

# 8<sup>th</sup> International Conference on Through-Life Engineering Services TESConf 2019

## October 27-29, 2019, Cleveland, Ohio

Hosted by Case Western Reserve University

# Program





INSTITUTE FOR SMART, SECURE AND CONNECTED SYSTEMS



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### Welcome to the 8<sup>th</sup> International Conference on Through-Life Engineering Services

## **Greetings from the Conference Chair**



Dear Attendees,

On behalf of the Organizing Committee for the 8<sup>th</sup> International Conference on Through-Life Engineering Services (TESConf 2019), I extend a warm "Welcome" to everyone for joining us in this exciting event, hosted by Case Western Reserve University in the historical City of Cleveland, Ohio, USA.

The TES Conference was initiated in 2012 at the Cranfield University in UK, with a focus on condition monitoring, diagnostics, prognostics, and maintenance of reliability-critical and technology-intensive high value products. The Conference

has been hosted by the Cranfield University six times over the past 7 years, except for 2017, when it was held at the University of Bremen, Germany. 2019 marks the first time for the TES Conference to be held outside of Europe. Reflecting the trend of digitalization in manufacturing, the topics of the conference have been expended in recent years, and in particular this year, to include Industry 4.0, Digital Twins, Internet of Things (IoT), big data analytics, etc.

Besides contributed technical papers that make up parallel paper sessions throughout the conference, TESConf 2019 provides a rich set of keynote speeches from four distinguished speakers: **Dr. S. Jack Hu**, Senior Vice President for Academic Affairs and Provost and UGA Foundation Distinguished Professor of Engineering at the University of Georgia, USA, **Dr. Xun Xu**, Professor and Chair of Manufacturing at the University of Auckland, New Zealand, **Dr. Lihui Wang**, Professor and Chair of Sustainable Manufacturing at KTH Royal Institute of Technology, Sweden, and **Dr. I.S. Jawahir**, James F. Hardymon Chair in Manufacturing Systems and Director of Institute for Sustainable Manufacturing (ISM) at the University of Kentucky. Their keynotes cover a broad spectrum of topics that are closely related to the central theme of TESConf 2019: Through-Life Engineering in the era of Digital Manufacturing.

To promote visibility and quality of the conference, a **Best Paper Award** was inaugurated for TESConf 2019. Three candidate papers were selected by the Program Committee as Finalists for the award, based on the outcome of the paper reviews. Final selection of the award winner was made by the Award Committee, which consisted of a group of distinguished scholars.

TESConf 2019 is technically sponsored by the International Academy for Production Engineering (CIRP) and financially sponsored by the Institute for Smart, Secure, and Connected Systems (ISSACS) at the Case Western Reserve University. On behalf of the conference organizers and attendees, I would like to express our sincere appreciation for the sponsorship. I would also like to thank members of the Conference, Program, and Local Organizing Committees, staff in the Mechanical and Aerospace Engineering and Case School of Engineering, and volunteers who give their time to help with the many details related to organizing the conference. It is the dedication and contribution from all these individuals that make this event a memorable one.

Once again, welcome to Cleveland, and enjoy TESConf 2019!

Robert X. Gao, Ph.D. Case Western Reserve University

## Organizers

## **Honorary Chair**

 Prof. Rajkumar Roy Cranfield University, UK Email: r.roy@cranfield.ac.uk

### **Conference Chair & Co-Chair**

- Prof. Robert Gao
  Case Western Reserve University, USA
  Email: <u>Robert.Gao@case.edu</u>
- Dr. John Erkoyuncu Cranfield University, UK Email: <u>j.a.erkoyuncu@cranfield.ac.uk</u>

### **Program Chair & Co-Chair**

- Prof. Kirsten Tracht University of Bremen, Germany Email: <u>kirsten.tracht@uni-bremen.de</u>
- Prof. Ruqiang Yan Xi'an Jiaotong University, China Email: <u>yanruqiang@xjtu.edu.cn</u>

## **Local Organizing Chair**

Dr. Peng Wang
 Case Western Reserve University, USA
 Email: <u>pxw206@case.edu</u>

## **Registration Information**

## **On–Site Registration**

On-site registration will be available during the following hours:

- Sunday, October 27: 3:30 pm 5:00 pm
- Monday, October 28: 7:30 am 5:00 pm
- Tuesday, October 29: 7:30 am 12:30 pm

Registration is mandatory for all conference participants. Badges will be provided to identify registered participants. All registered participants will receive admission to the welcome reception, opening and closing ceremonies, all technical and plenary sessions, all meals, including the conference banquet and award ceremony, and one set of the conference proceedings on a USB flash drive. Registration packets for all advance registrations will be available at the conference registration desk.

### **Registration Fees**

Conference registration fees cover conference materials, admission to all sessions, conference reception, meals, banquet, and breaks. The fees are shown in US dollars.

### **Participant**

| • | Early registration            | \$750 |
|---|-------------------------------|-------|
| • | Regular registration          | \$850 |
| • | On-site registration          | \$900 |
| • | Additional paper registration | \$200 |
| • | Student registration          | \$450 |
|   |                               |       |

### Guest

| • | Early registration   | \$250 |
|---|----------------------|-------|
| • | Regular registration | \$350 |

### Note

- Student registration rate is applicable when accompanied by a full registration.
- Registration fee covers conference proceedings publication, conference materials, reception, refreshments, meals, and banquet dinner.
- Each conference registration covers one accepted paper. Fees apply for each additional paper to be presented.
- A paper without accompanying registration will be removed from the conference presentation.
- Papers presented at TESConf 2019 will be published by Elsevier through <u>Procedia</u> <u>Manufacturing</u>.

## **Conference Overview**

| TESConf 2019: Conference-at-a-Glance |                      |                             |                             |  |
|--------------------------------------|----------------------|-----------------------------|-----------------------------|--|
| Time                                 | Sunday, October 27   | Monday, October 28          | Tuesday, October 29         |  |
| 7:30-8:30                            |                      | Breakfast                   | Breakfast                   |  |
| 8:30-9:00                            |                      | Opening Session             | Update                      |  |
| 9:00-9:45                            |                      | Keynote 1                   | Keynote 3                   |  |
| 9:45-10:00                           |                      | Break                       | Break                       |  |
| 10:00-10:45                          |                      | Keynote 2                   | Keynote 4                   |  |
| 10:45-11:00                          |                      | Break                       | Break                       |  |
| 11:00-12:30                          |                      | Parallel Technical Sessions | Parallel Technical Sessions |  |
| 12:30-13:30                          |                      | Lunch                       | Lunch                       |  |
| 13:30-15:00                          |                      | Parallel Technical Sessions | Parallel Technical Sessions |  |
| 15:00-15:30                          |                      | Break                       | Closing Ceremony            |  |
| 15:30-17:00                          | On-site Registration | Parallel Technical Sessions |                             |  |
| 18:30                                | Welcome Reception    | Banquet                     |                             |  |

## **Conference Venue**

### Tinkham Veale University Center Cleveland



The conference will be held at the Tinkham Veale University Center in Cleveland, Ohio, which is located 7.5 km east of Downtown Cleveland. Opened in August 2014, the 82,000square-foot facility is distinguishable on two levels — physically for iconic architecture and philosophically for campus unification. Designed to foster a culture of inclusion, it

satisfies the needs from student, faculty, and the community.

Physically, three wings hug the ground, creating what architect Perkins + Will dubbed a landscraper (not a skyscraper). The panoramic glass façade and sloping green roof make "The Tink" feel like a bridge, not a barrier, between the east and west sides of campus. Philosophically, the Tink pulses with people and ideas from around the university. Designed to foster a culture of inclusion, it draws student, faculty, staff and the community to what they need in its variety of office spaces and common



they need in its variety of office spaces and common areas.

Address: 11038 Bellflower Rd, Cleveland, OH 44106

Tel: +1-216-368-5681

#### Tinkham Veale University Center Location





## **Conference Recommended Hotel**

### Marriott Courtyard Hotel Cleveland at the University Circle



Located right next to the Case Western Reserve University Hospital and Medical Center, this modern hotel is within a 10-minute walk from the Case Western Reserve University campus and an RTA rapid transit train/bus station. Its contemporary-styled rooms offer free WiFi, desks, flat-screen TVs, minifridges and coffeemakers. Suites add separate living areas and microwaves.

Address: 2021 Cornell Rd, Cleveland, OH 44106, USA

Tel: +1-216-791-5678

Reservation Link: Book your group rate for TESConf 2019

Walking from Marriott Courtyard Hotel to Tinkham Veale University Center



## **Keynote Speeches**

### Industrial Internet of Things and Smart, Personalized Manufacturing

## S. Jack Hu, Ph.D.

The University of Georgia

Industrial Internet of Things enables the connection of manufacturing machines, systems and enterprises and the rapid communications of data among them. Such data provide unprecedented opportunities for smart manufacturing, including real-time monitoring and optimal decision making. But the volume, velocity, and variety of data also pose challenges in processing and understanding. This talk will provide an overview of smart manufacturing characteristics and the need for data analytics research for achieving smart manufacturing. In addition, the connection among customers, manufacturers, and suppliers are also creating a new paradigm of personalized manufacturing where customers actively participate in the design and fabrication of products or product components. Research in personalized manufacturing will also be highlighted.



**S. Jack Hu**, Ph.D., is the Senior Vice President for Academic Affairs and Provost, and UGA Foundation Distinguished Professor of Engineering at the University of Georgia. Dr. Hu's teaching and research interest are in manufacturing. He has authored or co-authored nearly 200 peer-reviewed journal articles related to his research in manufacturing systems, assembly and materials joining, and engineering statistics. He holds six patents, co-founded a startup company based on his research, and

worked closely with several industry partners to enhance manufacturing quality and productivity.

Prior to joining the University of Georgia, Hu was the Vice President for Research, the J. Reid and Polly Anderson Professor of Manufacturing at the University of Michigan. He is a member of the National Academy of Engineering and serves as a member of the Executive Committee of the National Academies' Transportation Research Board. He is a Fellow of the American Society of Mechanical Engineers, the Society of Manufacturing Engineers, the International Academy for Production Engineering (CIRP), and a foreign member of the Chinese Academy of Engineering. He is the recipient of several professional awards and best paper awards.

## Cyber-physical-System Technologies for Smart, Connected Products

### Xun Xu, Ph.D.

The University of Auckland

Recent advancement of smart technologies, such as cloud computing, wireless sensor networks, and big data analytics, has empowered us to develop innovative digital solutions to enhance the performance, output, monitoring, and control of engineering products and processes. An underpinning concept is cyber-physical systems (CPS). CPS technologies, e.g. Digital Twins, can be implemented to yield next-generation products that are smart, connected and service-orientated, which may otherwise be known as cyber-physical product-service systems. This talk will provide an overview of CPS technologies with a particular focus on how CPS technologies can be implemented for developing intelligent through-life engineering systems and services. Real-world examples will also be presented.



**Xun Xu,** Ph.D., is the Chair of Manufacturing in the Department of Mechanical Engineering at the University of Auckland. He joined the Department after completing a PhD from the University of Manchester (then UMIST), UK in 1996. He has been working in the field of intelligent manufacturing solutions for some 30 years. Dr. Xu is an internationally recognized expert in smart manufacturing systems, cloud-based manufacturing and IoT enabled manufacturing. He serves as an Associate Editor and member of Editorial Board of a number of international journals and has published over 350 research papers. Dr. Xu is

the founding Director of the University of Auckland "Innovative Manufacturing and Materials" Program, which draws expertise and experts from the Faculties of Engineering, Business and Science of the University. He is the Director of Laboratory for Industry 4.0 Smart Manufacturing Systems (LISMS), the only Laboratory for Industry 4.0 in New Zealand. His current research focus is around the Industry 4.0 technologies, e.g. smart factories, digital twins, cloud manufacturing, Augmented Reality (AR)/Virtual Reality (VR) for manufacturing, big industrial data and data analytics. Dr. Xu is the Fellow of American Society for Mechanical Engineers (ASME) and Engineering New Zealand (EngNZ).

## Combining Digital Twin with Big Data for Improved Through-Life Product Services

## Lihui Wang, Ph.D.

KTH Royal Institute of Technology

Through-life product services depend on the timely acquisition, distribution, monitoring and utilization of usage information from the products across spatial boundaries. These activities can improve accuracy and reliability in utilizing the products and help in maintenance scheduling to bring the products back to normal service conditions. As emerging tools, digital twin and big data analytics provide new opportunities to achieve this objective. This presentation will first present the current status and the latest advancement of Industry 4.0 and AI in general, and digital twin and big data in particular. In order to understand such new technologies and their future potential in through-life engineering services, definitions and characteristics among them will be explained and compared. This talk will then project their future growth enabled by digital twin and big data technologies. Research and applications will also be outlined to highlight the latest advancement in the field. While digital twin and big data show great promise in the future, challenges towards Internet-of-Everything in the areas of future trends remain to be identified in this talk.



Lihui Wang, Ph.D., is a Professor and Chair of Sustainable Manufacturing at KTH Royal Institute of Technology, Sweden. His research interests are focused on cyber-physical systems, cloud manufacturing, real-time monitoring and control, predictive maintenance, human-robot collaborations, adaptive and sustainable manufacturing systems. Professor Wang is actively engaged in various professional activities. He is the Editor-in-Chief of International Journal of Manufacturing Research, Editor-in-Chief of Robotics and Computer-Integrated Manufacturing, and Editor-in-Chief of Journal of Manufacturing Systems. He has published 8 books and authored in

excess of 450 scientific publications. Professor Wang is a Fellow of Canadian Academy of Engineering, CIRP, SME and ASME. He is also a Professional Engineer in Canada, the President-Elect of North American Manufacturing Research Institution of SME, and the Chairman of Swedish Production Academy.

## Through-life and Beyond: Leveraging the Internet of Things (IoT) and Industry 4.0 at Product, Process, and System Levels to Advance Circular Economy

## I.S. Jawahir, Ph.D.

University of Kentucky

With rapid population growth and an increasing global standard of living, the demand for manufactured goods is set to reach unforeseen levels. To support a sustainable and equitable future, it is important to decouple resource consumption from manufacturing output. While the Circular Economy (CE) concept promises to reduce resource consumption, it must advance beyond "end-of-pipe" solutions that heavily focus on recycling and reuse of raw materials. We must aim to leverage all of the 6R elements (*Reduce, Reuse, Recycle, Recover, Redesign, and Remanufacture*) of sustainable manufacturing across the fundamental levels of manufacturing: products, processes, and systems. To achieve this, the Internet of Things (IoT) and Industry 4.0 have a critical role to play in the orchestration and implementation. This presentation shows that IoT can be used to increase the amount of life-cycle information available to manufacturers through the use of a sensor network that collects data across all stages of the product life-cycle (pre-manufacturing, manufacturing, use, and post-use). This presentation investigates the use of IoT across product, process, and system levels to advance the CE and sustainable manufacturing across the manufacturing sector.



**I.S. Jawahir**, Ph.D., is the James F. Hardymon Endowed Chair in Manufacturing Systems and the Founding Director of the Institute for Sustainable Manufacturing (ISM) at the University of Kentucky. Prof. Jawahir's current research activities include sustainable product design and manufacturing processes. His early pioneering work on product and process design for sustainability and sustainable manufacturing processes, focusing on dry, near-dry, also known as MQL, and cryogenic machining/processing of materials, are well-recognized world-wide. He has produced over 400 technical research papers, including over 145 refereed journal papers, and has been awarded with 4 U.S. patents. Prof. Jawahir is a Fellow of CIRP, ASME, and SME. He is the Founding Editor-in-Chief of the International

Journal of Sustainable Manufacturing, and the Technical Editor of the Journal of Machining Science and Technology. Prof. Jawahir founded the CIRP International Conference Series on Modeling of Machining Operations in 1998, the CIRP's International Working Group on Surface Integrity in 2007, and the ASME's Research Committee on Sustainable Products and Processes.

## **Schedule for Presentations**

## Monday, October 28, 2019

#### Keynote Speech 1 (9:00-9:45)

Industrial Internet of Things and Smart, Personalized Manufacturing

#### S. Jack Hu, Ph.D.

Senior Vice President for Academic Affairs and Provost UGA Foundation Distinguished Professor of Engineering The University of Georgia, USA

#### Keynote Speech 2 (10:00-10:45)

## Cyber-physical-System Technologies for Smart, Connected Products

### Xun Xu, Ph.D.

Professor and Chair of Manufacturing Department of Mechanical Engineering The University of Auckland, New Zealand

#### M1: System Design (11:00–12:30)

## Design and Cost Modeling of High Capacity Lithium Ion Batteries for Electric Vehicles through a Techno-Economic Analysis Approach

Fenfen Wang (Case Western Reserve University), Yelin Deng (Soochow University), Chris Yuan (Case Western Reserve University)

#### Numerical Solution of Adsorption Cycle in Ethanol Dehydration Process

D. Guti é rrez-Gonz á leza (National Technological Institute of Mexico), G. Urrea-Garc í aa (National Technological Institute of Mexico), G. Luna-Solanoa (National Technological Institute of Mexico), D. Cant ú -Lozanoa (National Technological Institute of Mexico), J. G ó mez-Rodriguez (National Technological Institute of Mexico)

#### Elementary Systems Design for Urban Production and Through Life Engineering Services

Patrick Rückert (University of Bremen), Kirsten Tracht (University of Bremen), Jens Wulfsberg (Helmut Schmidt University)

#### **Development and Performance Evaluation of a Robot for Lawn Mowing**

Ilesanmi A. Daniyan (Tshwane University of Technology), Vincent Balogun (Edo State University), Adefemi Adeodu (Afe Babalola University), Johnson Kayode (Tshwane University of Technology), Khumbulani Mpofu (Tshwane University of Technology)

#### M2: System Modeling (11:00–12:30)

#### **Dynamic Modeling of Planetary Gear Set with Tooth Surface Wear**

Zhixian Shen (Xi'an Jiaotong University), Baijie Qiao (Xi'an Jiaotong University), Laihao Yang (Xi'an Jiaotong University), Wei Luo (Xi'an Jiaotong University), Ruqiang Yan (Xi'an Jiaotong University), Xuefeng Chen (Xi'an Jiaotong University)

#### Dynamic Modeling of a Planetary Gear System with Sun Gear Crack under Gravity and Carrier-ring Clearance

Xianhua Chen (University of Alberta), Yuejian Chen (University of Alberta), Ming J. Zuo (University of Alberta)

#### **Stamping Process Modelling in an Internet of Production**

Thomas Bergs (RWTH Aachen University), Philipp Niemietz (RWTH Aachen University), Jan Pennekamp (RWTH Aachen University), Ike Kunze (RWTH Aachen University), Daniel Trauth (RWTH Aachen University), Klaus Wehrle (RWTH Aachen University)

#### Enhancing Digital Twin Performance through Simulation of Computerized Numerical Control Firmware

Vladimir Kutscher (Technical University of Darmstadt), Reiner Anderl (Technical University of Darmstadt), Oleg Anokhin (Technical University of Darmstadt)

#### M3: Invited Session I (13:30–15:00)

## First Time Quality Diagnostics and Improvement through Data Analysis: A Study of a Crankshaft Line

Xinyan Ou (Stony Brook University), Jing Huang (University of Virginia), <u>Qing Chang</u> (University of Virginia), Scott Hucker (GM Technical Center, USA), Joseph G Lovasz (GM Technical Center, USA)

#### Machine Learning With Limited Data: Fault Diagnosis of Rolling Bearing Through Parallel Convolutional Neural Network

Mingxuan Liang (University of Connecticut), Pei Cao (University of Connecticut), <u>Jiong Tang</u> (University of Connecticut)

Digital Thread of Adaptive Remanufacturing for High Value Components Yuebin Guo (Rutgers University)

M4: Deep Learning for Diagnosis & Prognosis I (13:30–15:00)

#### Intelligent Fault Diagnosis for Bearing Dataset Using Adversarial Transfer Learning Based on Stacked Auto-Encoder

Jipu Li (South China University of Technology), Ruyi Huang (South China University of Technology), Weihua Li (South China University of Technology)

#### **Remaining Useful Life Prediction Using Deep Learning Approaches: A Review** Youdao Wang (Cranfield University), Yifan Zhao (Cranfield University), Sri Naga Pavan Addepalli (Cranfield University)

#### Multi-scale CNN for Multi-sensor Feature Fusion in Helical Gear Fault Detection Tianfu Li (Xi'an Jiaotong University), Zhibin Zhao (Xi'an Jiaotong University), Chuang Sun (Xi'an Jiaotong University), Ruqiang Yan (Xi'an Jiaotong University), Xuefeng Chen (Xi'an Jiaotong University)

## **Development and Application of a Method for Real Time Motor Fault Detection** Byung Gun Joung (Purdue University), Wo Jae Lee (Purdue University), Aihua Huang (Purdue University), John William Sutherland (Purdue University)

## Monday, October 28, 2019

|   | M5: Sensing and Information Extraction (15:30–17:00)   |
|---|--|
| Vision-Based                              | <b>Vibration Measurement by Sensing Motion of Spider Silk</b>  |
| Zhen Li                                   | iu (Shanghai Jiaotong University), Qingbo He (Shanghai Jiaotong University), Zhike Peng  |
| (Shangha                                  | ai Jiaotong University)  |
| Inspection of                             | <b>Electronic Component Using Pulsed Thermography</b>  |
| Lawrenc                                   | ce Tinsley (Cranfield University), Haochen Liu (Cranfield University), Sri Naga Pavan Addepalli  |
| (Cranfie!                                 | Id University), Wayne Lam (International Tin Association), Yifan Zhao (Cranfield University)   |
| Real-Time Gr                              | rinding Wheel Condition Monitoring Using Linear Imaging Sensor   |
| Taewan                                    | Lee (Oregon State University), Zhaoyan Fan (Oregon State University), Burak Sencer (Oregon   |
| State Un                                  | niversity)   |
| Lifelong Con                              | dition Monitoring Based on NB-IoT for Anomaly Detection of Machinery   |
| <b>Equipr</b>                             | ment   |
| Chenyan                                   | ng Li (Southeast University), Lingfei Mo (Southeast University), Hanru Tang (Southeast   |
| Universi                                  | ity), Ruqiang Yan (Xi'an Jiaotong University)  |
| <b>M6</b>                                 | 6: Deep Learning for Diagnosis & Prognosis II (15:30–17:00)  |
| <b>Ss-InfoGAN f</b>                       | for Class-Imbalance Classification of Bearing Faults   |
| Jingyao                                   | Wu (Xi'an Jiaotong University), Zhibin Zhao (Xi'an Jiaotong University), Chuang Sun (Xi'an   |
| Jiaotong                                  | University), Ruqiang Yan (Xi'an Jiaotong University), Xuefeng Chen (Xi'an Jiaotong   |
| Universi                                  | ity)   |
| Convolutiona                              | I Neural Network-Based Tool Condition Monitoring in Vertical Milling   |
| Operations Us                             | sing Acoustic Emissions  |
| Clayton                                   | Cooper (Case Western Reserve University), Peng Wang (Case Western Reserve University),   |
| Jianjing                                  | Zhang (Case Western Reserve University), Robert Gao (Case Western Reserve University),   |
| Travis R                                  | Roney (Penn State University), Ihab Ragai (Penn State University), Derek Shaffer (Penn State   |
| Universi                                  | ity)   |
| Intelligent Be                            | aring Fault Diagnosis Using Multi-Head Attention-Based CNN   |
| Hui Wa                                    | ng (Southeast University), Jiawen Xu (Southeast University), Ruqiang Yan (Xi'an Jiaotong   |
| Universi                                  | ity), Chuang Sun (Xi'an Jiaotong University), Xuefeng Chen (Xi'an Jiaotong University)   |
| Intelligent Fa<br>Variable Con<br>Weigang | ult Diagnosis Based on Receptive Field of DCNN for Rotary Machine under<br>ditions<br>g Wen (Beijing Jiaotong University), Yihao Bai (Beijing Jiaotong University), Fangquan Hu<br>Jiaotong University), Weidong Cheng (Beijing Jiaotong University) |

## Tuesday, October 29, 2019

#### *Keynote Speech 3* (9:00-9:45)

# Combining Digital Twin with Big Data for Improved Through-Life Product Services Lihui Wang, Ph.D.

Professor and Chair of Sustainable Manufacturing Department of Production Engineering KTH Royal Institute of Technology, Sweden

#### Keynote Speech 4 (10:00-10:45)

## Through-life and Beyond: Leveraging the Internet of Things (IoT) and Industry 4.0 at Product, Process, and System Levels to Advance Circular Economy

#### I. S. Jawahir, Ph.D.

Professor and James F. Hardymon Chair in Manufacturing Systems Department of Mechanical Engineering Director of Institute for Sustainable Manufacturing University of Kentucky, USA

#### **T1: Invited Session II** (11:00–12:30)

#### Real-time Scheduling of Heterogeneous Jobs on Non-stationary and Unreliable Parallel Machines to Minimize Weighted Tardiness

Juxihong Jalaiti, Soundar Kumara (Pennsylvania State University)

#### Impedance Spectroscopy Study on the Two-phase to Three-phase Transformation in Polymer Derived SiC Pyrolyzed at High Temperature

Md Atiqur Rahman Chowdhury (North Carolina State University), Cheryl Xu (North Carolina State University)

An IoT-Enabled Real-Time Logistics System for a Third Party Company: A Case Study Wei Wu (University of Hong Kong), Chunfai Cheung (University of Hong Kong), Lo Sin Yu (University of Hong Kong), <u>Ray Y. Zhong</u> (University of Hong Kong), George Q Huang (University of Hong Kong)

#### **T2:** Condition Monitoring & Fault Diagnosis (11:00–12:30)

**Chatter Identification in Flank Milling of Thin-Walled Blade Based on Fractal Dimension** Yue Zhuo (Harbin Institute of Technology), Hongyu Jin (Harbin Institute of Technology), Zhenyu Han (Harbin Institute of Technology)

#### Health Index Development for a Planetary Gearbox

Weixuan Tang (University of Alberta), Yuejian Chen (University of Alberta), Ming J. Zuo (University of Alberta)

#### Motor Bearing Fault Diagnosis Based on Frequency Conversion Estimation and Order Analysis

Jiahao Niu (Anhui University), Xiaoxian Wang (Anhui University), Siliang Lu (Anhui University), Fang Liu (Anhui University), Yongbin Liu (Anhui University)

#### Rolling Bearing Fault Diagnosis Via STFT and Improved Instantaneous Frequency Estimation Method

Dongdong Liu (Beijing Jiaotong University), Weidong Cheng (Beijing Jiaotong University), Weigang Wen (Beijing Jiaotong University)

#### T3: Supply and Supply Chains (13:30–15:00)

#### A Stackelberg Game-Theory Approach for Maintenance Grouping of Complex Multi-Component System under Smart Product-Service Paradigm

Fengtian Chang (Xi'an Jiaotong University), Guanghui Zhou (Xi'an Jiaotong University), Wei Cheng (Xi'an Jiaotong University), Kai Ding (Chang'an University), Changle Tian (Xi'an Jiaotong University)

#### **Order Classification in Inventory Planning of Job Shop Production**

Alexander Bader (University of Bremen), Julian Kaufmann (University of Bremen), Kirsten Tracht (University of Bremen)

## An Optimisation Framework for Improving Supply Chain Performance: Case Study of a Bespoke Service Provider

Maryam Farsi (Cranfield University), Bailly Adrien (Cranfield University), David Nicolas Bodin (Cranfield University), Victor Penella, Pierre-Ly Pinault (Cranfield University), Thai Thien Nghia Elodie (Cranfield University), Jim Sibson (Babcock International Group), John Erkoyuncu (Cranfield University)

## **Reliable Performance in Critical Asset Introductions: A Comparative Study on Collective Mindfulness**

Jan-jaap Moerman (University of Twente), Jan Braaksma (University of Twente), Leo Van Dongen (University of Twente)

#### T4: Lifecycle Management (13:30–15:00)

#### Hybrid-Additive Manufacturing Cost Model: A Sustainable Through-Life Engineering Support for Maintenance Repair Overhaul in the Aerospace

Moses O. Oyesola (Tshwane University of Technology), Khumbulani Mpofu (Tshwane University of Technology), Ntombi R. Mathe (National Laser Centre), Ilesanmi A. Daniyan (Tshwane University of Technology)

#### Service Data Quality Management Framework to Enable Through-Life Engineering Services

Fernanda Camera (Cranfield University), John Erkoyuncu (Cranfield University), Steve Wilding (BABCOCK International)

#### Ultra-Deepwater Drilling Riser Lifecycle Management System

Shaopeng Liu (GE Research), Judith Guzzo (GE Research), Li Zhang (GE Research), Uttara Kumar (GE Research), Greg J. Myers (Baker Hughes)

#### **Consolidation of Product Lifecycle Information within Human-Robot Collaboration for Assembly of Multi-Variant Products**

Patrick Rueckert (University of Bremen), Kirsten Tracht (University of Bremen), Werner Herfs (RWTH Aachen University), Simon Roggendorf (RWTH Aachen University), Viktor Schubert (Seeburger AG), Marcus Schneider (Seeburger AG)

## **Social Events**

### **Breaks**

Refreshments will be provided from 9:45–10:00, 10:45-11:00 and 15:00–15:30 on Monday, October 28, 9:45–10:00, and 10:45-11:00 on Tuesday, October 29.

### **Welcome Reception**

The welcome reception will take place from 18:30–20:30 on Sunday, October 27.

## **Opening Session**

The Opening Session will take place from 8:30–9:00 on Monday, October 28.

### Meals

All meals are included with your registration fee.

### **Conference Banquet**

The Conference Banquet will take place from 18:30–20:30 on Monday, October 28.

### **Closing Ceremony**

The Closing Ceremony will take place from 15:00–15:30 on Tuesday, October 29. The conference best paper award will be announced at this event.

## **Hosting Institution**



Established in 1826, **Case Western Reserve University** is a private research university located in Cleveland, Ohio. The university is the site of the famous Michelson-Morley interferometer experiment, and is associated with 16 Nobel laureates. Other notable alumni include Paul Buchheit, creator and lead developer of Gmail; Craig Newmark, founder of craigslist.org; Pete Koomen, the co-founder and CTO of Optimizely;

and Peter Tippett, who developed the anti-virus software Vaccine, which Symantec purchased and turned into the popular Norton AntiVirus.

Case Western Reserve University is well known for its medical school, business school, dental school, law school, Frances Payne Bolton School of Nursing, and Case School of Engineering. It is a leading institution for research in biomedical engineering, electrochemistry and electrochemical engineering, macromolecular science and engineering, robotics, thermal and fluid science and engineering, etc. The University is also a member of the Association of American Universities (AAU).

The Case School of Engineering (CSE) offers thirteen degree programs at the undergraduate level, and both Master of Science and Doctor of Philosophy programs at the graduate level. It also offers two specialized degrees at the master's level: a Master of Engineering specifically for practicing engineers, and an integrated Master of Engineering and Management jointly administered with the Weatherhead School of Management. It further offers two dual-degree programs jointly administered with the School of Medicine: a Doctor of Medicine/Master of Science and a Doctor of Philosophy.

#### **Quick Facts about CWRU:**

- Motto: Think Beyond the Possible
- Number of Schools in the University: Eight
- Academic Staff: 3,155
- Undergraduates: 4,661
- Postgraduates: 5,664
- Campus: Urban, 155 acres

## **Local Information**



The **Cleveland metropolitan area**, or **Greater Cleveland**, is the metropolitan area surrounding the city of Cleveland in Northeast Ohio, United States. According to the 2010 Census, the Cleveland-Elyria Metropolitan Statistical Area (MSA) consists of five counties and has a population of over 2 million people, making Greater Cleveland the 29th most populous metropolitan area in the United States and largest metro entirely in Ohio.

Northeast Ohio is home to more than 37% of *Fortune 500* companies, represented through corporate headquarters, major divisions, subsidiaries, sales offices, etc. In addition, more than 150 international companies have a presence in the region. As of 2006, Northeast Ohio serves as the corporate headquarters of 25 Fortune 1,000 firms.

## NOTES

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# Thank You!



# We hope you enjoyed the **TESConf 2019**, and wish you a good trip back home!





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