2017), 14 book chapters, and many publications in the engineering and statistical literature. He has won numerous awards for his research and contributions to the statistical and engineering professions including the ASQ Shewhart Medal and ASA's Deming Lecture Award.

Keynote Speech #3: An Analytic Tool Box for Optimizing CBM Decisions

Andrew K.S. Jardine, Department of Mechanical & Industrial Engineering, University of Toronto

Abstract:

Engineers and asset managers associated with Operations and Maintenance (O&M) have to make many difficult decisions, and this presentation addresses one of them: the important maintenance tactic of condition-based maintenance (CBM). Historically, companies either waited until a piece of equipment failed before repairing or replacing it, or simply guessed at a good time to perform maintenance and hopefully avoid failure. With CBM, the guesswork is largely eliminated because equipment is closely monitored. Empirical proof of a change in condition now guides maintenance decisions. The problem now is an overabundance of information. With the fourth industrial revolution, Industry 4.0, data come from everywhere, and everything is linked to everything else. ISO 55001 stresses in Section 8.2.3: "The organization should have the capability to make evidence-based decisions on proposed changes and the ability to consider scenarios systematically across the entire organization." This is all well and good, but if we want to make maintenance decisions based on evidence, which data are most relevant?

The focus of the presentation is evidence-based asset management (EBAM) and its application to CBM decisions. It illustrates the value of applying analytics to big data gathered by numerous condition monitoring technologies (oil sampling, vibration monitoring, pressure, temperature etc.) to ensure that an evidence-based decision is made and that the decision will, in fact, optimize the condition based maintenance decisions.

The methodology has been successfully applied in numerous sectors, such as the military, mining, transportation, pulp and paper, petrochemicals, food processing, and electricity generation.

Short Biography:

Andrew K.S. Jardine is the Founding Director of the Centre for Maintenance Optimization and Reliability Engineering (C-MORE) at the University of Toronto. He is the author of Maintenance, Replacement and Reliability, co-editor of Maintenance Excellence: Optimizing Equipment Life Cycle Decisions and co-author of Maintenance, Replacement & Reliability: Theory and Applications. Dr. Jardine is Professor Emeritus in the Department of Mechanical and Industrial Engineering, University of Toronto, Canada

Keynote Speech #4: Condition Monitoring and Fault Diagnosis of Technical Processes for Reliability Enhancement with Applications to Nuclear Power Plants

Jing Jiang, Department of Electrical & Computer Engineering, University of Western Ontario, London, Ont. Canada, N6A 5B9

Abstract:

To enhance the reliability of safety-critical technical systems or related equipment, condition monitoring and fault diagnosis techniques are often used. However, these techniques can be characterized as an 'inverse' problem, where one can only infer the condition of the underlying process through acquired external behaviours, often in the form of measurements. A distinctive feature in such inverse problems is that the solutions may not be unique, i.e. multiple causes can lead to a similar observation. This makes such a task very challenging. To assess the true condition of a technical process effectively and to diagnose any crucial faults, one has to increase the dimensionality of the observation space. Advanced signal processing techniques, models of the technical process, and emerging technologies, such as IoTs, digital twins, can help to increase the solvability of this problem by exploring causal relationships among different variables.

This talk will focus on the following aspects: (1) nonlinear relationships between the condition of a technical process being monitored and the observed behaviours through measurements; (2) existing signal processing methods and data analytics techniques to capture the genuine behaviours of the technical processes using models and measurement data; (3) advances in technologies that can gain insights of technical processes, that were not previously feasible; and (4) some application examples of the above developed techniques in condition monitoring and fault diagnosis in nuclear power plants.

More specifically, the talk will examine the relationships between the reliability and condition monitoring and fault diagnosis for technical systems. The process of condition monitoring and fault diagnosis is then described from an 'inverse' problem perspective. Explanation of why dimensionality of the observation data is critical in finding unique solutions to this problem. Different signal processing techniques, including time-frequency analysis, wavelets, and data fusion, will be described to extract key information, while removing noise or artifacts. Recent advancements in sensing technologies with distributed fibre optic sensors, printable electronics, no-touching eddy current probe arrays, as well as IoTs and digital twins have provided revolutionary means to acquire relevant information about the processes with no or minimal influence to its inherent operation. Some of the latest research results and demonstration examples will also be presented.

Short Biography: Jing Jiang received a Ph.D. degree from the University of New Brunswick in 1989. He has been with the Department of Electrical and Computer Engineering, University of Western Ontario, London, ON, Canada since 1991, where he is currently an NSERC/UNENE Senior Industrial Research Chair Professor. His current research interests include fault-tolerant control of safety-critical systems, advanced control of power plants containing non-traditional energy resources, and instrumentation and control for nuclear power plants. He is a registered professional engineer (P. Eng.) in Ontario and a fellow of the Canadian Academy of Engineering.

Panel Discussion

Topic: Safety, Security, and Reliability of Autonomous Vehicles

Moderator:

- W. Eric Wong (University of Texas at Dallas, USA)

Panelists (alphabetical order):

- Yue Chen (Futurewei Technologies, USA)
- Dennis Kengo Oka (Synopsys, Inc., Japan)
- Martin Soukup (Irdeto, The Netherlands)
- German Ros (Carla, USA)
- Min Xie (City University of Hong Kong, Hong Kong)
- James Yang (Western Michigan University, USA)
- Mohammad Zulkernine (Queen's University, Canada)
- Ming Zuo (University of Alberta, Canada)

Tutorials:

Tutorial #1: Building Multicriteria Decision Models for Risk, Reliability, and Maintenance Decision Analysis

Cristiano Cavalcante and Alexandre Alberti,
Universidade Federal de Pernambuco

Abstract: Risk, Reliability and Maintenance (RRM) are contexts in which decision problems with multiple objectives have been on the increase in recent years. Decisions on RRM issues can affect the strategic results of any organization, with financial impacts, as well as they may eventually have impacts on other important dimensions, such as human (safety) and environmental, hence the importance of having a well-structured decision process. The objective of this tutorial is to present some developments on building multicriteria models to support decisions on RRM management, and to promote the new book "Multicriteria Decision Models Optimization for Risk, Reliability, and Maintenance Decision Analysis – Recent Advances", edited by Adiel T. de Almeida, Love Ekenberg, Philip Scarf, Enrico Zio and Ming J. Zuo. The book includes methodological topics related to multicriteria decision making/aiding (MCDM/A) and some new MCDM/A models in RRM contexts, in addition to several optimization and multiobjective models and decision problems related to it. The book was developed after an invitation of the editors of the prestigious "International Series in Operations Research and Management Science", by Springer, and it follows a first book on this topic, "Multicriteria and Multiobjective Models for Risk, Reliability and Maintenance Decision Analysis", published in 2015.

Short Biography:

Cristiano Cavalcante is Associate Professor in the Management Engineering Department at Universidade Federal de Pernambuco (UFPE) since 2006. He obtained his PhD in 2005 from the Universidade Federal de Pernambuco for work on Multicriteria Decision Models to Support Maintenance Problems. He has held a research fellowship from the Brazil National Research Council (CNPq) since 2009. Currently, is the leader of RANDOM (Research Group on Risk and Decision Analysis in Operations and Maintenance), a group partner of the INCT-INSID (National Institute of Information and Decision Systems). Dr Cavalcante is a Fellow of The Institute of Mathematics and Its Applications (IMA) of the UK, Board Member of the INFORMS - Multiple Criteria Decision Making Section and senior Member of IEEE society. His research interests include Operations Research, Maintenance modelling, Logistics and Multicriteria Decision Making/Aiding.

Alexandre Ramalho Alberti is Assistant Professor in the Management Engineering Department at Universidade Federal de Pernambuco (UFPE) since 2020. He is Mechanical Engineer and received his Master and PhD degrees in Management Engineering from UFPE, Brazil. Currently, he is member of the RANDOM (Risk Analysis and Decisions on Operations and Maintenance Research Group), a group partner of the INCT-INSID (National Institute of Information and Decision Systems). His research interests include Operations Research, Maintenance Engineering and Multicriteria Decision Making/Aiding.

Tutorial #2: History of System Reliability Optimization

Professor David W. Coit, Rutgers University, Piscataway, NJ USA

Abstract:

In this tutorial, we review the most important contributions to system reliability optimization research, discuss how research and research priorities have changed in response to the needs of reliability professionals and availability of needed data. All engineering and all engineering disciplines are practical implementations of some form of an optimization problem. Almost from the inception of reliability as a formal engineering discipline, accompanied by mathematical principles based on probability theory, there has been research to systematically and rigorously analyze complex problems to produce a uniquely reliable design. The earliest research on system reliability optimization used formal methods, such a dynamic programming and nonlinear programming. This work was pioneering, but current needs are different and ongoing, and future research directions address realistic problems and exploit the availability of data to dynamically optimize as conditions change or trends emerge. Although always changing and advancing, the evolution of system reliability optimization research can be approximately classified into the following three chronological categories. The first era is Rigorous Mathematics, where dynamic programming, linear and nonlinear programming were used to select optimal designs, but for limited types of problem. Second, there is the era of Pragmatism, where heuristics and more approximate methods were used, but for much broader and richer types of design problems. Finally, there is the era of Active Reliability Improvement where reliability optimization becomes a dynamic analysis to continually improve performance. This tutorial will review these methods and discuss current and future trends.

Short Biography:

David W. Coit is a Professor in the Department of Industrial & Systems Engineering at Rutgers University, Piscataway, NJ, USA, and he currently holds a Visiting Professor position at Tsinghua University, Beijing, China. His current teaching and research involves system reliability modeling and optimization, and energy systems optimization. His research has been funded by National Science Foundation (NSF), U.S. Army, U.S. Navy, industry, and power utilities. He has been awarded several NSF grants, including a CAREER grant from NSF to develop new reliability optimization algorithms considering uncertainty. He has over 120 published journal papers and over 90 peer-reviewed conference papers. He was also the recipient of the P. K. McElroy award, Alain O. Plait award and Willian A. J. Golomski award for best papers and tutorials at the Reliability and Maintainability Symposium (RAMS). He received a BS degree in mechanical engineering from Cornell University, an MBA from Rensselaer Polytechnic Institute, and MS and PhD in industrial engineering from the University of Pittsburgh. He is a Department Editor for IISE Transactions and an Associate Editor for IEEE Transactions on Reliability and the Journal of Risk and Reliability.

Tutorial #3: Machine Learning in Data-Driven Prognostics and Health Management (PHM) for condition-based and predictive maintenance

Enrico Zio, PSL University, France and Politecnico di Milano, Italy

Abstract:

As the digital, physical and human worlds continue to integrate, the 4th industrial revolution, the internet of things and big data, the industrial internet, are changing the way we design, manufacture, deliver products and services. In this fast-pace changing environment, the attributes related to the reliability of components and systems continue to play a fundamental role for industry. On the other hand, the advancements in knowledge, methods and techniques, the increase in information sharing and data availability, offer new ways for reliable engineering of systems and new opportunities of business in several areas of application. Based on this increased knowledge, information and data available, we can improve our prediction capabilities. Particularly, the increased availability of data coming from monitoring the relevant parameters of components, systems and assets performance, and the grown ability of treating these data by intelligent machine learning algorithms, capable of mining out information relevant to the assessment and prediction of their state, has open wide the doors for disruptive advancements in many industrial sectors, for improved design, operation, management and maintenance.

In this lecture, I frame the different problems that can be tackled by machine learning, both by examples and scientifically, and offer some reflections on the opportunities and challenges related to the use of machine learning in various industrial sectors.

Short Biography:

Enrico Zio received the MSc degree in nuclear engineering from Politecnico di Milano in 1991 and in mechanical engineering from UCLA in 1995, and the Ph.D. degree in nuclear engineering from Politecnico di Milano and in probabilistic risk assessment at MIT in 1996 and 1998, respectively. He is currently full professor at the Centre for research on Risk and Crises (CRC) of Ecole de Mines, ParisTech, PSL University, France, full professor and President of the Alumni Association at Politecnico di Milano, Italy, eminent scholar at Kyung Hee University, Republic of Korea, distinguished guest professor at Tsinghua University, Beijing, China, adjunct professor at City University of Hong Kong, Beihang University and Wuhan University, China and Co-Director of the Center for REliability and Safety of Critical Infrastructures (CRESCI) and the sino-french laboratory of Risk Science and Engineering (RISE), at Beihang University, Beijing, China. In 2020, he has been awarded the prestigious Humboldt Research Award in Germany. His research focuses on the modeling of the failure-repair-maintenance behavior of components and complex systems, for the analysis of their reliability, maintainability, prognostics, safety, vulnerability, resilience and security characteristics, and on the development and use of Monte Carlo simulation methods, artificial techniques and optimization heuristics. He is author and co-author of seven books and more than 500 papers on international journals, Chairman and Co-Chairman of several international Conferences, associate editor of several international journals and referee of more than 20.

Tutorial #4: Mechanical Applications of Cepstrum Analysis in Machine and Structural Health Monitoring

Dr. Bob Randall, Emeritus Professor, School of Mechanical and Manufacturing Engineering, University of New South Wales (UNSW), Sydney, Australia

Abstract:

It is not widely realised that the first paper on cepstrum analysis was published two years before the FFT algorithm, despite having Tukey as a common author, and its definition was such that it was not reversible, even to the log spectrum. After publication of the FFT in 1965, the cepstrum (now called the "power cepstrum" or "real cepstrum") was redefined so as to be reversible to the log (amplitude) spectrum, and shortly afterwards Oppenheim and Schafer defined the ''complex cepstrum", which was reversible to the time domain, but only for transient signals (whose phase spectrum is continuous). They also derived the analytical form of the complex cepstrum of a transfer function in terms of its poles and zeros. The cepstrum had been used in speech analysis for determining voice pitch (by accurately measuring the harmonic spacing in voiced speech), but also for separating the formants (transfer function of the vocal tract) from voiced and unvoiced sources, and this led quite early to similar applications in mechanics, viz. identification of uniformly spaced sidebands from local faults in gearboxes (Randall), and extraction of the cylinder pressure signal in a diesel engine from acoustic responses (Lyon and Ordubadi), since the cepstrum of a response is the sum of the cepstra of the forcing and transfer functions. Gao and Randall in 1996 used this and the analytical form of the cepstrum to curve fit modal parameters of mechanical structures in the cepstrum. Thus, the cepstrum has been around for a long time, but not used to its full capacity. A breakthrough occurred in 2011, when it was found that edited time signals could be obtained by combining an edited amplitude spectrum (using the real cepstrum) with the original phase spectrum of (sections of) continuous signals, for example to remove families of harmonics and sidebands, or to separate response signals into components dominated by intrinsic forcing functions or modal properties, in particular for variable speed machines, where forcing functions vary with the speed, but modal frequencies remain independent of the speed. This has already been used for a wide range of mechanical applications. A very powerful processing tool is an exponential ''lifter" (window) applied to the cepstrum, which is shown to extract the modal part of the response (with a small extra damping of each mode corresponding to the window). This has already been shown to be valuable for Operational Modal Analysis(OMA), in particular of machines, where both forcing functions and modal properties can contain information about condition.

The tutorial is a survey of the history, latest developments, and potential future applications of cepstrum analysis applied to health monitoring of machines and structures.

Short Biography:

Bob Randall is a visiting Emeritus Professor in the School of Mechanical and Manufacturing Engineering at the University of New South Wales (UNSW), Sydney, Australia, which he joined in 1988. Prior to that, he worked for the Danish company Brüel & Kjær for 17 years, developing their condition monitoring systems, after ten years' experience in the chemical and rubber industries in Australia, Canada and Sweden. His book "Frequency Analysis", published by Brüel & Kjær with the last edition in 1987, was widely distributed. He was promoted to Associate Professor in 1996 and to Professor in 2001, and was made an Emeritus Professor on his retirement in 2008. He has

degrees in Mechanical Engineering and Arts (Mathematics, Swedish) from the Universities of Adelaide and Melbourne, respectively. He is the invited author of chapters on vibration measurement and analysis in a number of handbooks and encyclopedias, and a member of the editorial boards of three journals. His book Vibration-based Condition Monitoring was published in 2011 by Wiley with a new edition pending. He is the author of more than 350 papers in the fields of vibration analysis and machine diagnostics, and has supervised seventeen PhD projects in those areas. He has lectured in English, French, German, Danish, Swedish and Norwegian. From 1996 to 2011 he was Director of the DSTO (Defence Science and Technology Organisation) Centre of Expertise in Helicopter Structures and Diagnostics at UNSW, researching diagnostics and prognostics of gears and bearings in helicopter gearboxes and gas turbine engines. He is still active in research, for example being a co-author of thirteen journal papers in the last two years.

Tutorial #5: Design a Practical and Effective Reliability Test

Huairui (Harry) Guo, Fiat Chrysler Automobiles US LLC

Abstract:

One of the important tasks for reliability engineers is to design and conduct effective reliability tests. Many books and papers on reliability data analysis and modeling were published each year. However, very few literatures address the issue on how to design useful reliability tests. If a reliability test is not effective, then the data generated from it will not be very useful. Time and money are wasted, and the actual failure modes experienced later by the customers are not identified before product launch. But how to design an effective reliability test to evaluate the product performance?

An effective reliability test will at least address the following elements using a scientific way:

- How many samples are needed
- How long should each sample be tested
- What stresses should be applied in the test
- At what level for each stress should a sample be tested
- Should a stress be constant or time varying
- What is the reliability acceptance criteria
- What is the definition of failures

This tutorial will mainly focus on practical aspects of reliability test design. Through this tutorial, the audience will have a complete understanding of the process of planning and conducting an effective reliability test.

Short Biography:

Huairui (Harry) Guo is the Technical Fellow on Reliability Quality and Statistics at FCA US LLC. He is working on reliability growth, vehicle launch readiness KPIs, warranty cost prediction, customer usage data mining for connected vehicles, and statistical method applications on quality and reliability engineering. He also provides internal reliability, quality, and statistics trainings for release, design, quality, and reliability engineers in the company. Before joining FCA, Harry was the Director of the Theoretical Development at ReliaSoft, where he led the team to develop data analytics software packages Weibull++, DOE++, ALTA, RGA, and BlockSim. Harry obtained his PhD in systems and industrial engineering from University of Arizona in 2004. He is a Certified Reliability Professional (CRP), a Certified Reliability Engineer (CRE), and a Certified Quality Engineer (CQE). He is the Alan O. Plait Award recipient for Tutorial Excellence at RAMS 2018, Best Research Paper Award (2007) and the William Golomski Best Paper Award recipient(2013) from IIE (Institute of Industrial Engineers), and received the Stan Ofsthun Best Paper Award (2008, 2010, 2014, 2016) from SRE (Society of Reliability Engineers).

Tutorial #6: Past, Present and Future Directions and Advances in Reliability

Dr. Kailash [Kal] Kapur, P.E., Professor Emeritus, Department of Industrial & Systems Engineering, University of Washington, Seattle, Email: kalkapur@hotmail.com

Abstract:

A brief history of reliability and underlying assumptions, principles and models are presented. We will cover and integrate many of related qualities or "ilities" including maintainability and availability. This tutorial also integrates the three R's of Engineering: reliability, robustness and resilience. The three R's refer to the foundations of a basic skills-orientated educational program of reading, writing and arithmetic. There is tremendous interest these days to design and develop all types of complex systems, including infrastructure, communications, logistics, distribution and service systems that are not only reliable, safe, secure and maintainable but are also robust, resilient and sustainable. Concept of Prognostics started with Hippocrates (460-370BC). A brief history of prognostics and underlying assumptions and principles are presented. It is based on the evolution from open systems to feedback systems, diagnostics, prognostics and continuous future trends and development related to feedforward control systems. Impact of recent growth of technologies related to internet of things [IoT] and artificial intelligence [AI] is presented to develop prognostics for complex systems to improve reliability. Role and integration of prognostics with the three R's of Engineering and other "ilities" is presented. Objective is to develop new and holistic measures for reliability and their trends and future applications. This is based on systems oriented, integrated and distributed, customer-centered multi-state systems approach including fuzzy logic methodology.

Short Biography:

Dr. Kailash [Kal] C. Kapur is a Professor Emeritus of Industrial & Systems Engineering in the College of Engineering at the University of Washington, Seattle. He was the Director of Industrial Engineering at the University of Washington from January 1993 to September 1999. He was a Professor and the Director of the School of Industrial Engineering, University of Oklahoma from 1989-1992 and a professor in the Department of Industrial and Manufacturing Engineering at Wayne State University, Detroit, Michigan. Dr. Kapur received the Ph. D. degree in Industrial Engineering & Operations Research from the University of California, Berkeley, California. He has co-authored three books on reliability engineering and published over 100 research papers. He received the Allan Chop Technical Advancement Award from the Reliability Division and the Craig Award [twice] from the Automotive Division of American Society for Quality. He is a Fellow of American Society for Quality, a Fellow of the Institute of Industrial Engineers, and a registered professional engineer. LinedIn Website: https://www.linkedin.com/in/kckapur/.

Program for *2020 Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM)*

	Thursday, August 20	Friday, August 21	Saturday, August 22	Sunday, August 23
6:00 - 7:00		*Invited Session #1: Advanced reliability and safety management techniques in rail transits* *Invited Session #5: Dynamic reliability analysis of complex structural and mechanical systems* *Invited Session #6: Life analysis with deterioration with field applications* *Regular Session #6: General* *Regular Session #7: Nonstationary signal processing*	*Tutorial #1: Building Multicriteria Decision Models for Risk, Reliability, and Maintenance Decision Analysis*	*Invited Session #11: Reliability tests and data analysis* *Invited Session #2: Decision support systems for improving the construction and maintenance of wind farm projects* *Invited Session #4: Degradation Modeling and Inference* *Regular Session #13: Stability analysis* *Regular Session #8: Optimization*
7:00 - 7:20			*Tutorial #2: History of System Reliability Optimization* *Tutorial #3: Machine Learning in Data-Driven Prognostics and Health Management (PHM) for Condition-based and Predictive Maintenance*	
7:20 - 8:00				*Conference Closing Ceremony*
8:00 - 17:00				
17:00 - 18:00		*Keynote Speech #3: An Analytic Tool Box for Optimizing CBM Decisions*	*Tutorial #4: Mechanical Applications of Cepstrum Analysis in Machine and Structural Health Monitoring* *Tutorial #5: Design a Practical and Effective Reliability Test*	
18:00 - 18:30	*Conference Opening Ceremony*	*Keynote Speech #4: Condition Monitoring and Fault Diagnosis of Technical Processes for Reliability Enhancement with Applications to Nuclear Power Plants*	*Panel: Autonomous Vehicles* *Tutorial #6: Past, Present and Future Directions and Advances in Reliability*	
18:30 - 19:00	*Keynote Speech #1: Data-driven Crisis Management*			
19:00 - 19:10				
19:10 - 19:30		*Invited Session #10: Reliability modelling and optimal configuration of complex systems* *Regular Session #1: Advanced machine learning techniques* *Regular Session #10: Rotating machinery diagnostics* *Regular Session #2: Asset reliability analysis* *Regular Session #3: Degradation analysis*	*Invited Session #12.1: System reliability and maintenance modeling* *Invited Session #8.1: New models and approaches for the reliability & quality* *Invited Session #9.1: Reliability data analysis and decision making* *Regular Session #11.1: Maintenance strategy* *Regular Session #5.1: Fundamental reliability analysis theory*	
19:30 - 20:30	*Keynote Speech #2: Reliability in the 21st Century*			
20:30 - 20:40				
20:40 - 21:10	*Invited Session #3: Degradation analysis and remaining useful life prediction of components in aircraft utility systems* *Invited Session #7: Models and applications in network reliability*		*Invited Session #12.2: System reliability and maintenance modeling* *Invited Session #8.2: New models and approaches for the reliability & quality* *Invited Session #9.2: Reliability data analysis and decision making* *Regular Session #11.2: Maintenance strategy* *Regular Session #5.2: Fundamental reliability analysis theory*	
21:10 - 22:00	*Regular Session #12: Transfer learning* *Regular Session #4: Machine health management* *Regular Session #9: Random process*			

Thursday, August 20

Thursday, August 20 18:00 - 18:30 (America/Vancouver)

Conference Opening Ceremony

https://zoom.us/j/92493246918

Chair: Ming Jian Zuo (University of Alberta, Canada)

Conference Opening Ceremony Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Thursday, August 20 18:30 - 19:30 (America/Vancouver)

Keynote Speech #1: Data-driven Crisis Management

https://zoom.us/j/92493246918

Prof. Way Kuo

Chair: Min Xie (City University of Hong Kong, Hong Kong)

Keynote Speech #1 by Prof. Way Kuo Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Thursday, August 20 19:30 - 20:30 (America/Vancouver)

Keynote Speech #2: Reliability in the 21st Century

https://zoom.us/j/92493246918

Prof. William Q. Meeker

Chair: Min Xie (City University of Hong Kong, Hong Kong)

Keynote Speech #2 by Prof. William Q. Meeker Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Thursday, August 20 20:40 - 22:00 (America/Vancouver)

Invited Session #3: Degradation analysis and remaining useful life prediction of components in aircraft utility systems

https://zoom.us/j/99793633698

Chairs: Shaoping Wang (Beihang University, China), Chao Zhang (Beihang University, China)

Modeling and Optimization of Comb Electrodes Capacitive Three-Dimensional Force Tactile Sensor

Jian Tie, Shaoping Wang, Chao Zhang and Jian Shi (Beihang University, China)

An Adaptive Control Method for Electro-hydrostatic Actuator Based on Virtual Decomposition Control

Youhao Shen, Xingjian Wang and Shaoping Wang (Beihang University, China); Jouni Mattila (Tampere University of Technology, Finland)

Fault diagnosis of hydraulic actuator based on improved convolutional neural network

Liwei Zhao, Shaoping Wang, Jian Shi and Chao Zhang (Beihang University, China)

A Multi-source Information Fusion Fault Diagnosis Method for Vectoring Nozzle Control System Based on Bayesian Network

Youyou Zhang, Jian Shi, Shaoping Wang and Zhang Yang (Beihang University, China)

Invited Session #3 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #7: Models and applications in network reliability

https://zoom.us/j/92493246918

Chairs: Hansi Jiang (SAS Institute, USA), Yi-Kuei Lin (National Chiao Tung University, Taiwan)

Methodology for Integrating Conventional and Network Reliability Evaluation

Cheng-Hao Huang (National Chiao Tung University, Taiwan); Ping-Chen Chang (National Quemoy University, Taiwan); Yi-Kuei Lin (National Chiao Tung University, Taiwan)

Reliability Applications on Business Management

Shin-Guang Chen (Tungnan University, Taiwan)

Reliability Analysis for Multi-state Projects by Decomposition Subsets

Yi-Hao Chiu (National Chiao Tung University, Taiwan); Cheng-Fu Huang (Feng Chia University, Taiwan); Yi-Kuei Lin and Ding-Hsiang Huang (National Chiao Tung University, Taiwan)

Lifetime Performance Evaluation and Analysis Model of Passive Component Capacitor Products

Kuen-Suan Chen and Chun-Min Yu (National Chin-Yi University of Technology, Taiwan)

Invited Session #7 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #12: Transfer learning

https://meeting.tencent.com/s/PE7I9zMSSSWW

Chairs: Wei Guo (University of Electronic Science and Technology of China, China), Zhisheng YE (National University of Singapore, Singapore)

Virtual Rotating Speed Meter: Extracting Machinery Rotating Speed from Vibration Signals Based on Deep Learning and Transfer Learning

Meng Rao (University of Alberta, Canada); Qing Li (University of Alberta, Australia); Dongdong Wei and Ming Jian Zuo (University of Alberta, Canada)

Composite Fault Diagnosis Based on Deep Convolutional Generative Adversarial Network

Yonghong Zhang, Zhongyang Zhang, Fan Shao and Yifei Wang (Nanjing University of Information Science and Technology, China); Xiaoping Zhao (Nanjing University of Information Science & Technology, China); Kaiyang Lv (Nanjing University of Information Science and Technology, China)

Adversarial Domain Adaptation for Gear Crack Level Classification Under Variable Load

Dongdong Wei (University of Alberta, Canada); Te Han and Fulei Chu (Tsinghua University, China); Ming Jian Zuo (University of Alberta, Canada)

Transferable Health Indicator of Rolling Bearings: A New Solution for Cross-Working Condition Monitoring of Degradation Process

Jiaxian Chen and Wentao Mao (Henan Normal University, China); Yuejian Chen (University of Alberta, Canada)

Regular Session #12 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #4: Machine health management

https://meeting.tencent.com/s/Ru0AFmOz2akB

Chairs: Jian Guo (Lam Research, USA), Hu-Chen Liu (Tongji University, China)

A Decision-Support Model to Select Forming Principle of Part for Sustainable Manufacturing

Wenjin Zhang, Peipei Zhang and Jiabing Zhang (University of Electronic Science and Technology of China, China)

Risk Assessment of Worn-out Failure of Transport Aircraft based on Monte Carlo Simulation

Ziwen Zhang (Nanjing University of Aeronautics and Astronautics, China); Lei Huang (AVIC Helicopter Research and Development Institute, China); Zhong Lu (Nanjing University of Aeronautics and Astronautics, China)

Normal behavior of single-asperity contact of bcc iron: a molecular dynamics simulation study

Wenzhen Xie, Chao Liu and Dongxiang Jiang (Tsinghua University, China)

Research on the layout of spare parts warehouse network based on wind power industry

Bin Yan and Yifan Zhou (Southeast University, China)

Regular Session #4 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #9: Random process

https://zoom.us/j/95536125725
Chairs: Richard Arnold (Victoria University of Wellington, New Zealand), Stefanka Chukova (unknown)

Mean and Variance of an Alternating Geometric Process
Richard Arnold and Stefanka Chukova (Victoria University of Wellington, New Zealand); Yu Hayakawa (Waseda University, Japan); Sarah Marshall (Auckland University of Technology, New Zealand)

A Bias-Corrected Kaplan-Meier Estimator
Renyan Jiang (Changsha University of Science & Technology, China)

Remaining Useful Life Estimation Based on Wiener Degradation Process With Mixed Random Effects
Fengjun Duan (Nanjing University of Finance and Economics, China); Guanjun Wang and Wanmeng Wei (Southeast University, China)

Nonparametric Bayesian Analysis of Hazard Rate Functions using the Gamma Process Prior
Richard Arnold and Stefanka Chukova (Victoria University of Wellington, New Zealand); Yu Hayakawa (Waseda University, Japan)

Regular Session #9 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Friday, August 21

Friday, August 21 6:00 - 8:00 (America/Vancouver)

Invited Session #1: Advanced reliability and safety management techniques in rail transits

https://zoom.us/j/92493246918
Chairs: Wei Guo (University of Electronic Science and Technology of China, China), Chengning Zhou (University of Electronic Science and Technology of China, China)

A Sparse FP-VAR Model for Representing Multichannel Non-Stationary Baseline Vibration Signals from a Gearbox
Yuejian Chen, Qing Li, Dongdong Wei and Ming Jian Zuo (University of Alberta, Canada)

An Optimal Band-pass Filter based on Adaptive Identification of Bearing Resonant Frequency Band
Wei Guo (University of Electronic Science and Technology of China, China)

Fault Feature Extraction based on Cyclic Correntropy for Train Axle Bearings in Impulsive Noise
Xuejun Zhao (Beijing Jiaotong University, China); Yong Qin and Limin Jia (State Key Laboratory of Rail Traffic Control and Safety, China); Zhiliang Liu (University of Electronic Science and Technology of China, China)

An Intelligence Fault Diagnosis Approach for Rolling Bearings Based on Non-local Convolutional Neural Network
Haoran Han (University of Electronic Science and Technology, China); Huan Wang, Zhiliang Liu and Yijia Hao (University of Electronic Science and Technology of China, China)

Multi-Scale CNN based on Attention Mechanism for Rolling Bearing Fault Diagnosis
Yijia Hao, Huan Wang and Zhiliang Liu (University of Electronic Science and Technology of China, China); Haoran Han (University of Electronic Science and Technology, China)

Vibration Features of High-speed Train Gearbox Induced by Bearing Fault
Jiufeng Cai (SouthWest JiaoTong University, China); Yifan Li and Jianxin Liu (Southwest Jiaotong University, China)

Invited Session #1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #5: Dynamic reliability analysis of complex structural and mechanical systems

https://zoom.us/j/95536125725

Chairs: Xihui Liang (University of Manitoba, Canada), Sajad Saraygord Afshari (University of Manitoba, Canada)

The simulation and dynamic reliability estimation of multiple-crack system
Shan Jiang and Yan-Fu Li (Tsinghua University, China)

Dynamic Modeling of a Planetary Gearbox with Sun Gear Crack and Bearing Clearance
Xianhua Chen, Xingkai Yang, Ming Jian Zuo and Zhigang (Will) Tian (University of Alberta, Canada)

A Novel Nonlinear Analysis Tool: Multi-scale Symbolic Sample Entropy and Its Application in Condition Monitoring of Rotary Machinery
Shun Wang and Yongbo Li (Northwestern Polytechnical University, China)

Analysis and Evaluation of Dynamic Reliability for Mechanical Structures Considering Mixed Uncertain Parameters
Xueguang Yu, Xintian Liu, Jiachi Tong, Xu Wang and Xiaolan Wang (Shanghai University of Engineering Science, China)

Approximate Reliability Analysis for New Generation Avionics Network
Lin Guo, Xiaodong Wang and Zhuqing Wang (Northwestern Polytechnical University, China); Shuang Zhang (Northwestern Polytechnical University & Xi'an Institute of Optics and Precision Mechanics Chinese Academy of Sciences, China); Yangming Guo (College of Computer Science & Northwestern Polytechnical University, China)

Time-dependent Reliability Analysis of a Nonrepairable Multifunctional System Containing Multifunctional Components
Jiangbin Zhao, Shubin Si and Zhiqiang Cai (Northwestern Polytechnical University, China); Haitao Liao (University of Arkansas, USA)

Invited Session #5 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #6: Life analysis with deterioration with field applications

https://zoom.us/j/99793633698

Chairs: Qingpei Hu (Chinese Academy of Sciences, China), Jin Lu (University of Electro-Communications, Japan)

Exponential Superimposed Renewal Processes
Watalu Yamamoto (University of Electro-Communications, Japan)

Threshold Type Maintenance Policies for Systems Under Cumulative Damage From Random Shocks
Jin Lu and Shoma Matoba (University of Electro-Communications, Japan)

Statistical Analysis and Correlation Study of Tool Wear in NC Machining
Jiabing Zhang and Peipei Zhang (University of Electronic Science and Technology of China, China); Yue Zhou (Xi'an Jiaotong University, China); Wenjin Zhang (University of Electronic Science and Technology of China, China)

Statistical Inference for Lifetime Delayed Degradation Process with Gamma Process
Zan Li and Qingpei Hu (Chinese Academy of Sciences, China); Dan Yu (Academy of Mathematics and Systems Science, China)

Wiener processes with random initial degradation values for step-stress accelerated degradation tests data
Chengjie Wang (Academy of Mathematics and Systems Science & Chinese Academy of Sciences, China); Qingpei Hu (Chinese Academy of Sciences, China); Dan Yu (Academy of Mathematics and Systems Science, China)

Asset life assessment by utilizing Weibull analysis with application on tank bottom components
Saif Eldin Mohamed Youssef (GAS Arabian Services, Saudi Arabia)

Invited Session #6 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #6: General

https://meeting.tencent.com/s/PE7l9zMSSSWW

Chairs: Jian Guo (Lam Research, USA), Shaomin Wu (Room 308, Kent Business School & University of Kent, United Kingdom (Great Britain))

A Segmented CRC-Aided PSS-SS-SCL Algorithm for Polar Codes
Jianping Li and Huanhuan Liu (Communication University of China, China)

A new switching model for sampling plan based on process yield

Shih-Wen Liu (National Chin-Yi University of Technology, Taiwan); Chien-Wei Wu (National Tsing Hua University, Taiwan)

Developing a Variables Modified Chain Sampling Plan with Taguchi Capability Index

Zih-Huei Wang (Feng Chia University, Taiwan); Chien-Wei Wu (National Tsing Hua University, Taiwan); Wei-Ren Lin (Feng Chia University, Taiwan)

A Creep Model For Pressure Sensitive Adhesives Under Shear Load

Abhishek Deshpande (University of Maryland, USA); Zhichao Song (Google Inc, USA); Swanand Vaidya (GOOGLE LLC, USA)

On the Coverage Probability of Bias-Corrected Confidence Bounds

Tamer Tevetoglu (University of Stuttgart, Germany); Bernd Bertsche (Institute of Machine Components - University of Stuttgart, Germany)

Machine learning approaches in reliability and maintenance

Shaomin Wu (Room 308, Kent Business School & University of Kent, United Kingdom (Great Britain)); Di Wu (School of Management, Xi'an Jiaotong University, China); Rui Peng (Beijing University of Technology, China)

Regular Session #6 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #7: Nonstationary signal processing

https://meeting.tencent.com/s/Ru0AFmOz2akB

Chairs: Zhipeng Feng (University of Science and Technology Beijing, China), Ramin Moghaddass (University of Miami, USA)

Normalization of Gearbox Vibration Signal for Tracking Tooth Crack Severity Progression Under Time-Varying Operating Conditions

Xingkai Yang, Ming Jian Zuo and Zhigang (Will) Tian (University of Alberta, Canada)

Varying Speed Bearing Fault Diagnosis Based on Synchroextracting Transform and Deep Residual Network

Jie Shang and Tian Ran Lin (Qingdao University of Technology, China)

A Fault Classification Method for Rotor under Fluctuating Condition based on COTHS-CNN

Changjie Yue (University of Electronic Science and Technology of China(UESTC), China); KeSheng Wang (University of Electronic Science and Technology of China, China)

Matching time-frequency enhancement and its application to bearing fault diagnosis under time-varying speed conditions

Zehui Hua, Juanjuan Shi, Xingxing Jiang and Zhongkui Zhu (Soochow University, China)

Fault Diagnosis of Planetary Gearbox under Nonstationary Conditions Based on the Velocity Synchronous Chirplet Transform

Yunpeng Guan (University of Science & Technology Beijing, China); Zhipeng Feng (University of Science and Technology Beijing, China)

Synchrosqueezing transform based general linear chirplet transform of instantaneous rotational frequency estimation for rotating machines with speed variations

Yi Liu (Guilin University of Electronic Technology); Zhansi Jiang (Guilin University of Electronic Technology, China); Gang Wang and Jiawei Xiang (Wenzhou University, China)

Regular Session #7 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Friday, August 21 17:00 - 18:00 (America/Vancouver)

Keynote Speech #3: An Analytic Tool Box for Optimizing CBM Decisions

https://zoom.us/j/92493246918

Prof. Andrew Jardine

Chair: Tadashi Dohi (Hiroshima University, Japan)

Keynote Speech #3 by Prof. Andrew Jardine Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Friday, August 21 18:00 - 19:00 (America/Vancouver)

Keynote Speech #4: Condition Monitoring and Fault Diagnosis of Technical Processes for Reliability Enhancement with Applications to Nuclear Power Plants

https://zoom.us/j/92493246918

Prof. Jing Jiang

Chair: Tadashi Dohi (Hiroshima University, Japan)

Keynote Speech #4 by Prof. Jing Jiang Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Friday, August 21 19:10 - 21:10 (America/Vancouver)

Invited Session #10: Reliability modelling and optimal configuration of complex systems

https://zoom.us/j/99793633698

Chairs: Hansi Jiang (SAS Institute, USA), Rui Peng (Beijing University of Technology, China)

Imperfect Maintenance Scheduling for High Pressure Feedwater Heater System in Nuclear Power Plant

Mengyu Du, Chen Zhang, Taotao Zhou and Yan-Fu Li (Tsinghua University, China)

Degradation Assessment and Remaining Useful Life Prognostics of Centrifugal Pump Using Multi-Sensor Process Monitoring

Taotao Zhou and Yan-Fu Li (Tsinghua University, China)

Prediction of Software Fault Detection and Correction Processes with Time Series Analysis

Rui Peng and Yingchun Li (Beijing University of Technology, China); Kaiye Gao (Beijing Information Science and Technology, China); Ye Ma (Beijing University of Technology, China)

Cascading Failures of Overload Behaviors on Interdependent Networks

Ziyang Jin and Ning Wang (Chang'an University, China); Jiao Zhao (Chang'an University, China)

Modelling of Inspection Cycles for Power Distribution Transformers

Sathishkumar Nachimuthu and Ming Jian Zuo (University of Alberta, Canada); Stephen Seewald, Jebb Richard and Connor Thicke (EPCOR Distribution and Transmission Inc., Canada)

Research on the Technology to Build Safety Integration Model of Complex System Based on Relevant Failure

Nie Guojian (Electronic Product Reliability and Environmental Testing Research Institute, China); Hongqi Yang (China Electronic Product Reliability and Environmental Testing Research Institute & CEPREI Industrial Design Center for Quality and Reliability of Indutrial Product, China); Yong Pan, Yujie Liu and Zhe Lai (CEPREI, China)

Invited Session #10 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #1: Advanced machine learning techniques

https://meeting.tencent.com/s/PE7I9zMSSSWW

Chairs: Chao Liu (Tsinghua University, China), KeSheng Wang (University of Electronic Science and Technology of China, China)

Aero-engine Life Limit Parts Replacement Policy Optimization: Reinforcement Learning Method

Lin Lin and Jie Liu (Harbin Institute of Technology, China); Jinshan Liu (China Aerospace Science and Technology Corporation, China); Shisheng Zhong and Feng Guo (Harbin Institute of Technology, China)

A comparison study on the different SNR levels to the accuracy of two deep learning techniques in fault diagnosis of planetary gearbox

Ruiyuan Wang and KeSheng Wang (University of Electronic Science and Technology of China, China)

A Novel Anomaly Detection Method for Gas Turbines Using Weight Agnostic Neural Network Search

Shisheng Zhong, Dan Liu and Lin Lin (Harbin Institute of Technology, China); Minghang Zhao and Xuyun Fu (Harbin Institute of Technology at Weihai, China); Feng Guo (Harbin Institute of Technology, China)

Bearing Fault Diagnosis Based on Extreme Machine Learning Optimized by Differential Evolution

Yongtao Hu (Henan Institute of Technology, China); Jinfeng Gao (Zhengzhou University, China); Qiang Zhou (Henan Weihua Heavy Machinery Co., Ltd, China); Xiaoyu Chen (Henan Institute of Technology, China)

A two-stage algorithm of railway sleeper crack detection based on edge detection and CNN
Gang Wang (Wenzhou University, China); Yi Liu (Guilin University of Electronic Technology); Jiawei Xiang (Wenzhou University, China)

Unsupervised Fault Diagnosis of Machine via Multiple-Order Graphical Deep Extreme Learning Machine
Xiaoli Zhao (the University of British Columbia, Canada); Zheng Liu (University of British Columbia Okanagan, Canada); Teng Wang (the University of British Columbia, Canada); Junchi Bin (University of British Columbia, Okanagan, Canada); Minping Jia (Southeast University, China)

Regular Session #1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #10: Rotating machinery diagnostics

https://zoom.us/j/92493246918
Chairs: Guoliang LU (Shandong University, China), Zhigang (Will) Tian (University of Alberta, Canada)

Use of Autoregressive Conditional Heteroskedasticity Model to Assess Gear Tooth Surface Roughness
Yuejian Chen (University of Alberta, Canada); Ke Feng (University of New South Wales, Australia); Robert Randall (University of South Wales, Australia); Pietro Borghesani (University of New South Wales, Australia); Ming Jian Zuo (University of Alberta, Canada)

Hierarchical Graph Model Based Approach for Change Detection in Bearing Degradation Process
Shaohua Yang, Zhenjie Zhu and Guoliang LU (Shandong University, China)

Study on A Special Category of FM Signals with Applications to Planetary Gearbox Fault Diagnosis Under Non-stationary Conditions
Peng Zhou (Shanghai Jiao Tong University, China); Zhike Peng (Shanghai Jiaotong University, China); Zhigang (Will) Tian and Ming Jian Zuo (University of Alberta, Canada)

Dynamic Modeling of Spur Gear with Spalling Fault Considering Manufacture Pitch Error
Qiuyuan Chen, Liming Wang, Yimin Shao, Xiaoxi Ding and Guorong Long (Chongqing University, China)

Vibration mechanism of gear system with angular misalignment error based on an improved meshing stiffness calculation method
Guorong Long, Liming Wang, Yimin Shao and Qiuyuan Chen (Chongqing University, China)

A Fault Feature Extraction Method for Rolling Bearing Based on Intrinsic Time-Scale Decomposition and AR Minimum Entropy Deconvolution
Jiakai Ding and Dongming Xiao (School of Mechanical Engineering, Hunan University of Science and Technology & School of Mechatronics Engineering, Foshan University, China); Liangpei Huang (School of Mechanical Engineering, Hunan University of Science and Technology, China)

Regular Session #10 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #2: Asset reliability analysis

https://zoom.us/j/95536125725
Chairs: Zhiqiang Cai (Northwestern Polytechnical University, China), Lin Zhu (Lam Research Corporation, USA)

Positioning Accuracy and Reliability Analysis of Rigid-Flexible Coupling Model of Six-DOF Manipulator
Jianmin Li, Ling Hu and Liyan Wang (Zhejiang Sci-Tech University, China); Jun Pan (Teacher, China); Huanguo Chen (Zhejiang Sci-tech University, China); Hongfei Zu (Zhejiang Sci-Tech University, China)

Reliability assessment of corroded pipeline considering multiple defects interaction based on an artificial neural network method
Han Zhang and Zhigang (Will) Tian (University of Alberta, Canada)

Lindley Type Distributions and Software Reliability Assessment
Qi Xiao, Tadashi Dohi and Hiroyuki Okamura (Hiroshima University, Japan)

Reliability Analysis of Manufacturing Machine with Degradation and Low-quality Feedstocks
Zhenggeng Ye and Zhiqiang Cai (Northwestern Polytechnical University, China); Hui Yang (Pennsylvania State University, USA)

Reliability Analysis of Position Accuracy of Welding Robot
Wenxue Qian, Shuai Song and Changhui Yao (Northeastern University, China); Xiaowei Yin (Shenyang Institute of Engineering, China)

Reliability Analysis of Vacuum Circuit Breakers with Multiple Failure Modes

Will C Wascom (Texas Tech University & NASA Ames, USA); Yisha Xiang (Texas Tech University, USA)

Regular Session #2 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #3: Degradation analysis

https://meeting.tencent.com/s/Ru0AFmOz2akB
Chairs: Zhiliang Liu (University of Electronic Science and Technology of China, China), Tieling Zhang (University of Wollongong, Australia)

Quantitative Method of Health State Assessment Inside the Safe Region
Yuhua Yin and Zhiliang Liu (University of Electronic Science and Technology of China, China); Zhe Cheng (National University of Defense Technology, China)

A Review of State-of-health Estimation of Lithium-ion Batteries: Experiments and Data
Ruomei Zhou, Shasha Fu and Weiwen Peng (Sun Yat-sen University, China)

A Particle-Filter-Based Online Method for Degradation Analysis with Exponential-Dispersion Process
Ricong Huang and Weiwen Peng (Sun Yat-sen University, China)

Bayesian-based Method for the Remaining useful life and reliability prediction of steel structure
Teng Wang (the University of British Columbia, Canada); Zheng Liu (University of British Columbia Okanagan, Canada); Xiaoli Zhao (the University of British Columbia, Canada); Min Liao (National Research Council Canada, Canada); Nezih Mrad (NRC, USA)

Life prediction for the tractor of an elevator based on the sliding displacement
Yimin Wei (Zhejiang Sci-Tech University, China); Jun Pan (Teacher, China); Tong Li and Meide Wang (Zhejiang Sci-Tech University, China); Bin Feng (Hangzhou Youmai Tech Co Ltd, China); Yonglei Dai (Zhejiang Academy of Special Equipment Science, China)

Energy Pipeline Degradation Modeling
Wenxu Li, Richard Dwight and Tieling Zhang (University of Wollongong, Australia)

Regular Session #3 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Saturday, August 22

Saturday, August 22 6:00 - 7:00 (America/Vancouver)

Tutorial #1: Building Multicriteria Decision Models for Risk, Reliability, and Maintenance Decision Analysis

https://zoom.us/j/92493246918
Profs. Cristiano Cavalcante and Alexandre Alberti

Chair: Steven Li (Western New England University, USA)

Tutorial #1 by Profs. Cristiano Cavalcante and Alexandre Alberti Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Saturday, August 22 7:00 - 8:00 (America/Vancouver)

Tutorial #2: History of System Reliability Optimization

https://zoom.us/j/92493246918
Prof. David Coit

Chair: Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Tutorial #2 by Prof. David Coit Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Tutorial #3: Machine Learning in Data-Driven Prognostics and Health Management (PHM) for Condition-based and Predictive Maintenance

https://zoom.us/j/99793633698

Prof. Enrico Zio

Chair: Yuan Tao (Ohio Univ, USA)

Tutorial #3 by Prof. Enrico Zio Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Saturday, August 22 17:00 - 18:00 (America/Vancouver)

Tutorial #4: Mechanical Applications of Cepstrum Analysis in Machine and Structural Health Monitoring

https://zoom.us/j/92493246918
Prof. Robert Randall

Chair: Ming Jian Zuo (University of Alberta, Canada)

Tutorial #4 by Prof. Robert Randall Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Tutorial #5: Design a Practical and Effective Reliability Test

https://zoom.us/j/99793633698
Dr. Harry Guo

Chair: Jak-Hak Lim (Hanbat National University, Korea (South))

Tutorial #5 by Dr. Harry Guo Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Saturday, August 22 18:00 - 19:00 (America/Vancouver)

Panel: Autonomous Vehicles

https://zoom.us/j/99793633698
Prof. Eric Wong

Chair: Steven Li (Western New England University, USA)

Panel on Autonomous Vehicles Organized by Prof. Eric Wong Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Tutorial #6: Past, Present and Future Directions and Advances in Reliability

https://zoom.us/j/92493246918
Prof. Kailash Kapur

Chair: Suk Joo Bae (Hanyang University, Korea (South))

Tutorial #6 by Prof. Kailash Kapur Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Saturday, August 22 19:10 - 20:30 (America/Vancouver)

Invited Session #12.1: System reliability and maintenance modeling

https://zoom.us/j/99793633698
Chairs: Tongdan Jin (Texas State University, USA), Zhigang (Will) Tian (University of Alberta, Canada)

Joint optimization of maintenance and production scheduling for unrelated parallel-machine system
Mageed Ghaleb, Sharareh Taghipour and Hossein Zolfagharinia (Ryerson University, Canada)

Variance of Reliability Estimate for K-Out-Of-N System with Cold Standby Units
Tongdan Jin (Texas State University, USA); Jose Espiritu and Heidi Taboada (The University of Texas at El Paso, USA)

Maintenance Decision Making using State Dependent Markov Analysis with Failure Couplings
Xinyang Liu and Pingfeng Wang (University of Illinois at Urbana Champaign, USA)

Optimal Maintenance Policies for degrading hydrocarbon pipelines using Markov Decision Process
Yisha Xiang and Eric Bediako (Texas Tech University, USA); Suzan Alaswad (Zayed University, United Arab Emirates); Zhigang (Will) Tian (University of Alberta, Canada)

Invited Session #12.1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #8.1: New models and approaches for the reliability & quality

https://zoom.us/j/92493246918

Chairs: Hisashi Yamamoto (Tokyo Metropolitan University, Japan), Xufeng Zhao (Nanjing University of Aeronautics and Astronautics, China)

Periodic and Sequential Inspection Policies with Mission Failure Probabilities
Xufeng Zhao (Nanjing University of Aeronautics and Astronautics, China); Xujie Jia (Minzu University of China, China); Mingchih Chen (Fu Jen Catholic University, Taiwan); Cunhua Qian (Nanjing Tech University, China); Toshio Nakagawa (Aichi Institute of Technology, Japan)

Algorithm for Finding the Optimal Arrangement of Consecutive-k-out-of-n:F Systems with Multiple Types of Components
Taishin Nakamura (Tokai University, Japan); Sawa Murata and Hisashi Yamamoto (Tokyo Metropolitan University, Japan)

A Simulation Study on Resilience of Systems with Simultaneous Failures
Tetsushi Yuge (National Defense Academy, Japan)

A Study on Evaluation of Stability in Process Mean Using Bayesian Updating
Yasuhiko Takemoto (KINDAI University, Japan); Ikuo Arizono (Okayama University, Japan)

Invited Session #8.1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #9.1: Reliability data analysis and decision making

https://meeting.tencent.com/s/Ru0AFmOz2akB

Chairs: Rui Peng (Beijing University of Technology, China), Chi Zhang (Beijing University of Technology, China)

Maintenance of a System with Increasing Energy Consumption Rate
Di Wu (School of Management, Xi'an Jiaotong University, China); Rui Peng and Ye Ma (Beijing University of Technology, China); Li Yang (University of Toronto, Canada)

Reliability of dynamic k-out-of-n systems with coupling components in power transmission systems
Heping Jia (North China Electric Power University, China); Yi Ding (Zhejiang University, China); Liudong Xing (University of Massachusetts, USA); Dunnan Liu (North China Electric Power University, China)

Integrating Protection, Restoration, and Flow Redistribution for Building Resilient Networked Critical Infrastructures
Huaxing Zhu and Su Wu (Tsinghua University, China); Chi Zhang (Beijing University of Technology, China); Raúl Monroy (Tecnologico de Monterrey, Mexico); Jose Ramirez-Marquez (Stevens Institute of Technology, USA)

A New Compound Negative Binomial Distribution and Its Applications in Reliability
Xiaoyue Wang (Beijing Technology and Business University, China); Xian Zhao and Jinglei Sun (Beijing Institute of Technology, China)

Invited Session #9.1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #11.1: Maintenance strategy

https://zoom.us/j/95536125725

Chairs: Alexandre Ramalho Alberti (Universidade Federal de Pernambuco & RANDOM, INCT-INSID, Brazil), Alireza Namdari (Western New England University, USA)

An Alternative Maintenance Policy for Protection Systems Subject to Shocks Due to Demands

Alexandre Ramalho Alberti and Cristiano Alexandre Virgínio Cavalcante (Universidade Federal de Pernambuco & RANDOM, INCT-INSID, Brazil)

Assessment of Maintenance Effectiveness for Repairable Systems: PM and CM Case Studies
Syamsundar Annamraju (Visakhapatnam Steel Plant, India); V. N. Achutha Naikan (Indian Institute of Technology, Kharagpur, India)

Expected Maintenance Actions for Imperfect Production Processes Using a Markovian Approach
Wael I. Al Hajailan and David He (University of Illinois at Chicago, USA)

Optimal Post-Warranty Maintenance Strategy For The Second-Hand Product
Jak-Hak Lim (Hanbat National University, Korea (South)); Dae Kyung Kim (Chonbuk National University, Korea (South)); Dong Ho Park (Hallym University, Korea (South))

Regular Session #11.1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #5.1: Fundamental reliability analysis theory

https://meeting.tencent.com/s/PE7l9zMSSSWW
Chairs: Jian Guo (Lam Research, USA), Liyang Xie (Northeastern University, China)

On Two New Quantum Lifetime Distributions
Kunsong Lin, Jiaxiao Zhu and Yunxia Chen (Beihang University, China)

A sample truncation rule for product reliability estimation with multiple censoring data
Liyang Xie, Jiaxin Song and Ningxiang Wu (Northeastern University, China)

Reliability analysis for competing failure processes with mutual dependence of system under the cumulative shock
Lina Bian and Guanjun Wang (Southeast University, China)

Reliability evaluation based on historical batch information
Wenda Kang, Houbao Xu and Huiling Zheng (Beijing Institute of Technology, China)

Regular Session #5.1 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Saturday, August 22 20:40 - 22:00 (America/Vancouver)

Invited Session #12.2: System reliability and maintenance modeling

https://zoom.us/j/99793633698
Chairs: Yu Liu (University of Electronic Science and Technology of China, China), Lin Zhu (Lam Research Corporation, USA)

A Multi-State k-out-of-n:F Balanced System with a Rebalancing Mechanism
Siqi Wang and Xian Zhao (Beijing Institute of Technology, China); Ming Jian Zuo (University of Alberta, Canada)

Optimal Maintenance Strategy for Second-Hand Product Considering Preventive Maintenance Actions
Minjae Park (Hongik University, Korea (South)); Ki Mun Jung (Kyungsung University, Korea (South)); Dong Ho Park (Hallym University, Korea (South))

Maintenance Optimization of Multi-State Systems with Single Maintenance Capacity and Arbitrarily Distributed Maintenance Time
Yiming Chen, Tao Jiang and Yu Liu (University of Electronic Science and Technology of China, China)

Reliability analysis for competitive failure processes with multi-state degradation
Aiping Jiang and Leqing Huang (Shanghai University, China); Yisha Xiang (Texas Tech University, USA)

Invited Session #12.2 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #8.2: New models and approaches for the reliability & quality

https://zoom.us/j/92493246918
Chairs: Sajad Saraygord Afshari (University of Manitoba, Canada), Xufeng Zhao (Nanjing University of Aeronautics and Astronautics, China)

Optimization Problems for Consecutive-k-out-of-n:G Systems with Exchangeable Components
Lei Zhou, Hisashi Yamamoto and Xiao Xiao (Tokyo Metropolitan University, Japan)

Factor copula modeling of coherent systems with dependent components
Shuhei Ota (Kanagawa University, Japan); Mitsuhiro Kimura (Hosei University, Japan)

Random Replacement Policies for Two Failure Modes

Satoshi Mizutani (Aichi Institute of Technology, Japan); Xufeng Zhao (Nanjing University of Aeronautics and Astronautics, China); Toshio Nakagawa (Aichi Institute of Technology, Japan)

Bi-objective Optimization of Network Reliability by Genetic Algorithm
Natsumi Takahashi (National Defense Academy, Japan); Tomoaki Akiba (Chiba Institute of Technology & Faculty of Social Sysetms Science, Japan); Hisashi Yamamoto (Tokyo Metropolitan University, Japan); Shao-Chin Sung (Aoyama Gakuin University, Japan)

Invited Session #8.2 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #9.2: Reliability data analysis and decision making

https://meeting.tencent.com/s/Ru0AFmOz2akB

Chairs: Liyang Xie (Northeastern University, China), Huimin Wang (University of Electronic Science and Technology of China, China)

A Knowledge Synthesis Method for Weibull Distribution Estimation with Four Right-Censored Life Data
Liyang Xie, Jungang Ren, Jiaxin Song and Ningxiang Wu (Northeastern University, China)

Reliability of a Star Configuration Power Grid System with Performance Sharing
Peng Su and Guanjun Wang (Southeast University, China)

Bayesian Based Data Analysis Method for Reliability Prediction of Electronics
Zheng Lixiang, Yu Di, Nie Guojian, Yang Yun, Lei Ting and Liu Yuke (Electronic Product Reliability and Environmental Testing Research Institute, China)

Invited Session #9.2 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #11.2: Maintenance strategy

https://zoom.us/j/95536125725

Chairs: Guangyu Chen (University of Electronic Science and Technology of China, China), Nobuyuki Tamura (Hosei University, Japan)

Structure of an optimal maintenance policy for a Semi-Markovian deteriorating system with major and minor failures
Nobuyuki Tamura (Hosei University, Japan)

Preventive maintenance optimization for large-scale systems under life cycle cost
Ruiqi Wang, Guangyu Chen and Na Liang (University of Electronic Science and Technology of China, China)

Predictive maintenance framework of the aircraft system based on PHM information
Hongsheng Yan and Hongfu Zuo (Nanjing University of Aeronautics and Astronautics, China); Jianqi Tang and Ronghui Wang (Xiamen Airlines, China); Xiaojun Ma (Science and Technology Commission COMAC, China)

Maintenance task scheduling of wind turbine based on task priority
Longfei Wang (Southeast University, China)

Regular Session #11.2 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #5.2: Fundamental reliability analysis theory

https://meeting.tencent.com/s/PE7l9zMSSSWW

Chairs: Xiaoyang Li (School of Reliability and Systems Engineering, Beihang University, China), Ning-cong Xiao (University of Electronic Science and Technology of China, China)

Adaptive sampling with neural networks for system reliability analysis
Ning-cong Xiao, Hongyou Zhan and Kai Yuan (University of Electronic Science and Technology of China, China)

Belief Reliability Evaluation with Limited Time-to-Failure Data under Uncertain Right Censoring
Wenbin Chen (School of Reliability and Systems Engineering, Beihang University & Science and Technology on Reliability and Environmental Engineering Laboratory, China); Xiaoyang Li and Fangrong Li (School of Reliability and Systems Engineering, Beihang University, China); Rui Kang (BUAA, China)

An effective Kriging-based Approach for System Reliability Analysis with Multiple Failure Modes
Chengning Zhou and Ning-cong Xiao (University of Electronic Science and Technology of China, China); Ming Jian Zuo (University of Alberta, Canada); Wei Gao (University of New South Wales, Australia); Qing Li (University of Electronic Science and Technology of China, China)

Regular Session #5.2 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Sunday, August 23

Sunday, August 23 6:00 - 7:20 (America/Vancouver)

Invited Session #11: Reliability tests and data analysis

https://zoom.us/j/99793633698

Chairs: Alireza Namdari (Western New England University, USA), Yuan Tao (Ohio Univ, USA)

Planning Accelerated Destructive Degradation Test with Block Effects
Jiaxiang Cai and Zhisheng YE (National University of Singapore, Singapore)

Remaining useful life prediction using machine learning
Xiaoyan Zhu and Ping Zhang (University of Chinese Academy of Sciences, China); Min Xie (City University of Hong Kong)

A Differential Burn-in Policy Considering Nonhomogeneous Distribution of Spatial Defects in Semiconductor Manufacturing
Yuan Tao (Ohio Univ, USA); Yuan Chen (Ohio University, USA); Yue Kuo (Texas A&M University, USA)

A Bayesian Model Averaging Method for Software Reliability Assessment
Qiumin Yu (University of Electronic Science and Technology of China, China); Steven Li (Western New England University, USA)

Invited Session #11 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #2: Decision support systems for improving the construction and maintenance of wind farm projects

https://zoom.us/j/92493246918

Chairs: Yuejian Chen (University of Alberta, Canada), Nima Gerami Seresht (University of Alberta, Canada)

Simulation-based approach for risk assessment in onshore wind farm construction projects
Emad Mohamed, Nima Gerami Seresht, Stephen Hague and Simaan AbouRizk (University of Alberta, Canada)

Framework for Risk Identification of Renewable Energy Projects Using Fuzzy Case-Based Reasoning
Sahand Somi, Nima Gerami Seresht and Aminah Robinson Fayek (University of Alberta, Canada)

Wind Turbine Power Output Estimation with Probabilistic Power Curves
Siyun Ge, Ming Jian Zuo and Zhigang (Will) Tian (University of Alberta, Canada)

A PdM framework Through the Event-based Genomics of Machine Breakdown
Morad Danishvar and Alireza Mousavi (Brunel University, United Kingdom (Great Britain)); Veerendra C. Angadi (Brunel University London, United Kingdom (Great Britain))

Invited Session #2 Recording
Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Invited Session #4: Degradation Modeling and Inference

https://meeting.tencent.com/s/PE7I9zMSSSWW

Chairs: Zhiliang Liu (University of Electronic Science and Technology of China, China), Jia Wang (Hebei University of Technology, China)

Optimal design of accelerated life tests for one-shot devices
Chinuk Lee and Suk Joo Bae (Hanyang University, Korea (South))

Optimal design of degradation testing and life testing based on Wiener process models
Zhonghai Ma, Songlin Nie, Fanglong Yin and Hui Ji (Beijing University of Technology, China)

Modeling the degradation-shock dependence with the consideration of system resistance
Jia Wang and Luyu Zhang (Hebei University of Technology, China); Guanghan Bai (National University of Defense Technology, China)

Planning of an Accelerated Degradation Test under Different Constraints of Operating Conditions
I-Chen Lee and Zi-Yu Lin (National Cheng Kung University, Taiwan)

Invited Session #4 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #13: Stability analysis

https://meeting.tencent.com/s/Ru0AFmOz2akB

Chairs: Zhiyuan Wang (Wuhan University, China), Junjun Zheng (Ritsumeikan University, Japan)

A Note on Uncertainty Propagation for Availability Model of Mobile Cloud Computing Systems

Junjun Zheng (Ritsumeikan University, Japan); Jiahao Zhang, Hiroyuki Okamura and Tadashi Dohi (Hiroshima University, Japan)

Stability Analysis of Wireless Powered Communication Networks

Mingfu Li (Chang Gung University, Taiwan); Ching-Chieh Fang (Chang Gung Unicersity, Taiwan); Huei-Wen Ferng (National Taiwan University of Science and Technology, Taiwan)

Structural Robustness-based SHM Point Arrangement Strategy for In-service Cable-stayed Bridge Subjected to Cable Damage Effect

Qiwen Jin (Henan University of Technology, China); Zheng Liu (University of British Columbia Okanagan, Canada)

Effects of flow rate and silt particle on vibration of a double-suction centrifugal pump

Zhiyuan Wang and Zhongdong Qian (Wuhan University, China)

Regular Session #13 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Regular Session #8: Optimization

https://zoom.us/j/95536125725

Chairs: Hiroyuki Okamura (Hiroshima University, Japan), Zhe-George Zhang (Western Washington University, USA)

Optimum replacement last policy for a cumulative damage model

Shey-Huei Sheu (Asia University, Taiwan); Zhe-George Zhang (Western Washington University, USA); Tzu-Hsin Liu (Asia University, Taiwan); Jau-Chuan Ke (National Taichung University of Science and Technology, Taiwan)

Electric Bus Charging Station's Location and Capacity Based on Routes and Grid AP Clustering Algorithm

Fan Yanhong, He Chunhui and Fei Danxiong (Shanghai Fengxian Power Supply Company, National Grid Company, China); Gu Jiu (Shanghai Jiaotong University, China); Da Xie (Shanghai Jiao Tong University, China)

Formulation of Opportunity-Based Age Replacement Models with Markovian Arrival Process

Hiroyuki Okamura (Hiroshima University, Japan); Junjun Zheng (Ritsumeikan University, Japan); Tadashi Dohi (Hiroshima University, Japan)

Inventory Control Optimization via Neural-Nets Based Demand Prediction

Haoyu Wang, Xiaoyu Fan, Yan Zhang, Xiaoyue Du, Bohan Cui and Yingjun Deng (Tianjin University, China)

Regular Session #8 Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Sunday, August 23 7:20 - 8:00 (America/Vancouver)

Conference Closing Ceremony

https://zoom.us/j/92493246918

Chair: Ming Jian Zuo (University of Alberta, Canada)

Conference Closing Ceremony Recording

Liudong Xing (Publications Chair, University of Massachusetts, Dartmouth, USA)

Journal Special Issues/Sections

Six special issues or special sections of journals have been secured for selected papers presented at APARM 2020, August 20-23, Vancouver, Canada (www.aparm2020.org). Authors of selected papers will be invited to submit their papers for possible publication in one of such special issues/sections. All manuscripts submitted to these special issues/sections will be peer-reviewed following the corresponding journal's editorial policy.

1. **Journal: Reliability Engineering and System Safety**
   - Special Issue on Maintenance Modelling
   - Guest Editors: Ming J Zuo, University of Alberta (ming.zuo@ualberta.ca)
     Shaomin Wu, University of Kent (s.m.wu@kent.ac.uk)
   - Author Guidelines: http://www.elsevier.com/journals/reliability-engineering-and-system-safety/0951-8320/guide-for-authors
   - Submission Deadline: November 20, 2020

2. **Journal: Journal of Risk and Reliability**
   - Special Issue on Reliability Analysis
   - Guest Editors: Shaomin Wu, University of Kent (s.m.wu@kent.ac.uk)
     Rui Peng, Beijing University of Technology (pengrui1988@bjut.edu.cn)
     Mahmood Shafiee, Cranfield University (m.shafiee@cranfield.ac.uk)
   - Author Guidelines: http://uk.sagepub.com/en-gb/eur/proceedings-of-the-institution-of-mechanical-engineers-part-o-journal-of-risk-and-reliability#submission-guidelines
   - Submission Deadline: November 20, 2020

3. **Journal: Measurement Science and Technology**
   - Special Feature on Rotating Machinery Condition Monitoring by Connecting Physics-Based and Data-Driven Methods
   - Guest Editors: Yaguo Lei, Xi'an Jiaotong University (yaguolei@mail.xjtu.edu.cn)
     Xihui Liang, University of Manitoba (Xihui.Liang@umanitoba.ca)
     Fakher Chaari, National School of Engineers of Sfax (fakher.chaari@gmail.com)
   - Author Guidelines: https://iopscience.iop.org/journal/0957-0233/page/Information%20for%20authors%20and%20referees
   - Submission Deadline: October 31, 2020

4. **Journal: IEEE Transactions on Reliability**
   - Special Section on Dynamic Reliability Analysis of Complex Structural and Mechanical Systems
   - Guest Editors: Ming J. Zuo, University of Alberta (ming.zuo@ualberta.ca)
     Zhaojun Li, Western New England University (zhaojun.li@wne.edu)
     Xihui Liang, University of Manitoba (Xihui.Liang@umanitoba.ca)
     Sajad Afshari, University of Manitoba (Sajad.SaraygordAfshari@umanitoba.ca)

- Author Guidelines: https://rs.ieee.org/publications/transactions-on-reliability.html
- Submission Deadline: 31 December 2020

5. Journal: Quality and Reliability Engineering International

- Special Issue on Degradation Modeling and Prognostics
- Guest Editors: May Feng, University of Houston (qfeng@Central.UH.EDU)
  Zhigang Tian, University of Alberta (ztian@ualberta.ca)
- Author Guidelines:
  https://onlinelibrary.wiley.com/page/journal/10991638/homepage/forauthors.html
- Submission Deadline: November 20, 2020

6. Journal: Sustainability (ISSN 2071-1050)

- Special Issue on Decision Support Systems for Improving the Construction and Maintenance of Renewable Energy Projects (Papers submitted to this special issue based on papers presented at APARM 2020 will enjoy a 20% discount of the Article Processing Charge)
- Guest Editors: Aminah Robinson Fayek, University of Alberta (aminah@ualberta.ca),
  Nima Gerami Seresht, University of Alberta (nima.gerami@ualberta.ca)
- Website for Special Issue:
  https://www.mdpi.com/journal/sustainability/special_issues/decision_support_systems_renewable_energy_projects
- Submission Deadline: November 20, 2020

UNIVERSITY OF ALBERTA

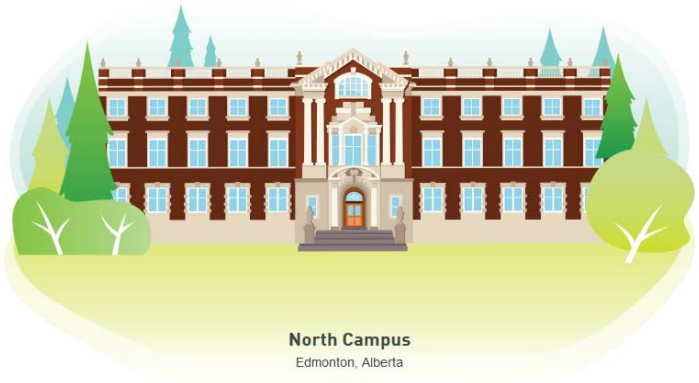
Prospective Students | Current Students | Faculty & Staff | Alumni & Friends

About Us

The University of Alberta in Edmonton is one of Canada's top teaching and research universities, with an international reputation for excellence across the humanities, sciences, creative arts, business, engineering and health sciences.

"...knowledge shall not be the concern of scholars alone. The uplifting of the whole people shall be its final goal." - Henry Marshall Tory, Founding President

Our Campuses



The University of Alberta has 18 faculties on five campuses-four in Edmonton, one in Camrose. North Campus has 150 buildings covering 50 city blocks nestled on the edge of the North Saskatchewan River. Campus Saint-Jean is a French-language campus, a one-of-a kind gem in the heart of Edmonton's francophone community. Augustana is a historic campus in a vibrant rural community with an intimate residential learning environment. South Campus contains extensive land for agricultural research and is home to several recreational facilities. Enterprise Square forms a hub in Edmonton's downtown for learners at all stages of life and for entrepreneurs creating businesses out of new research.

Motto

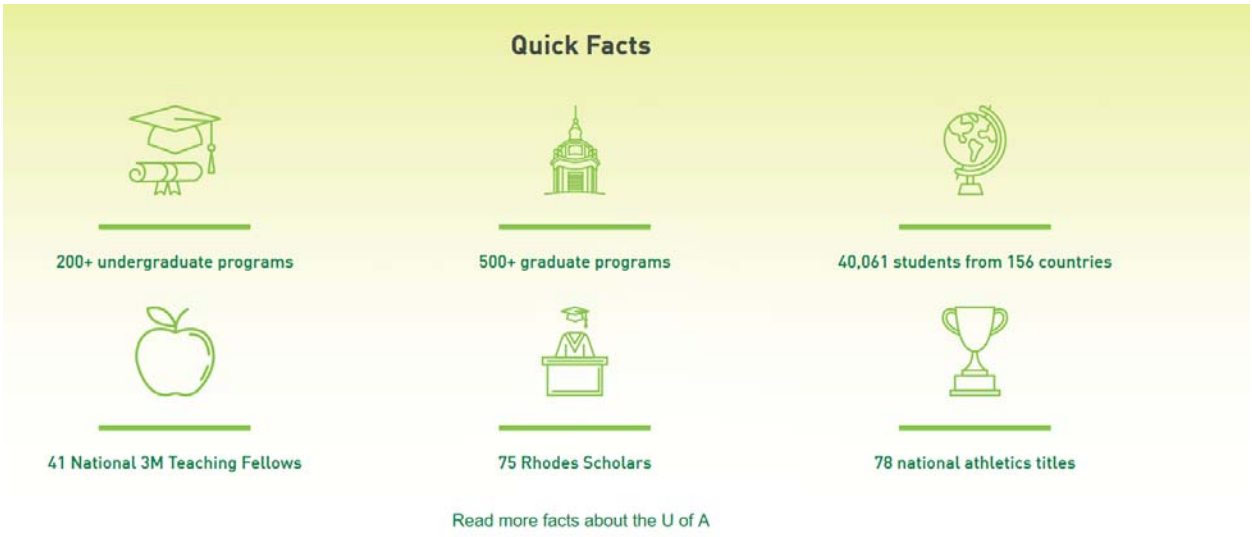
Quaecumque vera means "whatsoever things are true." The phrase comes from the Epistle of St. Paul to the Philippians, Chapter 4, Verse 8, in the Latin Vulgate version of the Bible. In the passage, the writer exhorts the readers to focus their thoughts on truth and other virtues.

Mission

Within a vibrant and supportive learning environment, the University of Alberta discovers, disseminates and applies new knowledge through teaching and learning, research and creative activity, community involvement and partnerships. The U of A gives a national and international voice to innovation in our province, taking a lead role in placing Canada at the global forefront.

Vision

To inspire the human spirit through outstanding achievements in learning, discovery and citizenship in a creative community, building one of the world's great universities for the public good.



Rankings

The U of A is one of the world's top research universities — fourth in Canada and eighty-first in the world for research impact. From making discoveries that answer fundamental questions to building new businesses and industries, to improving human health and fostering social change, our researchers are at the forefront of advancing knowledge for the benefit of all. Learn more about where we rank.

Student Opportunities

The University of Alberta offers hundreds of options for students to expand their education and experience beyond their courses.

Student Groups

More than 425 student groups provide students with opportunities to pursue academic, cultural, recreational and political interests. Students also participate in university governance as part of the Students' Union and the Graduate Students' Association.

Study Abroad

The U of A gives students opportunities to study at dozens of partner institutions around the world. Exchanges are also available with fellow members of the Worldwide Universities Network, a consortium of 23 top research universities.

Undergraduate Research Opportunities

The Undergraduate Research Initiative provides funding to undergraduate students to pursue research and creative activities. Since it opened in 2011, the initiative has supported 410 projects with $5,000 stipends.

Community Service Learning

In the Community Service-Learning Program, students gain hands-on experiences and draw real-life connections to social issues while giving back to their community. Since launching 12 years ago, the program has seen a 900 per cent increase in enrolment and a fourfold increase in community partners.

Employability

Benefiting from multiple internship and work experience programs as well as job shadowing and career mentoring opportunities, U of A graduates rank #2 in Canada for employment rate.

Research & Innovation

The pursuit of truth drives the work done at the University of Alberta. By asking why, what and how, our researchers push the boundaries of knowledge. They make discoveries that improve our lives, and the world. They help shape our future. Using some of world's most advanced research facilities, equipment and resources, our researchers have discovered new knowledge in health and life sciences, energy, artificial intelligence and much more. Learn more about our research.

Top 5
Research university in Canada

91
Canada Research Chairs

$500+M
Annual research funding 2019

130+
Active Spinoffs

Distinctively U of A

The University of Alberta is located in one of the northernmost major cities in the world. Edmonton is a city with one million residents and one of Canada's strongest local economies. Like the university, Edmonton is a place where people come together to build, create and change things for the better. It is a place where good ideas have a strong chance to become reality.

The Faculty of Native Studies, the only faculty of its kind in Canada, provides undergraduate programs specializing in the study of Aboriginal experiences and issues of language, culture, land and resources.

The U of A Libraries is Canada's second-largest research library containing more than 4.7 million titles, 8.7 million volumes, 1.3 million e-books and 1,700 databases.

The Peter Lougheed Leadership College offers students an inclusive, interdisciplinary undergraduate leadership development program. Students gain real-world advice from established professionals in their specific industries or subject areas.

Sustainability

The University of Alberta has been one of Canada's greenest employers for the past 12 years. The university is committed to sustainability in every aspect. Its working groups develop solutions and pilot ideas to advance sustainability on campus. The university's Sustainability Plan outlines the strategic goals, initiatives and practices that encourage sustainability.

Alumni

Our founders challenged students to think beyond themselves, to act and to uplift the whole people. Today, more than 290,000 alumni in 140 countries carry on this spirit as community and business leaders. They solve problems and take action to change lives. Collectively our alumni have founded more than 70,000 organizations globally, one-third of which are non-profit or have a cultural, environmental or social mission. "Do Great Things" continues to be both the challenge and the promise of all U of A alumni.

Governance & Administration

The University of Alberta has a bi-cameral governance structure, as set out in the Alberta Post-secondary Learning Act. The Board of Governors has authority for board governance and the General Faculties Council (GFC) has authority for academic governance. The Board of Governors consists of a chairman appointed by the Lieutenant-Governor in Council, the chancellor, the president and 18 other persons appointed by the Lieutenant-Governor in Council, representing alumni, students, staff and the general public.

The chancellor is the ceremonial, or titular, head of the University of Alberta and is elected by the university's senate to serve a four-year term. The senate of the University of Alberta is an independent body of diverse community leaders and university representatives that fosters and celebrates the achievements of the university.

President

Bill Flanagan is the 14th president and vice-chancellor of the University of Alberta. Under his leadership, the university is embarking on a major program of academic and administrative restructuring guided by the University of Alberta of Tomorrow proposal, his five-year vision for the university.

Chancellor

Peggy Garritty is an independent business owner and strategic communicator who was ATB Financial's chief reputation and brand officer for a decade. She serves on a number of boards, including for the Winspear Centre and the Art Gallery of Alberta, and has worked with a number of municipal and charitable organizations, including as an advisory board member of the Children's Wish Foundation.

Board Chair

Kate Chisholm was appointed chair of the University of Alberta's Board of Governors in 2019. She has served as an energy industry senior executive for twenty years and counselled the boards of private and public companies.

Renowned as China's cradle for the national electronic industry, University of Electronic Science and Technology of China (formerly Chengdu Institute of Radio Engineering) is situated at Chengdu, the city of over a thousand-year-old cultural history in "the land of abundance". In 1956, instructed by Premier Zhou Enlai, UESTC was founded on the basis of the incorporation of electronic divisions of the then three universities including Jiaotong Universities, Nanjing Institute of Technology and South China Institute of Technology. As one of the seven earliest key universities in national defense, UESTC became one of the nation's key universities in 1960. Then, in 1997 it was included as one of the first universities into "Project 211", a project in China for developing 100 first-class universities and a number of key fields of research for the 21st century. In 2001, UESTC was admitted into the nation's Project 985, receiving special support for developing world-class universities and world-famous research-oriented universities. In 2017, the University was selected as one of “Double First-class" universities (Top 36).

Sixty years' efforts and cultivations have witnessed the University's process from sole dependence on electronic information engineering to all-around programs in electronic disciplines, and the University now turns out to be a key multidisciplinary university with electronic science and technology as its nucleus, engineering as its major field and featured the harmonious integration of science, engineering, management and liberal arts, well prepared at the call of the history to come up as a high-level research-oriented university.

In the new century, electronic information science and technology as the lead for modern high-tech development demonstrates a more swift and violent stance. In face of the new chances and challenges, the staff of the University will hold on its notion of "to seek facts and truth, to be noble and ambitious" in the pursuit of excellence and embark on the journey to a more glorious future.

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

CAMPUSES A-Z DIRECTORY SIGN IN Search

ADMISSION PROGRAMS LEARNING COMMUNITY ABOUT RESEARCH

SFU is Canada's most community-engaged research university, with three thriving urban campuses.

In the place where innovative education, cutting-edge research and community outreach intersect, you'll find Simon Fraser University, Canada's leading engaged university.

Born in 1965, SFU has become Canada's leading comprehensive university with vibrant campuses in British Columbia's largest municipalities — Vancouver, Burnaby and Surrey — and deep roots in partner communities throughout the province and around the world.

With eight faculties, SFU offers endless opportunities to our students, faculty and staff, and communities:

Faculty of Applied Sciences, Faculty of Arts and Social Sciences, Beedie School of Business, Faculty of Communication, Art and Technology, Faculty of Education, Faculty of Environment, Faculty of Health Sciences, Faculty of Science.

In addition to critical thinking and research skills, SFU helps students to gain the practical experience, social aptitudes and civic understanding not only to be job-ready, but also to be life-ready.

SFU is committed to becoming a world leader in knowledge mobilization, renowned for its capacity to disseminate knowledge and to harness new ideas and innovations for the benefit of society.

SFU contributes all its capacities, from people to properties, to develop healthier and more vibrant communities.

IEEE CALL FOR PAPERS

IEEE Reliability Society

Global Reliability & Prognostics and Health Management Conference
2020 Shanghai China

Original papers are being solicited for presentation at the IEEE Global Reliability & Prognostics and Health Management (IEEE GlobalRel & PHM - Shanghai)

The 2020 IEEE Global Reliability and PHM Conference will be held in Shanghai, China, on October 16-18, 2020. PHM is a wide-ranging, interdisciplinary field, that requires an energized exchange of ideas. This conference will match-up world-class expertise in the academic, engineering, and management disciplines to create synergistic exchanges of ideas and practices. Special attention has been paid to assure a sociable and professional atmosphere to encourage networking, forge new relationships, and deepen existing ones.

Authors are invited to submit papers of relevance to the IEEE PHM Conference. PHM topics and applications include but are not limited to:

- ☐ Energy Systems
- ☐ Electronics Prognostics
- ☐ Vehicle Health Management
- ☐ Powertrains
- ☐ Battery Health Management
- ☐ Algorithms and Implementation
- ☐ Structures and Materials
- ☐ Economics and PHM
- ☐ Railway Systems
- ☐ Gas Turbines and Rotating Machinery
- ☐ Multimode Systems
- ☐ Aerospace Systems

Important Dates:

Draft Full Paper Due	**June 19, 2020**
Notification of Acceptance	**July 17, 2020**
Final Manuscript Due	**August 7, 2020**
Conference dates	**Oct. 16-18, 2020**

All presented papers that meet IEEE quality standards will be submitted to IEEE Xplore® for publication.

For more information visit the conference website:
https://phm.techconf.org

IEEE Reliability Society

QRS 2020

The 20th IEEE International Conference on
Software Quality, Reliability, and Security

December 11-14, 2020 • Macau, China
https://qrs.techconf.org/

In 2015, the SERE conference (IEEE International Conference on Software Security and Reliability) and the QSIC conference (IEEE International Conference on Quality Software) were combined into a single conference, QRS, with **Q** representing *Quality*, **R** for *Reliability*, and **S** for *Security*, sponsored by the IEEE Reliability Society. This conference provides engineers and scientists from both industry and academia a platform to present their ongoing work, relate their research outcomes and experiences, and discuss the best and most efficient techniques for the development of reliable, secure, and trustworthy systems. It also represents an excellent opportunity for the academic community to become more aware of subject areas critical to the software industry as practitioners bring their needs to the table. The 20th QRS conference will be held from December 11-14 in Macau, China.

Topics of Interest

- Reliability, Security, Availability, and Safety of Software Systems
- Software Testing, Verification, and Validation
- Program Debugging and Comprehension
- Information and Software Quality Assurance
- Fault Tolerance for Software Reliability Improvement
- Modeling, Prediction, Simulation, and Evaluation
- Metrics, Measurements, and Analysis
- Secure and Reliable Storage
- Software Penetration and Protection
- Software Vulnerabilities
- Formal Methods
- Malware Detection and Analysis
- Intrusion Detection and Prevention
- Operating System Security and Reliability
- Mobile and Smartphone Applications
- Internet of Things and Cloud Computing
- Information and Knowledge Management
- Benchmark, Tools, Industrial Applications, and Empirical Studies
- Machine Learning and Deep Learning Models and Systems

Important Dates

- April 10, 2020: Regular and Short papers due
- June 15, 2020: Workshop papers due
- June 15, 2020: Fast Abstracts, Industry Track, and Posters due
- July 1, 2020: Author Notification (Regular and Short)
- July 10, 2020: Author Notification (Workshop, Fast Abstract, Industry Track, and Poster)

Submission

Submit original manuscripts (not published or considered elsewhere) with the following page maximums: twelve pages (regular papers), eight pages (short papers and workshop papers), and two pages (Fast Abstracts Track and Industry Track). Each paper should include a title and the name and affiliation of each author. Except for the Fast Abstracts Track and Industry Track, each submission should also include a 150-word abstract and up to 6 keywords. The format of your submission must follow the guidelines for IEEE conference proceedings. At least one Best Paper Award with a cash prize will be presented. Detailed instructions for paper submission can be found at https://qrs.techconf.org.

Conference Proceedings & Special Section of IEEE Transactions on Reliability

IEEE Computer Society Conference Publishing Services (CPS) will publish the proceedings. Accepted papers will also be submitted for inclusion in the IEEE Xplore and to other abstracting and indexing partners such as the Ei Compendex. *Selected papers of top quality will be published in a special section of IEEE Transactions on Reliability instead of the conference proceedings. This will speed up the journal publication of these papers. There is also a special section of IEEE Access for extended versions of high quality papers from QRS.*

Organizing Committee

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Program Chair	W.K. Chan	City University of Hong Kong

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T.H. Tse	The University of Hong Kong

General Inquiries

For more detailed and updated information, please refer to https://qrs.techconf.org. For paper submission, review, or other questions, please send emails to qrsconference@outlook.com.

CALL FOR PAPERS

The 11th International Conference on Prognostics and System Health Management

Following the successful PHM conferences over the past 10 years, the 11th International Conference on Prognostics and System Health Management will be held in Jinan, China, from October 23 to 25, 2020. This conference will provide a premier interdisciplinary forum on PHM related topics. Papers will be submitted for inclusion into IEEE Xplore as well as other Abstracting and Indexing (A&I) databases. Selected excellent papers will be recommended to some special issues of SCI journals after proper extension. Please feel free to contact the organization committee via email (phm2020@phmic.org) if you have any questions.

Jinan, the capital of Shandong Province on China's east coast, is located in the mid west of Shandong. It is the province's political, economic and cultural center. Jinan is at the juncture of the Beijing-Shanghai and Qingdao-Jinan railways. Nearby to the south is Mount Tai, officially recognized by the United Nations as part of the world's natural and cultural heritage. To the north is the Yellow River, which is called the "cradle of the Chinese nation." As Jinan boasts a number of natural springs amid picturesque scenery, it is known as the "City of Springs".

Important Dates

Draft Full Paper Submission Due:
July 15, 2020 (Extended)

Notification of Draft Paper Acceptance:
July 30, 2020 (Extended)

Final Manuscript Due:
August 15, 2020 (Extended)

Author Registration Deadline:
August 30, 2020 (Extended)

Conference Dates:
October 23-25, 2020

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Mariela Cerrada, U de Los Andes, Venezuela
Hongyong Fu, CAS, China
Yong Qin, Beijing Jiaotong U, China
Yunxia Chen, Beihang U, China
Bin Zhang, U of South Carolina, USA
Yan Su, NUAA, China
Shukun Cao, U of Jinan, China

Topics of Interest

PHM 2020 - Jinan is seeking original papers for presentations at the conference. Researchers and participants from academia, industry, and government organizations are invited to submit papers on the following topics:

Principles

- ❑ Physics of failure
- ❑ Sensors and devices
- ❑ Structural sensing
- ❑ Modeling and simulation
- ❑ Data-driven methods
- ❑ Model-based methods
- ❑ Multi-sensor fusion principles
- ❑ Logic/reasoning techniques
- ❑ Verification, validation, and maturation
- ❑ Benchmarking
- ❑ Affordability aspects and business cases for PHM
- ❑ Standards and methodologies

System Designs & Implementation

- ❑ Requirements development
- ❑ System design & engineering
- ❑ Automated reconfiguration
- ❑ Statistical analysis of uncertainty
- ❑ Component-level PHM
- ❑ Nondestructive evaluation technologies with PHM utilization
- ❑ Decision support & simulation
- ❑ PHM computer-aided engineering technologies/applications
- ❑ Integrated structure/frame health management

Applications

- ❑ PHM within power smart grid technology
- ❑ PHM within distributed, networked & cloud computing
- ❑ PHM for electronics components and systems
- ❑ PHM within innovative aerospace and defense, appliance, medical, electric vehicle, deep drilling, and energy applications
- ❑ Fleet/industrial PHM-based maintenance management
- ❑ Informed logistics
- ❑ Lessons learned from PHM systems design and integration

Call for Special Session Proposal

Proposals for Special Sessions are welcomed. Prospective organizers of special sessions should submit proposals indicating:

- Title of the proposed session;
- Short biography of the organizer with contact information;
- List of at least 5 prospective papers with titles, coauthors, and contact information of corresponding authors;