

Yuan JIANG

Reliability Analysis & Safety Assurance (RASA) Laboratory
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EDUCATION

Ph.D.	University of Illinois Urbana-Champaign, IL, USA	08/2023 – Present
	Industrial Engineering GPA: 4.0/4.0	
M.Sc.	Tongji University, Shanghai, China.	09/2020 – 06/2023
	Vehicle Engineering GPA: 4.76/5.0 Rank: 1/37	
B.Sc.	Tongji University, Shanghai, China.	09/2015 – 07/2020
	Vehicle Engineering (Railway) GPA: 4.83/5.0 Rank: 1/14	

RESEARCH EXPERIENCE

08/2023 – Present **Advancing Technologies for Logistics Architectures in Space**

Advisor: Pingfeng Wang (Professor), University of Illinois Urbana-Champaign

- Built low-fidelity and high-fidelity Hall thruster plasma dynamic model using Hallthruster.jl and VSim, respectively; simulated plasma properties at different stages, and built an iterative wall erosion simulation platform based on shell script to obtain wall erosion degradation profile
- Predicted erosion rate and indirect measurements based on adaptive self-cognizant dynamic systems with neural network surrogate models and particle filter for remaining useful life estimation of Hall thrusters under variable operating and environmental conditions

01/2024 – Present **Design and Optimization for Battery Thermal Management Systems**

Advisor: Pingfeng Wang (Professor), University of Illinois Urbana-Champaign

- Developed a low-fidelity 2D physics model of complex 3D indirect liquid cooling battery thermal management system; reduced simulation time by 50 seconds per case
- Proposed multi-fidelity physics-informed convolutional neural network (MF-PICNN) to predict heat map of battery packs based on different layouts under limited training data amount; reduced heat map prediction error by at least 20% and training data amount to 1/5
- Optimized battery pack layout based on MF-PICNN and genetic algorithm; reduced battery temperature variance by 20% and computation time by 2 hours

06/2021 – 06/2023 **Time-frequency Feature Extraction and Health Monitoring of Rail Short-pitch Damage**

Advisor: Gang Niu (Professor), Tongji University

- Built multi-body dynamic model in Simpack, developed rail damage irregularity in MATLAB as input, simulated axle-box vibration responses of different damage lengths and depth in various velocities to study relationship between rail damage and axle-box vibration response
- Proposed iterative frequency-domain envelope tracking filter (IFETF) for multimodal dispersive signal (Lamb wave) decomposition and rail impulsive damage feature extraction; ameliorated group delay estimation and signal decomposition accuracy by 5 ~ 20 dB; doubled computation efficiency compared with previous methods
- Proposed iterative adaptive Vold-Kalman filter (IAVKF) for multimodal non-stationary signal decomposition; enhanced instantaneous frequency estimation accuracy by 10 ~ 20 dB and signal decomposition accuracy by 5 ~ 10 dB; applied the algorithm for fault feature extraction of bearings, gears, and rail harmonic damage

05/2020 – 05/2022 **Intelligent Instrument for Adaptive Fault Diagnosis of Mechanical Transmission Systems**

Advisor: Gang Niu (Professor), Tongji University

- Designed intelligent hardware platform based on FPGA+ARM heterogeneous system architecture, embedded advanced signal processing algorithms and CNN in hardware for edge-computing-based diagnosis without using big data platform
- Proposed large speed variation – tacholeless order tracking technique based on iterative extended chirp mode decomposition to stabilize non-stationary time-domain vibration signals into angle domain
- Converted angle-domain signal and its envelope to 2D images as input of CNN, improved LeNet-5 CNN for fault classification, and the diagnostic accuracy can reach 95%

01/2020 – 06/2020 **Condition Monitoring and Degradation Prognosis of Train Bogie Bearings**

Supervisor: Gang Niu (Professor), Tongji University

- Extracted degradation features in time domain (e.g. RMS, kurtosis, skewness, impulse factor), frequency domain (frequency center, frequency RMS), and time-frequency domain (wavelet packet decomposition energy)
- Executed feature denoising based on local weighted regression, evaluated feature trends by correlation analysis to determine principal features
- Estimated remaining useful life based on SVR, the estimation accuracy improved by 20% compared with BPNN

JOURNAL PUBLICATIONS

- [J1] **Yuan Jiang**, Zheng Liu, Pouya Kabirzadeh, Yulun Wu, Yumeng Li, Nenad Miljkovic, and Pingfeng Wang. Multi-fidelity Physics-informed Convolutional Neural Network for Heat Map Prediction of Battery Packs. *Reliability Engineering & System Safety*, 256 (2025) 110752. DOI: [10.1016/j.ress.2024.110752](https://doi.org/10.1016/j.ress.2024.110752).
- [J2] Zheng Liu, Yanwen Xu, **Yuan Jiang**, Anabel Renteria, Parth Bansal, Chenlong Xu, Pingfeng Wang, and Yumeng Li. Uncertainty Quantification of Additively Manufactured Architected Cellular Materials for Energy Absorption Applications. *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering*, 11 (3) (2025). DOI: [10.1115/1.4066933](https://doi.org/10.1115/1.4066933).
- [J3] Pouya Kabirzadeh, Zheng Liu, Mostafa Olyaei, Haoyun Qiu, Yashraj Gurumukhi, Harsh Tyagi, **Yuan Jiang**, Vivek S Garimella, Bakhshish Preet Singh, Yumeng Li, Pingfeng Wang, and Nenad Miljkovic. Integrating heat transfer and control optimization: A comprehensive review of battery thermal management systems. *Journal of Energy Storage*, 131 (2025) 117289. DOI: [10.1016/j.est.2025.117289](https://doi.org/10.1016/j.est.2025.117289).
- [J4] Yuejian Chen, Zihan Li, **Yuan Jiang**, Chunsheng Yang, Min Xia, and Ke Feng. Enhanced Sparse LPV-ARMA Model with Ensemble Basis Functions for Mechatronic Transmission Fault Detection Under Variable Speed Conditions. *IEEE Internet of Things Journal*, 12 (11) (2025) 17223-17232. DOI: [10.1109/JIOT.2025.3535580](https://doi.org/10.1109/JIOT.2025.3535580).
- [J5] Yuejian Chen, Zihan Li, **Yuan Jiang**, Dao Gong, and Kai Zhou. Sparse LPV-ARMA Model for Non-stationary Vibration Representation and its Application on Gearbox Tooth Crack Detection Under Variable Speed Conditions. *Mechanical Systems and Signal Processing*, 224 (2025) 112161. DOI: [10.1016/j.ymssp.2024.112161](https://doi.org/10.1016/j.ymssp.2024.112161).
- [J6] **Yuan Jiang**, Yuejian Chen, and Pingfeng Wang. An Iterative Adaptive Vold-Kalman Filter for Non-stationary Signal Decomposition in Mechatronic Transmission Fault Diagnosis Under Variable Speed Conditions. *IEEE Transactions on Industrial Informatics*, 20 (8) (2024) 10510-10519. DOI: [10.1109/TII.2024.3393536](https://doi.org/10.1109/TII.2024.3393536).
- [J7] **Yuan Jiang** and Gang Niu. An Iterative Frequency-domain Envelope-tracking Filter for Dispersive Signal Decomposition in Structural Health Monitoring. *Mechanical Systems and Signal Processing*, 179 (2022) 109329. DOI: [10.1016/j.ymssp.2022.109329](https://doi.org/10.1016/j.ymssp.2022.109329).

CONFERENCE PROCEEDINGS

- [C1] **Yuan Jiang**, Alexandra N. Leeming, Joshua L. Rovey, and Pingfeng Wang, Remaining Useful Life Prediction for

- Hall Thrusters based on Adaptive Self-Cognizant Dynamic System and Multi-Physics Modeling. *ASME 2025 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE2025)*, Anaheim, CA, USA. 18 Aug. 2025, 10 Pages. (Accepted and selected as **Paper of Distinction**)
- [C2] Zheng Liu, **Yuan Jiang**, Yumeng Li, and Pingfeng Wang, Physics-Informed Machine Learning Enhanced Battery Pack Optimization, *2025 IEEE/AIAA Transportation Electrification Conference and Electric Aircraft Technologies Symposium (ITEC+ EATS)*, Anaheim, CA, USA. 18 June 2025, 5 Pages. DOI: [10.1109/ITEC63604.2025.11098093](https://doi.org/10.1109/ITEC63604.2025.11098093).
- [C3] **Yuan Jiang**, Alexandra N. Leeming, Joshua L. Rovey, Pingfeng Wang, Prognostics of Hall Thruster Erosion using Multiphysics-based Modeling and Machine Learning, *2025 Annual Reliability and Maintainability Symposium*, Destin, FL, USA. 27 Jan. 2025, 7 Pages. DOI: [10.1109/RAMS48127.2025.10935282](https://doi.org/10.1109/RAMS48127.2025.10935282).
- [C4] Zheng Liu, **Yuan Jiang**, Yumeng Li, Pingfeng Wang, Physics-informed Machine Learning for Battery Pack Thermal Management, *2025 Annual Reliability and Maintainability Symposium*, Destin, FL, USA. 27 Jan. 2025, 7 Pages. DOI: [10.1109/RAMS48127.2025.10935157](https://doi.org/10.1109/RAMS48127.2025.10935157).
- [C5] Shimeng Yang, **Yuan Jiang**, Zheng Liu, Pingfeng Wang, Transductive Transfer Learning Features for Prognostics and Health Management, *2025 Annual Reliability and Maintainability Symposium*, Destin, FL, USA. 27 Jan. 2025, 7 Pages. DOI: [10.1109/RAMS48127.2025.10935143](https://doi.org/10.1109/RAMS48127.2025.10935143).
- [C6] Parth Bansal, **Yuan Jiang**, Zhou Li, Sergio Cordero, Zahra Heussen, Debbie Senesky, Pingfeng Wang, Yumeng Li, Multiphysics Modeling and Simulation of Gas Sensor for NO₂ Detection, *ASME International Mechanical Engineering Congress and Exposition*, Portland, OR, USA, 17 Nov. 2024, 6 Pages. DOI: [10.1115/IMECE2024-145663](https://doi.org/10.1115/IMECE2024-145663).
- [C7] **Yuan Jiang**, Gang Niu, Rail Local Damage Detection based on Recursive Frequency-domain Envelope Tracking Filter and Rail Impact Index, *2022 Global Reliability and Prognostics and Health Management*, Yantai, China. 13 Oct. 2022, 7 Pages. DOI: [10.1109/PHM-Yantai55411.2022.9942082](https://doi.org/10.1109/PHM-Yantai55411.2022.9942082). (**Best Paper Award**)
- [C8] Hongyang Zhao, **Yuan Jiang**, Gang Niu, A Tacholeless Order Tracking Method based on Extended Intrinsic Chirp Component Decomposition for Gears under Large Speed Variation Conditions, *Journal of Physics: Conference Series*, 2184 (1) (2022) 12052. DOI: [10.1088/1742-6596/2184/1/012052](https://doi.org/10.1088/1742-6596/2184/1/012052).
- [C9] **Yuan Jiang**, Hongyang Zhao, Gang Niu, Intelligent Rolling Bearing Fault Diagnosis under Variable Speed Conditions without Tachometers, *2021 Global Reliability and Prognostics and Health Management*, Nanjing, China. 15 Oct. 2021, 7 Pages. DOI: [10.1109/PHM-Nanjing52125.2021.9613049](https://doi.org/10.1109/PHM-Nanjing52125.2021.9613049).

WORK EXPERIENCE

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| 05/2023 – 08/2023 | NIO Automobile, Inc | Power System Algorithm Intern |
| <ul style="list-style-type: none"> ➤ Developed online condition monitoring system for EV power swaps and power chargers based on Python stream API; realized real-time fault diagnosis for charging plug detachment, PLC servo communication failure, and battery swap timeout within 5 seconds ➤ Analyzed vibration signals of fan bearings based on envelope decomposition and spectrum kurtosis; resolved rolling element fault on fan motor bearings | | |
| 06/2022 – 08/2022 | HiRain Technologies | Autonomous Driving Development Intern |
| <ul style="list-style-type: none"> ➤ Developed camera SDK and host program using C++ and OpenCV to realize multi-camera grabbing, software triggering, parameter setting, and online monitoring ➤ Developed automatic mosaic adding and watermark printing algorithm of videos and photos with C++ and OpenCV for copyright and privacy | | |
| 02/2021 – 05/2021 | NIO Automobile, Inc | Battery Testing Intern |
| <ul style="list-style-type: none"> ➤ Conducted offline tests of LFP and NCM automobile batteries by CANoe and CANalyzer software, exported and analyzed data with MATLAB | | |

- Developed automatic data analysis algorithm for battery cycle test with MATLAB, reduced data processing time to 1/10 compared with manual methods

HONORS & AWARDS

Chinese National Scholarship (Top 1%)	12/2019, 10/2022
Merit Graduate Thesis in Tongji University (Top 1%)	01/2024
Shanghai Outstanding Graduates (Top 1%)	06/2020
Mao Yisheng Science and Technology Award – Railway Education Hope Star (Top 1%)	03/2019
The First Prize of Tongji Scholarship of Excellence (Top 3%)	12/2016, 12/2017, 12/2018
Outstanding Student of Tongji University (Top 3%)	01/2017, 01/2019, 01/2020

ACADEMIC SERVICE

Journal Reviewer	Reliability Engineering & System Safety (JCR Q1, IF=11.0)
	Mechanical Systems and Signal Processing (JCR Q1, IF=8.9)
	IEEE Internet of Things Journal (JCR Q1, IF=8.9)
	Engineering Applications of Artificial Intelligence (JCR Q1, IF=8.0)
	ISA Transactions (JCR Q1, IF=6.5)
	IEEE Transactions on Instrumentation & Measurement (JCR Q1, IF=5.9)
	IEEE Sensors Journal (JCR Q1, IF=4.5)
	Journal of Process Control (JCR Q2, IF=3.9)
Conference Reviewer	Journal of Vibration and Control (JCR Q2, IF=2.4)
	International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE)

TEACHING EXPERIENCE

01/2025 – 05/2025	Teaching Assistant, <i>Reliability Engineering</i> (SE411, UIUC)
08/2025 – 12/2025	Teaching Assistant, <i>Decision Analysis</i> (SE450, UIUC)
08/2024 – 12/2024	
02/2022 – 07/2022	Teaching Assistant, <i>Rail Vehicle Systems Health Management</i> (Tongji University)

PROFESSIONAL SKILLS

- Coding: Python, MATLAB, LaTeX, Julia, LabVIEW, C++, CUDA, Arduino
- Software & Packages: PyTorch, COMSOL, VSim, Simpack, ANSYS, AutoCAD, Fusion 360, SolidWorks, OpenCV
- Algorithms & Techniques: Physics-informed Machine Learning, Deep Learning, Signal processing, Plasma Simulation, Dynamic simulation analysis, Finite element analysis