

# **2020 International Conference on Sensing, Measurement & Data Analytics in the era of Artificial Intelligence (ICSMD 2020)**

**Xi'an, China  
15-17 October 2020**



**IEEE Catalog Number: CFP20X57-POD  
ISBN: 978-1-7281-9278-9**

**Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP20X57-POD
ISBN (Print-On-Demand):	978-1-7281-9278-9
ISBN (Online):	978-1-7281-9277-2

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# Technical Program

## Oral Presentations

Friday, October 16, 2020

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

**Big Data Analytics for Intelligent Sensing and Measurement**

Robert X. Gao, Ph.D.

Cady Staley Professor and Chair  
Department of Mechanical and Aerospace Engineering  
Case Western Reserve University

**Keynote Speech 2 (9:45-10:30)**

**High-speed 3D Optical Sensing, Information Processing, and Applications**

Song Zhang, Ph.D.

Professor and Assistant Head for Experiential Learning  
School of Mechanical Engineering  
Purdue University

---

**10:50-12:30**

**Session 4: Intelligent Sensing, Measurement & Data Analytics for Vehicles**

**Chairs:** Zhongkui Zhu (Soochow University), Zaigang Chen (Southwest Jiaotong University)

**Main Hall**

---

**(10:50-11:10) A Fuzzy Logic-based Method for Proton Exchange Membrane Fuel Cell Fault**

**Diagnosis** .....1

Mengliu Pei (University of Science and Technology of China)

Chen Zhang (University of Science and Technology of China)

Mingruo Hu (Shanghai Jiao Tong University)

Lisa Jackson (Loughborough University)

Lei Mao (University of Science and Technology of China)

**(11:10-11:30) On-line Fault Diagnosis of Proton Exchange Membrane Membrane Fuel Cell**

**Using Polarization Curve** .....7

Shuyou Wu (Wuhan Second Ship Design and Research Institute)

Xu Peng (Wuhan Second Ship Design and Research Institute)

Lei Mao (University of Science and Technology of China)

Ao Liu (Wuhan Second Ship Design and Research Institute)

Liang Dong (Wuhan Second Ship Design and Research Institute)

Tong Wang (Wuhan Second Ship Design and Research Institute)

**(11:30-11:50) Suppression of Low-Frequency Magnetic Interference on Eddy Current**

**Displacement Sensor with Nanometer Resolution** .....11

Chengliang Pan (HeFei University of Technology)

Shupeng Ren (HeFei University of Technology)

Fei Yang (HeFei University of Technology)

Chao Shi (HeFei University of Technology)

Heng Zuo (Nanjing Institute of Astronomical Optics & Technology, Chinese Academy of Sciences)

Zihua Feng (University of Science and Technology of China)

**(11:50-12:10) Vibration Feature of Locomotive Axle Box with a Localized Defect in its Bearing Outer Race .....17**

Yuqing Liu (Southwest Jiaotong University)  
Zaigang Chen (Southwest Jiaotong University)

**(12:00-12:30) Buckling and Postbuckling Analysis Method of Stretchable and Flexible Sensor Networks Based on ABAQUS.....21**

Shuguang Hu (Nanjing University of Aeronautics and Astronautics)  
Yu Wang (Nanjing University of Aeronautics and Astronautics)  
Lei Qiu (Nanjing University of Aeronautics and Astronautics)

**10:50-12:30**

**Session 6: Advanced Sensors and Intelligent Signal Processing Methods for Navigation  
Chairs: Haoqian Huang (Hohai University), Di Liu (Southeast University)  
International Hall**

**(10:50-11:10) Visual Inertial Calibration of Mobile Robotic System Based on Reinforcement Learning .....27**

Wenxing Zhu (Southeast University)  
Lihui Wang (Southeast University)

**(11:10-11:30) Geomagnetic Matching Navigation for Aircraft Based on Improved Iterative Closest Contour Point Algorithm .....33**

Ninghui Xu (Southeast University)  
Lihui Wang (Southeast University)

**(11:30-11:50) An Improved Interacting Multiple Model Algorithm for INS/DVL Integrated Navigation System .....39**

Lanhua Hou (Southeast University)  
Xiaosu Xu (Southeast University)  
Yiqing Yao (Southeast University)  
Di Wang (Southeast University)

**(11:50-12:10) The Implementation and Comparison Between Kalman Filter-based and Vector Tracking Loops .....45**

Zhe Yan (Southeast University)  
Xiyuan Chen (Southeast University)  
Xinhua Tang (Southeast University)  
Xuefen Zhu (Southeast University)

**10:50-12:30**

**Session 12: Intelligent Sensing and High Precision Measurement for Aerospace  
Chairs: Guangcun Shan (Beihang University), Yong Zhang (Xi'an Jiaotong University)  
No.7 Meeting Room**

**(10:50-11:10) Graph Theory Based Localization of Wireless Sensor Networks for Radio Irregularity Cases .....51**

Xiaofeng Ma (Beihang University)  
Ning Yu (Beihang University)  
Tianle Zhou (Beihang University)  
Renjian Feng (Beihang University)  
Yinfeng Wu (Beihang University)

**(11:30-11:50) High Precision Measurement of Dynamic Angular Rate for Turntable in the Calibration Application of Airborne Inertial Sensor .....57**

Xuejun He (Changcheng Institute of Metrology and Measurement)  
Aijun Wang (Changcheng Institute of Metrology and Measurement)  
Tianle Zhou (Beihang University)  
Xuxing Zhao (Beihang University)  
Ning Yu (Beihang University)

**(11:50-12:10) Design Method of the Heating System for Controllable Heating Humidity Sensor .....62**

Chun Hu (Beihang University)  
Dapeng Li (Beihang University)  
Peng Peng (Chongqing Dexin Robot Testing Center Limited Company)  
Dezhi Zheng (Beihang University)

**(12:10-12:30) A Condition-Based Calibration Method for Flight Test Measuring Equipment...69**

Renjian Feng (Beihang University)  
Ruoyan Xing (Beihang University)  
Yinfeng Wu (Beihang University)  
Ning Yu (Beihang University)

**10:50–12:30**

**Session 9: Quartz MEMS Devices and Technologies**

**Chairs:** Jing Ji (Xidian University)

**No.8 Meeting Room**

**(10:50-11:10) Design of the Self-test Structure of QVBA .....74**

Shengshou Lin (Southeast University)  
Jinxing Liang (Southeast University)

**(11:10-11:30) Performance Improvement of Wavelet Noise Reduction Based on New Threshold Function .....80**

Shiqi Yu (Tongji University)  
Yongrui Qin (Xi'an Jiaotong-liverpool University)  
Jiaxin Gao (Tongji University)  
Shiqi Hou (Tongji University)  
Fuyong Lyu (Tongji University )  
Xuefeng Li (Tongji University)

**(11:50-12:10) Optimal Design for New Support Structure of Quartz Resonators.....85**

Jing Ji (Xidian University)  
Meng Zhao (Xidian University)  
Toshitsugu Ueda (Waseda University)

**(12:10-12:30) Behavior Anomaly Detection Fused with Features of Mel Frequency Cepstrum Coefficients.....89**

Fuyong Lyu (Tongji University)  
Zhouhang Yang (Tongji University)  
Lujie Wang (Tongji University)  
Qi Zhou (Tongji University)

Shiqi Hou (Tongji University)  
Xuefeng Li (Tongji University)

**14:00-15:40**

**Session 5: Condition Detection and Evaluation, System Control and Protection, Data Mining of Railway Track-vehicle-grid System**

**Chairs:** Zhigang Liu(Southwest Jiaotong University), Alfredo Núñez(Delft University of Technology)  
**Main Hall**

**(14:00-14:20) Muscle Temperature Sensing and Control with A Wearable Device for Hand Rehabilitation of People After Stroke .....94**

Han Li (Southeast University)  
Jun Zhang (Southeast University)  
Chaojun Jiang (Southeast University)  
Qi Liu (Southeast University)  
Maozeng Zhang (Southeast University)  
Jingsong Zhou (Southeast University)

**(14:20-14:40) Action-driven Reinforcement Learning for Improving Localization of Brace Sleeve in Railway Catenary .....100**

Junping Zhong (Southwest Jiaotong University)  
Zhigang Liu (Southwest Jiaotong University)  
Hongrui Wang (Delft University of Technology)  
Wenqiang Liu (Southwest Jiaotong University)  
Cheng Yang (Southwest Jiaotong University)  
Alfredo Núñez (Delft University of Technology)

**(14:40-15:00) An Automatic Defect Detection Method for Catenary Bracing Wire Components Using Deep Convolutional Neural Networks and Image Processing.....106**

Wenqiang Liu (Southwest Jiaotong University)  
Dan Wang (Southwest Jiaotong University)  
Cheng Yang (Southwest Jiaotong University)  
Yuyang Li (Southwest Jiaotong University)  
Hui Wang (Southwest Jiaotong University)  
Zhigang Liu (Southwest Jiaotong University)

**(15:00-15:20) Pantograph Vibration Interference Signal Recognition Based on SVM Classification .....112**

Yuming Ding (China Academy of Railway Sciences)  
Jun Zhao (China Academy of Railway Sciences Corporation Limited)  
Jinzhaoli Liu (China Academy of Railway Sciences Corporation Limited)  
Wenxuan Zhang (China Academy of Railway Sciences Corporation Limited)  
Xiaodi Xu (China Academy of Railway Sciences Corporation Limited)  
Zhipeng Yang (China Academy of Railway Sciences Corporation Limited)

**(15:20-15:40) Coupling Deep Models and Extreme Value Theory for Open Set Fault Diagnosis .....118**

Xiaolei Yu (Xi'an Jiaotong University)  
Zhibin Zhao (Xi'an Jiaotong University)  
Xingwu Zhang (Xi'an Jiaotong University)

Chuang Sun (Xi'an Jiaotong University)  
Qiyang Zhang (Xi'an Jiaotong University)  
Xuefeng Chen (Xi'an Jiaotong University)

**14:00-15:40**

**Session 6: Advanced Sensors and Intelligent Signal Processing Methods for Navigation**

**Chairs:** Haoqian Huang (Hohai University), Di Liu (Southeast University)

**International Hall**

**(14:00-14:20) A Novel Polarized Light Compass Aided by GPS Module .....124**

Chengshuai Zhao (North University of China)  
Xiaojie Liu (North University of China)  
Chong Shen (North University of China)  
Jun Tang (North University of China)  
Jun Liu (North University of China)

**(14:20-14:40) Structural Design and Simulation Analysis of Silicon Micro Triaxial Wheel-ring Gyroscope.....130**

Huiliang Cao (North University of China)  
Rui Zhao (North University of China)  
Qi Cai (North University of China)  
Yunbo Shi (North University of China)  
Li Liu (Jinzhou 777 Microelectronics Co., Ltd)

**(14:40-15:00) A Novel State Estimation Algorithm Based on Variational Bayesian Method Applied to AUV.....133**

Haoqian Huang (Hohai University)  
Jiacheng Tang (Hohai University)  
Chao Wang (Hohai University)

**(15:00-15:20) A Novel INS/CNS/GNSS Integrated Navigation Algorithm .....137**

Di Liu (Southeast University)  
Xiyuan Chen (Southeast University)  
Xiao Liu (Southeast University)  
Zhe Yan (Southeast University)

**(15:20-15:40) Method for Estimating the Location of A Low-frequency Target in A Shallow Sea Based on A Single Vector Hydrophone.....141**

Xianbin Sun (Qingdao University of Technology)  
Xinming Jia (Qingdao University of Technology)  
Yi Zheng (Shandong Academy of Sciences)  
Zhen Wang (Shandong Academy of Sciences)

**14:00-15:40**

**Session 12: Intelligent Sensing and High Precision Measurement for Aerospace**

**Chairs:** Guangcun Shan (Beihang University), Yong Zhang (Xi'an Jiaotong University)

**No. 7 Meeting Room**

**(14:00-14:20) Development of Photoelectron Emission Yield Measurement System for Metal Material.....148**

Yu Chen (Xi'an Jiaotong University)  
Yan Yang (Xi'an Jiaotong University)

Guorui Huang (Xi'an Jiaotong University)  
Hanzhi Li (Xi'an Jiaotong University)  
Changxi Li (Xi'an Jiaotong University)  
Shuang Wang (Xi'an Jiaotong University)  
Yonghong Cheng (Xi'an Jiaotong University)

**(14:20-14:40) Analysis of Secondary Electron Yield and Energy Spectrum of Metal Materials based on Furman Model .....152**

Zecai Chen (Xi'an Jiaotong University)  
Yu Chen (Xi'an Jiaotong University)  
Guorui Huang (Xi'an Jiaotong University)  
Changxi Li (Xi'an Jiaotong University)  
Qingyun Shi (Xi'an Jiaotong University)  
Shuang Wang (Xi'an Jiaotong University)

**(14:40-15:00) Theoretical Calculation of Photoemission Yield Spectrum of Space Metal Materials .....156**

Changxi Li (Xi'an Jiaotong University)  
Yu Chen (Xi'an Jiaotong University)  
Yan Yang (Xi'an Jiaotong University)  
Zecai Chen (Xi'an Jiaotong University)  
Hanzhi Li (Xi'an Jiaotong University)  
Shuang Wang (Xi'an Jiaotong University)

**(15:00-15:20) Development of a Measurement System for the Secondary Electron Emission Yield Spectrum of Space Materials .....160**

Yu Chen (Xi'an Jiaotong University)  
Guorui Huang (Xi'an Jiaotong University)  
Yan Yang (Xi'an Jiaotong University)  
Qingyun Shi (Xi'an Jiaotong University)  
Zecai Chen (Xi'an Jiaotong University)  
Shuang Wang (Xi'an Jiaotong University)  
Yonghong Cheng (Xi'an Jiaotong University)

**(15:20-15:40) In-pipe Detection System Based on Magnetic Flux Leakage and Eddy Current Detection .....164**

Xiaolin Liu (Beihang University)  
Chun Hu (Beihang University)  
Peng Peng (Chongqing Dexin Robot Testing Center Limited Company)  
Rui Li (Petrochina Pipeline Company)  
Xiaoming Zhao (Petrochina Pipeline Company)  
Dezhi Zheng (Beihang University)

**14:00-15:40**

**Session 11: Advanced Sensing, Monitoring and Diagnosis in Smart Grid**

**Chairs:** Yu Chen (Xi'an Jiaotong University), Zhe Li (Shanghai Jiaotong University)

**No. 8 Meeting Room**



**(14:00-14:20) Fault Accurate Location Method in UHV GIL Based on Transient Voltage Travelling Wave .....170**

Yong Wang (Guangzhou Power Supply Co. Ltd Electric Power Test & Research Institute)  
Dengwei Ding (Sichuan Energy Internet Research Institute, Tsinghua University)  
Lu Zhu (Guangzhou Power Supply Co. Ltd Electric Power Test & Research Institute)  
Wenxiong Mo (Guangzhou Power Supply Co. Ltd Electric Power Test & Research Institute)  
Weinan Fan (Guangzhou Power Supply Co. Ltd Electric Power Test & Research Institute)  
Ziwei Zhang (Sichuan Energy Internet Research Institute, Tsinghua University)

**(14:20-14:40) An Optical Partial Discharge Localization Method Based on Simulation and Machine learning in GIL .....174**

Yiming Zang (Shanghai Jiao Tong University)  
Yong Qian (Shanghai Jiao Tong University)  
Hui Wang (Shanghai Jiao Tong University)  
Antian Xu (Fudan University)  
Gehao Sheng (Shanghai Jiao Tong University)  
Xiuchen Jiang (Shanghai Jiao Tong University)

**(15:00-15:20) The 500kV Oil-filled Submarine Cable Temperature Monitoring System Based on BOTDA Distributed Optical Fiber Sensing Technology .....180**

Yu Chen (Xi'an Jiaotong University)  
Shuang Wang (Xi'an Jiaotong University)  
Yi Hao (Xi'an Jiaotong University)  
Kai Yao (Xi'an Jiaotong University)  
Hanzhi Li (Xi'an Jiaotong University)  
Feng Jia (Xi'an Jiaotong University)  
Qingyun Shi (Xi'an Jiaotong University)  
Dongli Yue (Xi'an Jiaotong University)  
Yonghong Cheng (Xi'an Jiaotong University)

**(15:20-15:40) Stator Inter-turns Short Circuit Fault Detection in DFIG using Empirical Mode Decomposition Method on Leakage Flux .....184**

Attiq Ur Rehman (Xi'an Jiaotong University)  
Yu Chen (Xi'an Jiaotong University)  
Guorui Huang (Xi'an Jiaotong University)  
Yan Yang (Xi'an Jiaotong University)  
Shuang Wang (Xi'an Jiaotong University)  
Yihan Zhao (Xi'an Jiaotong University)  
Yong Zhao (Xi'an Thermal Power Research Institute Co. Ltd)  
Yonghong Cheng (Xi'an Jiaotong University)  
Toshikatsu Tanaka (Waseda University)

**16:00-18:00**

**Session 2: Fault Prognosis and Life Prediction**

**Chairs:** Yi Qin(Chongqing University), Chuan Li(Chongqing Technology and Business University)

**Main Hall**

**(16:00-16:20) A KLIEP-based Transfer Learning Model for Gear Fault Diagnosis under Varying Working Conditions .....188**

Chao Chen (Southeast University)  
Fei Shen (Southeast University)  
Zhaoyan Fan (Oregon State University)  
Robert X. Gao (Case Western Reserve University)  
Ruqiang Yan (Xi'an Jiaotong University)

**(16:20-16:40) Battery Evaluation Based on Mechanism Parameters .....194**

Xiaofang Cheng (University of Science and Technology of China)  
Lei Mao (University of Science and Technology of China)  
Wen Li (University of Science and Technology of China)  
Chen Zhang (University of Science and Technology of China)

**(16:40-17:00) A Comparative Study of Particle Filters and Its Variants in Lithium-ion Battery SOH Estimation .....198**

Dawei Pan (Harbin Engineering University)  
Hengfeng Li (Harbin Engineering University)  
Yuchen Song (Harbin Institute of Technology)

**(17:00-17:20) The Mathematical Construction of the Battery Mechanism Function .....204**

Li Wen (University of Science and Technology of China)  
Mao Lei (University of Science and Technology of China)  
Zhang Chen (University of Science and Technology of China)  
Xiaofang Cheng (University of Science and Technology of China)

**(17:20-17:40) Attention-based Convolutional Neural Networks for Diesel Fuel System Fault Diagnosis.....210**

Yijing Xie ( Air Force Engineering University)  
Tianlin Niu ( Air Force Engineering University)  
Siyu Shao (Air Force Engineering University)  
Yuwei Zhao (Air Force Engineering University)  
Yuemeng Cheng (Air Force Engineering University)

**(17:40-18:00) RUL Prediction for Turbine Disc Based on High-Order Particle Filtering.....215**

Yang Fu (Xi'an Jiaotong University)  
Hongrui Cao (Xi'an Jiaotong University)

**16:00-18:00**

**Session 3: Advanced Sensors and Intelligent Signal Processing Methods for Navigation**

**Chairs:** Yuyong Xiong (Shanghai Jiao Tong University), Dong Wang (Shanghai Jiao Tong University)

**International Hall**

**(16:00-16:20) Sub-Sampled Two-Dimensional SAR Imaging Method Based on MIMO FMCW Radar.....221**

Zesheng Ren (Shanghai Jiao Tong University)  
Yuyong Xiong (Shanghai Jiao Tong University)  
Songxu Li (Shanghai Jiao Tong University)  
Dong Wang (Shanghai Jiao Tong University)  
Zhike Peng (Shanghai Jiaotong University)

**(16:20-16:40) Principal Component Analysis Based Kullback-Leibler Divergence for Die Cracks Detection .....224**

Sha Wei (Shanghai Jiao Tong University)  
Dong Wang (Shanghai Jiao Tong University)  
Zhike Peng (Shanghai Jiao Tong University)

**(16:40-17:00) Research on Inductively Coupled Full Duplex Communication Method with Power Transmission.....229**

Tao Zhang (Chongqing university)  
Deqi Zhang (Chongqing university)  
Wenbin Huang (Chongqing university)

**(17:00-17:20) Ultra-micro Vibration Measurement Method Using CW Doppler Radar.....235**

Songxu Li (Shanghai Jiao Tong University)  
Yuyong Xiong (Shanghai Jiao Tong University)  
Zesheng Ren (Shanghai Jiao Tong University)  
Changzhan Gu (Shanghai Jiao Tong University)  
Zhike Peng (Shanghai Jiao Tong University)

**(17:20-17:40) A Selective Anchor Node Method Based on Tetrahedral Volume for Three-dimensional DFL Node Self-localization .....238**

Binghua Huang (Nanjing University of Science and Technology)  
XuLiang Qin (NanJing University of Science and Technology)  
JiaXing Yang (NanJing University of Science and Technology)  
Manyi Wang (NanJing University of Science and Technology)

**16:00-18:00**

**Session 13: Intelligent Anomaly Detection, Fault Diagnosis and Prognostics for Aero-engines**

**Chairs:** Jianzhong Sun (Nanjing University of Aeronautics and Astronautics), Liansheng Liu (Harbin Institute of Technology)

**No.7 Meeting Room**

**(16:00-16:20) Enhancing the Reliability of the Quadrotor by Formulating the Control System Model .....242**

Zhuo Zhi (Harbin Institute of Technology)  
Liansheng Liu (Harbin Institute of Technology)  
Datong Liu (Harbin Institute of Technology)

**(16:20-16:40) An SOC and SOP Joint Estimation Method of Lithium-ion Batteries in Unmanned Aerial Vehicles .....247**

Wanqing Cheng (Harbin Institute of Technology)  
Zhiheng Yi (Harbin Institute of Technology)  
Jun Liang (Harbin Institute of Technology)  
Yuchen Song (Harbin Institute of Technology)  
Datong Liu (Harbin Institute of Technology)

**(16:40-17:00) UAV Anomaly Detection Using Active Learning and Improved S3VM Model.....253**

Dawei Pan (Harbin Engineering University)  
Longqiang Nie (Harbin Engineering University)  
Weixin Kang (Harbin Engineering University)  
Zhe Song (Harbin Engineering University)

**(17:00-17:20) Research on Multivariate Variational Mode Decomposition Method and Its Application to Bearing Fault Diagnosis .....259**

Qiuyu Song (Soochow University)  
Xingxing Jiang (Soochow University)  
Jun Wang (Soochow University)  
Changqing Shen (Soochow University)  
Juanjuan Shi (Soochow University)  
Weiguo Huang (Soochow University)  
Zhongkui Zhu (Soochow University)

**(17:20-17:40) Development and Application of Aero-engine Experimental Data Mining Algorithm Library.....264**

Zichen Yan (Nanjing University of Aeronautics and Astronautics)  
Haonan Zhang (University of Chinese Academy of Sciences)  
Jianzhong Sun (Nanjing University of Aeronautics and Astronautics)  
Yi Yang (Nanjing University of Aeronautics and Astronautics)  
Guangwei Xia (AECC Hunan Aviation Powerplant Research Institute)

**(17:40-18:00) Differentiable Architecture Search for Aeroengine Bevel Gear Fault Diagnosis .....270**

Zheng Zhou (Xi'an Jiaotong University)  
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)

**16:00-18:00**

**Session 8: Flexible sensing and intelligent diagnosis/prognosis for rolling bearings &**

**Session 15 NDT&E and Intelligent Monitoring & Others**

**Chairs:** Hongrui Cao(Xi'an Jiaotong University), Yuhua Cheng(University of Electronic Science and Technology of China)

**No.8 Meeting Room**

**(16:00-16:20) Rolling Bearing Fault Diagnosis based on Horizontal Visibility Graph and Graph Neural Networks.....275**

Chenyang Li (Southeast University)  
Lingfei Mo (Southeast University)  
Ruqiang Yan (Xi'an Jiaotong University)

**(16:20-16:40) Decoupled Feature-Temporal CNN: Explaining Deep Learning-Based Machine Health Monitoring .....280**

Rui Zhao (Harveston Asset Management)  
Zhenghua Chen (Institute for Infocomm Research)  
Chaoyi Zhu (Beihang University)  
Zery Chan (Institute for Infocomm Research)  
Jinjiang Wang (China University of Petroleum-Beijing)  
Ruqiang Yan(Xi'an Jiaotong Univeristy)

**(16:40-17:00) Deep Feature-aligned Convolutional Neural Network for Machinery Fault Diagnosis.....286**

Junbin Chen (South China University of Technology)

Longcan Liu (South China University of Technology)

Ruyi Huang (South China University of Technology)

Weihua Li (South China University of Technology)

**(17:00-17:20) Research on Defects Recognition Method Based on Impedance Information .....292**

Xu Zhang (University of Electronic Science and Technology of China)

Jian Zhang (Shanghai Space Propulsion Technology Research Institute)

Libing Bai (University of Electronic Science Technology of China)

Lulu Tian (University of Electronic Science and Technology of China)

Jie Zhang (University of Electronic Science and Technology of China)

Yuhua Cheng (University of Electronic Science and Technology of China)

**(17:20-17:40) Telemetry Data-based Spacecraft Anomaly Detection Using Generative Adversarial Networks.....297**

Yue Song (Beihang University)

Jinsong Yu (Beihang University)

Diyin Tang (Beihang University)

Danyang Han (Beihang University)

Sen Wang (Beijing Aerospace Automatic Control Institute)

**(17:40-18:00) Workpiece Detection Based on Image Processing and Convolutional Neural Network.....302**

Wocheng Chen (South China University of Technology)

Xifan Yao (South China University of Technology)

Yi Lei (South China University of Technology)

Min Liu (South China University of Technology)

Junming Zhang (South China University of Technology)

## Saturday, October 17, 2020

### **Keynote Speech 3 (9:00-9:50)**

#### **Digital Twin: State-of-the-art and Its Application**

Fei Tao, Ph.D., Professor  
School of Automation Science and Electrical Engineering  
Beihang University, P.R.China

### **Lecture- How to Write and Publish a Scientific Paper in English (16:00-17:20)**

#### **Fujun Liang**

Senior Editor, quality director of CJME, part-time professor of Beijing University of Posts and Telecommunications, and National Science and Technology Expert

**10:10–12:10**

#### **Session 1: Advanced Sensing and Intelligent Computation for Medical Signals**

**Chairs:** Chengyu Liu (Southeast University), Zhi Tao(Soochow University)

#### **Main Hall**

#### **(10:10-10:30) A Bayesian Fusion Model for Heart Rate Annotations.....307**

Jianan Di (Southeast University)  
Jianqing Li (Southeast University)  
Chengyu Liu (Southeast University)

#### **(10:30-10:50) Continuous Estimation of Left Ventricular Hemodynamic Parameters Based on Heart Sound and PPG Signals Using Deep Neural Network.....313**

Tengfei Feng (Dalian University of Technology)  
Hong Tang (Dalian University of Technology)  
Miao Wang (Dalian University of Technology)  
Chi Zhang (Dalian University of Technology)  
Hongkai Wang (Dalian University of Technology)  
Fengyu Cong (Dalian University of Technology)

#### **(10:50-11:10) Voice Pathology Detection and Multi-classification Using Machine Learning Classifiers .....319**

Yuanbo Wu (Soochow University)  
Changwei Zhou (Soochow University)  
Ziqi Fan (Soochow University)  
Yihua Zhang (Soochow University)  
Xaojun Zhang (Soochow University)  
Zhi Tao (Soochow University)

#### **(11:10-11:30) Classification of Normal and Pathological Voices Using Convolutional Neural Network .....325**

Changwei Zhou (Soochow University)  
Lili Zhang (Soochow University)  
Xiaojun Zhang (Soochow University)  
Yuanbo Wu (Soochow University)  
Di Wu (Soochow University)  
Zhi Tao (Soochow University)

**(11:30-11:50) Modeling Voice Pathology Detection Using Imbalanced Learning .....330**

Ziqi Fan (Soochow University)

Jinyang Qian (Soochow University)

Baoyin Sun (Soochow University)

Di Wu (Soochow University)

Yishen Xu (Soochow University)

Zhi Tao (Soochow University)

**(11:50-12:10) Multi-label Feature Selection for Long-term Electrocardiogram Signals .....335**

Yuwen Li (Southeast University)

Zhimin Zhang (Science and Technology on Information Systems Engineering Laboratory)

Fan Zhou (Southeast University)

Yantao Xing (Southeast University)

Jianqing Li (Nanjing Medical University)

Chengyu Liu (Southeast University)

---

**10:10–12:10**

**Session10: Advanced Measurement and Data Processing for Aerospace**

**Chairs:** Jingli Yang (Harbin Institute of Technology), Lianlei Lin (Harbin Institute of Technology)

**No.7 Meeting Room**

---

**(10:10-10:30) A Robotic Sensor Node for Mechanical Property Detection of Material on Asteroid Surface .....341**

Jun Zhang (*Southeast University*)

Maozeng Zhang (Southeast University)

Yizhuang Ding (Southeast University)

Liuchen Chen (Southeast University)

Qixuan Li (Southeast University)

Minghan Qin (Southeast University)

**(10:30-10:50) Research and Verification of Multi-Satellite Thermal Vacuum Test Method ...347**

Xiaofeng Zhang (Innovation Academy for Microsatellites of CAS)

Li Wu (Innovation Academy for Microsatellites of CAS)

Hong Liu( Innovation Academy for Microsatellites of CAS)

Jianchao Feng (Innovation Academy for Microsatellites of CAS)

Meijuan Xu (Innovation Academy for Microsatellites of CAS)

Rui Cheng (Innovation Academy for Microsatellites of CAS)

**(10:50-11:10) Satellite Control and Data Processing Unit Software Design based on Multi-core Processor .....352**

Junwang He (Shanghai Engineering Center for Microsatellites)

Luyang Xu(University of Science and Technology of China)

Dongxiao Xu (Shanghai Engineering Center for Microsatellites)

Shunjing Yu (Shanghai Engineering Center for Microsatellites)

Kaige Wang (School of Information Science and Engineering)

Liang Chang (Shanghai Engineering Center for Microsatellites)

**(11:10-11:30) Analysis of Ionospheric Scintillation Detection based on Machine Learning...357**

Mengying Lin (Southeast University)

Xuefen Zhu (Southeast University)  
Yimei Luo (Southeast University)  
Fan Yang (Southeast University)

**(11:30-11:50) Detection Method of Solar Radio Bursts Based on Support Vector Machine Model .....362**

Yimei Luo (Southeast University)  
Xuefen Zhu (Southeast University)  
Mengying Lin (Southeast University)  
Fan Yang (Southeast University)

**(11:50-12:10) Optimal Placement of Blade Tip Timing Sensors Considering Multi-mode Vibration Using Evolutionary Algorithms .....367**

Jinghui Xu (Xi'an Jiaotong University)  
Baijie Qiao (Xi'an Jiaotong University)  
Zhibo Yang (Xi'an Jiaotong University)  
Yuanchang Chen (University of Massachusetts Lowell)  
Xuefeng Chen (Xi'an Jiaotong University)

**10:10-12:10**

**Session 15: NDT&E and Intelligent Monitoring**

**Chairs:** Yuhua Cheng (University of Electronic Science and Technology of China), Liuyang Zhang (Xi'an Jiaotong University)

**No.10 Meeting Room**

**(10:10-10:30) Eddy Current Thermography for the Detection of Conductive Defects in Composite Insulators.....373**

Yanxin Tu (Tsinghua Shenzhen International Graduate school)  
Chenjun Guo (Electric Power Research Institute of Yunnan Power Grid Co.)  
Hongwei Mei (Tsinghua Shenzhen International Graduate school)  
Lishuai Liu (Tsinghua Shenzhen International Graduate school)  
Chenglong Cong (Tsinghua Shenzhen International Graduate school)  
Liming Wang (Tsinghua Shenzhen International Graduate school)

**(10:30-10:50) Model-Based Parameter Estimation Method for Terahertz Signals .....378**

Yafei Xu (Xi'an Jiaotong University)  
Liuyang Zhang (Xi'an Jiaotong University)  
Xuefeng chen (Xi'an Jiaotong University)  
Zhen Zhang (Xi'an Jiaotong University)  
Zhonglei Shen (Xi'an Jiaotong University)  
Donghai Han (Xi'an Jiaotong University)

**(10:50-11:10) Battery State of Health Estimation with Incremental Capacity Analysis Technique.....384**

Yuanyuan Li (University of Electronic Science and Technology of China)  
Hanmin Sheng (University of Electronic Science and Technology of China)  
Yuhua Cheng (University of Electronic Science and Technology of China)



**(11:10-11:30) Convolutional LSTM Networks for Vibration-based Defect Identification of the Composite Structure .....390**

Ruiheng Zhang (University of Electronic Science and Technology of China)  
Rui Li (Shanghai Space Propulsion Technology Research Institute)  
Libing Bai (University of Electronic Science Technology of China)  
Lulu Tian (University of Electronic Science Technology of China)  
Jie Zhang (University of Electronic Science Technology of China)  
Zhen Liu (University of Electronic Science and Technology of China)

**(11:30-11:50) Study on the Lowest Spatial Resolution of Magnetic Flux Leakage Testing for Weld Cracks.....396**

Chunrui Feng (University of Electronic Science Technology of China),  
Zhen Zhang (Shanghai Space Propulsion Technology Research Institute)  
Libing Bai (University of Electronic Science Technology of China)  
Lulu Tian (University of Electronic Science Technology of China)  
Jie Zhang (University of Electronic Science Technology of China)  
Yuhua Cheng (University of Electronic Science and Technology of China)

**(11:50-12:10) Application of Tensor Decomposition Methods in Eddy Current Pulsed Thermography Sequences Processing .....401**

Yiping Liang (University of Electronic Science and Technology of China)  
Libing Bai (University of Electronic Science and Technology of China)  
Jinliang Shao (University of Electronic Science and Technology of China)  
Yuhua Cheng (University of Electronic Science and Technology of China)

---

**14:00–15:40**

**Session 1: Advanced Sensing and Intelligent Computation for Medical Signals & Others**

**Chairs:** Chengyu Liu (Southeast University), Zhi Tao (Soochow University)

**Main Hall**

---

**(14:00-14:20) A Portable NeuECG Monitoring System for Cardiac Sympathetic Nerve Activity Assessment.....407**

Yantao Xing (Southeast University)  
Jianqing Li (Southeast University)  
Zhengyuan Hu (Southeast University)  
Yuwen Li (Southeast University)  
Yike Zhang (The First Affiliated Hospital of Nanjing Medical University)  
Chang Cui (The First Affiliated Hospital of Nanjing Medical University)  
Cheng Cai (The First Affiliated Hospital of Nanjing Medical University)  
Chengyu Liu (Southeast University)

**(14:20-14:40) An Octave Convolution Neural Network-based QRS Detector.....413**

Wei Liu (Southeast University)  
Xingyao Wang(Southeast University)  
Hongxiang Gao (Southeast University)  
Chenxi Yang (Southeast University)  
Jianqing Li (Southeast University)  
Chengyu Liu (Southeast University)

**(14:40-15:00) Capacitance Measurement of Molten Metal Level in Continuous Casting System.....419**

Zhe Zhuang (Xi'an Jiaotong University)  
Yu Zhang (Shanghai Hinner Information Technology Co., Ltd)  
Tonghao Zhou (Xi'an Jiaotong University)  
Shengchang Ji (Xi'an Jiaotong University)

**(15:00-15:20) Application of Wire Mesh Sensor to Identify Gas-liquid Flow Patterns in a Horizontal Pipe .....424**

Shuai Liu (Shanghai Jiao Tong University)  
Li Liu (Shanghai Jiao Tong University)  
Jiarong Zhang (Shanghai Jiao Tong University)  
Hanyang Gu (Shanghai Jiao Tong University)  
Qi Zhang (Shanghai Jiao Tong University)

**(15:20-15:40) Flow Visualization of Centrifugal Pump by the Combination of LIF and PIV...429**

Qi Zhang (Shanghai Jiao Tong University)  
Hanyang Gu (Shanghai Jiao Tong University)  
Shuai Liu(Shanghai Jiao Tong University)  
Junlong Li (Shanghai Jiao Tong University)  
Sichao Tan (Harbin Engineering University)  
Jianke Su (support Center of Nuclear Technology, CAEA)

**14:00-15:00**

**Session 14: THz Testing and Intelligent Sensing & Others**

**Chairs:** Liuyang Zhang (Xi'an Jiaotong University), Shuncong Zhong (Fuzhou University)

**No.7 Meeting Room**

**(14:20-14:40) Sensitive Detection of Trace Pesticide Residue Implemented by Terahertz All-Dielectric Metamaterial .....433**

Zijian Cui (Xi'an University of Technology)  
Yue Wang (Xi'an University of Technology)  
Xiaoju Zhang (Xi'an University of Technology)  
Lisha Yue (Xi'an University of Technology)  
Xinmei Wang (Xi'an University of Technology)  
Chen Yang (Xi'an University of Technology)  
Hui Hu (Xi'an University of Technology)  
Kuang Zhang (Harbin Institute of Technology)  
Yue Wang (Harbin University of Science and Technology)

**(14:40-15:00) Super-Resolution Imaging Using Very Deep Convolutional Network in Terahertz NDT Field.....438**

Qiang Wang (Air Force Engineering University)  
Hongbin Zhou (Air Force Engineering University)  
Yi Wang (Air Force Engineering University)  
Ruicong Xia (Air Force Engineering University)  
Qiuhan Liu (Air Force Engineering University)  
Boyan Zhao (Air Force Engineering University)  
Yue Wang (Air Force Engineering University)

**14:00–15:40**

**Session7: Intelligent Sensing and Data Analytics for Smart Manufacturing  
& Others**

**Chairs:** Yongbo Li (Northwestern Polytechnical University), Siliang Lu (Anhui University)

**No.10 Meeting Room**

**(14:00-14:20) Generative Model Driven Sampling Strategy for High Efficient Measurement of Complex Surfaces on Coordinate Measuring Machines .....442**

Jieji Ren (Shanghai Jiaotong University)

Mingjun Ren (Shanghai Jiaotong University)

Lijian Sun (Zhejiang Lab)

**(14:20-14:40) Architecture and Implementation of IoT Middleware for Ground Support Systems in Launch Site.....448**

Litian Xiao (Beijing Special Engineering Design and Research Institute)

Nan Xiao (China Aerospace Academy of System Science and Engineering)

Mengyuan Li (Beijing Special Engineering Design and Research Institute)

Shanshan Xie (Information Support Lab, Equipment Department, Aerospace System Ministry)

Kewen Hou (Beijing Special Engineering Design and Research Institute)

Yuliang Li (Beijing Special Engineering Design and Research Institute)

**(14:40-15:00) Dual-lane Phononic Crystal for Low-frequency Elastic Wave Attenuation.....455**

Jiawen Xu (Southeast University)

Ruqiang Yan (Xi'an Jiaotong University)

**(15:00-15:20) Research Progress of Intelligent Lightning Protection Based on Internet of Things Technology .....459**

Qibin Zhou(Shanghai University)

Feipeng Tang (Shanghai University)

Xin Huang (Shanghai University)

Huahui Chen(Shanghai Meteorological Bureau)

**(15:20-15:40) Parameter Study of the Variable Reluctance Energy Harvester for Smart Railway Axle Box Bearing.....464**

Yun Gong (Chongqing university)

Sijia Wang (Chongqing university)

Zhengqiu Xie (Chongqing university)

Wenbin Huang (Chongqing university)

# Poster Presentations

**Time: 13:00-14:00, 17<sup>th</sup> October, 2020**  
**Chairs:** Datong Liu (Harbin Institute of Technology), Yu Chen (Xi'an Jiaotong University)  
**Venue: Main Hall Lobby**

**P-01: Bimodal Anxiety State Assessment Based on Electromyography and Electroencephalogram.....470**

Diancong Zhang (Qufu Normal University)  
Dianguo Cao (Qufu Normal University)  
Jingyu Zhang (Qufu Normal University)  
Jiashuai Wang (Qufu Normal University)  
Jingxin Cao (Qufu Normal University)  
Xi Chen (Qufu Normal University)

**P-02: Performance Degradation Prediction of Rolling Bearing based on KJADE and Holt-Winters.....475**

Ran Wei (Anhui University)  
Yawei Hu (Anhui University)  
Changbo He(Anhui University)  
Zheng Cao (Anhui University)  
Siliang Lu(Anhui University)  
Fang Liu(Anhui University)  
Yongbin Liu (Anhui University)

**P-03: Fault Diagnosis of Wind Turbine Bearing Using Variational Nonlinear Chirp Mode Decomposition and Order Analysis.....479**

Zhichao Wu(Anhui University)  
Jiahao Niu (Anhui University)  
Siliang Lu (Southwest Jiaotong University)  
Yongbin Liu (Anhui University)  
Fang Liu (Anhui University)

**P-04: Compressed Sensing-based Blade Tip-timing Vibration Reconstruction Under Variable Speeds.....485**

Hao Sheng (Hunan University of Technology)  
Zhongsheng Chen (Hunan University of Technology)  
Yemei Xia (Hunan University of Technology)  
Weimin Wang (Beijing University of Chemical Technology)

**P-05: Online Intelligent Evaluation of Dispensing Quality Based on Entropy Weight Fuzzy Comprehensive Evaluation Method and Machine learning .....491**

Liping Zhao (Xi'an Jiaotong University)  
Xiangqian Cheng (Xi'an Jiaotong University)  
Yiyong Yao (Xi'an Jiaotong University)

**P-06: A Deep Reinforcement Learning Based Control Approach for Suspension Systems of Maglev Trains.....496**

Yougang Sun (Tongji University)  
Junqi Xu (Tongji University)  
Chen Chen (Tongji University)  
Wei Hu (CRRC Zhuzhou Locomotive Co., Ltd.)

**P-07: Broadband Aperture Extension of a Passive Sonar Array Using Multi-Dimension Autoregression Model.....502**

Yuning Qian (Nanjing Research Institute of Electronics Technology)  
Yawei Chen (Nanjing Research Institute of Electronics Technology)  
Xinrong Cao (Nanjing Research Institute of Electronics Technology)  
Jun Sun (Nanjing Research Institute of Electronics Technology)

**P-08: Improved Rotating Speed Estimation and Bearing Fault Diagnosis Using Multi-Channel Vibration Signals .....507**

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

**P-09: Incremental Learning of Bearing Fault Diagnosis Via Style-Based Generative Adversarial Networks.....512**

Yinjun Wang (Chongqing university)  
Liling Zeng (Chongqing university)  
Xiaoxi Ding (Chongqing university)  
Liming Wang (Chongqing university)  
Yimin Shao (Chongqing university)

**P-10: Recovery of Under-sampled Signal During High-speed Machining Condition Monitoring Using Approximate Sparsity in Frequency Domain .....518**

Yang Li (Xiamen University)  
Binqiang Chen (Xiamen University)  
Nianyin Zeng (Xiamen University)  
Xincheng Cao (Xiamen University)  
Bin Yao (Xiamen University)

**P-11: A Novel Weak Fault Diagnosis Method Based on Sparse Representation and Empirical Wavelet Transform for Rolling Bearing.....524**

Wei Lu (Beijing University of Chemical Technology)  
Liuyang Song (Beijing University of Chemical Technology)  
Lingli Cui (Beijing University of Technology)  
Huaqing Wang (Beijing University of Chemical Technology)

**P-12: A Weak Fault Diagnosis Method Based on Sparsity Overlapping Group Lasso for Rolling Bearing.....530**

Li Qiu (Beijing University of Chemical Technology)

Xiaoming Wang (Beijing University of Chemical Technology)

Zhengcai Guo (Beijing University of Chemical Technology)

Guoan Yang (Beijing University of Chemical Technology)

**P-13: A Novel Fault Diagnosis Method for Planetary Gearboxes under Imbalanced Data**.....536

Tianyu Gao (Harbin Institute of Technology)

Jingli Yang (Harbin Institute of Technology)

Shouda Jiang (Harbin Institute of Technology)

**P-14: An Impedance-based Structural Health Monitoring by Using Piezoelectric Transducers**.....542

Jiawen Xu (Southeast University)

Xin Zhang (Southeast University)

Ruqiang Yan(Xi'an Jiaotong University)

**P-15: Tip Timing Based Non-contact Vibration Measurement of Aero-engine Turbine Blades**.....546

Meiru Liu (Xi'an Jiaotong University)

Weiqiang Gao (AECC Sichuan Gas Turbine Establishment)

Xiao Xiao (AECC Sichuan Gas Turbine Establishment)

Guangrong Teng(AECC Sichuan Gas Turbine Establishment)

Chunyan Ao (Xi'an Jiaotong University)

Baijie Qiao (Xi'an Jiaotong University)

**P-16: Distributed Space Remote Sensing and Multi-satellite Cooperative On-board Processing**.....551

Yang Liu (Chinese Academy of Sciences)

Yuanyuan Dai (Chinese Academy of Sciences)

Guohua Liu (Harbin Institute of Technology)

Jingli Yang (Chinese Academy of Sciences)

Longfei Tian (Chinese Academy of Sciences)

Hua Li (Shanghai Jiaotong University)

**P-17: A Method of Antenna Gain Testing without Standard Gain Antenna**.....557

Kuo Gao (Chinese Academy of Sciences)

Huijie Liu (Chinese Academy of Sciences)

Lei Liu (Chinese Academy of Sciences)

Xiaotong Pan (Chinese Academy of Sciences)

Hao Wang (Chinese Academy of Sciences)

Yang Liu (Chinese Academy of Sciences)

**P-18: Design and Application on Complicated Power System Operation Cockpit Technologies**.....561

Zhiyong Li (CSG Power Dispatching and Control Center)

Chunxiao Liu (CSG Power Dispatching and Control Center)

**P-19: Study on Energy Harvesting of Open-close Current Transformer**.....567

Chi Tan (Xi'an Jiaotong University)

Yanzhen Zhao (Xi'an Jiaotong University)

Zijian Tang (Xi'an Jiaotong University)

**P-20: Mining Association Rules of Distribution Network Equipment Based on Genetic Algorithm.....572**

Wenxiong Mo (Guangzhou Power Supply Co., Ltd.)  
Zhong Xu (Guangdong Power Grid Co., Ltd Guangzhou power supply)  
Simin Luo (Guangdong Power Grid Co., Ltd Guangzhou power supply)  
Chao Chen (Xi'an Jiaotong University)  
Yiming Kong (Xi'an Jiaotong University)  
Xuanda Lai(Xi'an Jiaotong University)

**P-21: Automatic Detection of Transmission Line on UAV Inspection Images with the Statistics Approach in the DCT Domain.....577**

Min Zhang (Northwest University)  
Khalid Abubakar (Xi'an Jiaotong University)  
Yifan Li (Xi'an Jiaotong University)  
Yu Chen (Xi'an Jiaotong University)

**P-22: Risk Grading of Distribution Network Equipment Group Based on Fuzzy Clustering Factor Analysis.....582**

Hongbin Wang (Guangdong Power Grid Co.; Ltd)  
Le Luan (Guangzhou Power Supply Co.; Ltd.)  
Kai Zhou (Guangdong Power Grid Co., Ltd)  
Xueyan Chai (Xi'an Jiaotong University)  
Xue Li (Xi'an Jiaotong University)  
Minghui Xie (Xi'an Jiaotong University)

**P-23: Temperature Online Monitoring System for Aerospace Manufacturing Process Based on Gradient Boosting Decision Tree (GBDT) Algorithm.....587**

Liliang Wang (Beihang University)  
Jiaqi Qu (Beihang University)  
Zheng Qian (Beihang University)

**P-24: A Temperature and Humidity Compensation Method for On-board NOx sensors with LSTM Network .....593**

Anran Huang (Beihang University)  
Yingming Lyu (Beijing Machinery Industry Bureau)  
Zicheng Guo (Beihang University)  
Xiangyang Zhao (Beihang University)

**P-25: A Three-Dimensional Metamaterial Resonator in Low Terahertz Frequency.....598**

Shengnan Li (Xi'an Jiaotong University)  
Zhonglei Shen (Xi'an Jiaotong University)  
Donghai Han (Xi'an Jiaotong University)  
Liuyang Zhang (Xi'an Jiaotong University)

**P-26: Modified Generative Adversarial Network for Super-Resolution of Terahertz Image.....602**

Zhen Zhang (Xi'an Jiaotong University)  
Liuyang Zhang (Xi'an Jiaotong University)

Xuefeng Chen (Xi'an Jiaotong University)

Yafei Xu (Xi'an Jiaotong University)

**P-27: A Thermal-imaging-based Method for 2D Electric Current Distribution Measurement.....606**

Chao Ren (University of Electronic Science and Technology of China)

Lijian Zhu (Shanghai Space Propulsion Technology Research Institute)

Libing Bai (University of Electronic Science and Technology of China)

Lulu Tian (University of Electronic Science and Technology of China)

Jie Zhang (University of Electronic Science and Technology of China)

Zhen Liu (University of Electronic Science and Technology of China)

**P-28: CycleGANs for Semi-supervised Defects Segmentation.....611**

Jiangshan Ai (University of Electronic Science Technology of China)

Sihua Chen (Shanghai Space Propulsion Technology Research Institute)

Peng Deng (Sichuan Aerospace Measurement & Test Research Institute)

Libing Bai(University of Electronic Science Technology of China)

Lulu Tian (University of Electronic Science Technology of China)

Jie Zhang (University of Electronic Science Technology of China)

**P-29: BP-Neural-Network-Based Aging Degree Estimation of Power Transformer Using Acoustic Signal.....617**

Yukun Zhang (Shaanxi Normal University)

Jisheng Li (Shaanxi Normal University)

Hanchao Liu (Shaanxi Normal University)

Rong Liu (Shaanxi Normal University)

Fan Yang (Shaanxi Normal University)

Ting Li (Shaanxi Normal University)

**P-30: The Control Method of Tying Shoelaces for Robotic Hand Based on Angular Velocity Sensor.....622**

Zhigang Li (Southeast University)

Jianwei Cui (Southeast University)

Pudong Lu (Southeast University)

Huice Jiang (Southeast University)

**P-31: Design and Performance Analysis of a Moveable Groove-tracking Milling Machine for Repairing Thread of Marine Steering Gear Nuts.....627**

Guiping Lu (Beijing Institute of technology, Zhuhai)

Zhiyong Xiao (Beijing Institute of technology, Zhuhai)

Zhensheng Zhong (Beijing Institute of technology, Zhuhai)

Jiaran Liang (Beijing Institute of technology, Zhuhai)

Zhili Xiang (Beijing Institute of technology, Zhuhai)

Zhiyang Tang (Beijing Institute of technology, Zhuhai)

**P-32: Research on the Method of Rub-Impact Fault Recognition Based on the Conditional Generative Adversarial Nets and Acoustic Emission.....633**

Jing Li (Southeast University)



Aidong Deng (Southeast University)  
Yong Yang (Southeast University)  
Jing Zhu (Southeast University)  
Minqiang Deng (Southeast University)

**P-33: Analysis of Real-time Noise Signal Characteristics of Power Transformer Based on All-phase Fast Fourier Transform.....638**

Xiaojuan Zhao (State Grid Chongqing Electric Power Research Institute)  
Yaqi Zhou(State Grid Hubei Transmission and Transformation Engineering CO.LTD)  
Xue Wang (32620 Army)  
Ruilin Xu (State Grid Chongqing Electric Power Research Institute)  
Shihai Han (State Grid Chongqing Electric Power Research Institute)  
Xin Chen (State Grid Hubei Transmission and Transformation Engineering CO.LTD)