

Jie Chen

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Address: 2145 Sheridan Road, Evanston, IL 60208

Google Scholar Page**EDUCATION**

2018.8 - 2022.3	Ph.D. in Mechanical Engineering Arizona State University (ASU), Tempe, AZ, USA Thesis: Uncertainty quantification and prognostics using Bayesian statistics and machine learning Advisor: Professor Yongming Liu
2015.9 - 2018.3	M.S. in Civil Engineering Beihang University, Beijing, China Thesis: Experimental study on fatigue performance of corroded steel reinforcement Advisor: Professors Bo Diao and Jingjing He
2011.9 - 2015.6	B.S. in Civil Engineering Beihang University, Beijing, China Thesis: Degradation law of carrying capacity of bending reinforced concrete section with fatigue damage Advisor: Professor Bo Diao

PROFESSIONAL EXPERIENCE

2022.4 - present	Northwestern University	Postdoctoral Fellow Advisor: Professor Wei Chen
2023.1 - 2023.3	Northwestern University (NU)	Assistant Instructor
2018.8 - 2022.3	Arizona State University	Research Assistant
2018.3 - 2018.7	China Academy of Engineering Physics	Visiting Scholar

AWARDS

2023.10	Travel award for the Future Faculty Symposium at Society of Engineering Science Conference
2023.8	Third Prize in the Data Hackathon on “Automating Material Selection for Product Design” at ASME IDETC-CIE Conference
2023.3	NSF travel award for REMADE Conference
2023.2	Wiley Top Cited Article 2021-2022 (Publication [8])
2022.2	AIAA SciTech 2022 Aerospace Design & Structures Student Paper Competition Semi-finalist
2021.11	Dean’s Dissertation Award in the Ira A. Fulton Schools of Engineering, ASU
2019.9	PHM Doctoral Symposium participant (One of 10 selected PhD students)
2018.3	Beijing Excellent Graduate (Top 5 out of 88, Ranking 1), Beihang University
2018.3	Best Thesis of Beihang University (Top 3 out of 88)
2016.11	Graduate Scholarship Award (Top 4 out of 21)

2016 & 2014 Merit Student of Beihang University
2014.9 Scholarship for Academic Excellence

JOURNAL PUBLICATIONS

Accepted/Published Journal Articles

1. **Chen, J.**, Zhang, H., Wahl, C. B., Liu, W., Mirkin, C. A., Dravid, V. P., Apley, D. W., & Chen, W. (2023). Automated crystal symmetry identification from diffraction patterns using machine learning under uncertainty. *Proceedings of the National Academy of Sciences* (2023 accepted)
2. Karkaria, V., **Chen, J.**, Siuta, C., Lim, D., Radelescu, R., & Chen, W. A Machine Learning based tire life prediction framework for increasing life of commercial vehicle tires. *Journal of Mechanical Design* (2023 accepted).
3. Wahl, C. B., **Chen, J.**, Zhang, H., Liu, W., Zhang, S., Wu, J., Mirkin, C. A., Dravid, V. P., Apley, D. W. & Chen, W. (2023). Automated Crystal System Identification from Four-dimensional Scanning Transmission Electron Microscopy Data Using Brain-inspired Artificial Intelligence. *Microscopy and Microanalysis*. 29, Supplement_1.
4. Kethamukkala, K., Meng, C., **Chen, J.**, & Liu, Y. (2023). Crack Growth-based Life Prediction for Additively Manufactured Metallic Materials considering Surface Roughness. *International Journal of Fatigue*, 107914.
5. **Chen, J.**, & Liu, Y. (2023). Neural optimization machine: a neural network approach for optimization and its application in additive manufacturing with physics-guided learning. *Philosophical Transactions of the Royal Society A*, 381(2260), 20220405.
6. Ghumman, U. F., Chen, Q., D'Angelo, V. E., Clark, M., **Chen, J.**, Shull, K. R., & Chen, W. (2023). Crack Surface Analysis of Elastomers Using Transfer Learning. *ACS Applied Materials & Interfaces*, 15(11), 14901-14913.
7. **Chen, J.**, Meng, C., Gao, Y., & Liu, Y. (2022). Multi-fidelity neural optimization machine for Digital Twins. *Structural and Multidisciplinary Optimization*, 65(12), 340.
8. **Chen, J.**, Yu, Y., & Liu, Y. (2022). Physics-guided mixture density networks for uncertainty quantification. *Reliability Engineering & System Safety*, 228, 108823.
9. **Chen, J.**, Gao, Y., & Liu, Y. (2022). Multi-fidelity data aggregation using convolutional neural networks. *Computer Methods in Applied Mechanics and Engineering*, 391, 114490.
10. **Chen, J.**, & Liu, Y. (2022). Fatigue modeling using neural networks: A comprehensive review. *Fatigue & Fracture of Engineering Materials & Structures*, 45(4), 945-979.
11. Tien, S. C., Wei, H., **Chen, J.**, & Liu, Y. (2022). Energy - based time derivative damage accumulation model under uniaxial and multiaxial random loadings. *Fatigue & Fracture of Engineering Materials & Structures*, 45(1), 159-173.
12. Shivankar, S., **Chen, J.**, & Liu, Y. (2022). Subcycle fatigue crack growth and equivalent initial flaw size model for fatigue life assessment under arbitrary loadings for Al-7075. *International Journal of Fatigue*, 156, 106685.
13. **Chen, J.**, & Liu, Y. (2021). Fatigue property prediction of additively manufactured Ti-6Al-4V using probabilistic physics-guided learning. *Additive Manufacturing*, 39, 101876.
14. **Chen, J.**, & Liu, Y. (2021). Probabilistic physics-guided machine learning for fatigue data analysis. *Expert Systems with Applications*, 168, 114316.
15. Sharma, A., **Chen, J.**, Diewald, E., Imanian, A., Beuth, J., & Liu, Y. (2022). Data-driven sensitivity analysis for static mechanical properties of additively manufactured Ti-6Al-4V.

- ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part b: Mechanical Engineering, 8(1), 011108.
16. Dai, R., Chandrasekaran, G., **Chen, J.**, Jackson, C., Liu, Y., Nian, Q., & Kwon, B. (2021). Thermal conductivity of metal coated polymer foam: Integrated experimental and modeling study. *International Journal of Thermal Sciences*, 169, 107045.
 17. Wang, W., **Chen, J.**, Diao, B., Guan, X., He, J., & Huang, M. (2021). Bayesian Fatigue Life Prediction of Corroded Steel Reinforcing Bars. *Advances in Civil Engineering*, 2021, 1-15.
 18. **Chen, J.**, Ersoy, D., & Liu, Y. (2020). Probabilistic bulk property estimation using multimodality surface non-destructive measurements for vintage pipes. *Structural Safety*, 87, 101995.
 19. **Chen, J.**, Imanian, A., Wei, H., Iyyer, N., & Liu, Y. (2020). Piecewise stochastic rainflow counting for probabilistic linear and nonlinear damage accumulation considering loading and material uncertainties. *International Journal of Fatigue*, 140, 105842.
 20. **Chen, J.**, Liu, S., Zhang, W., & Liu, Y. (2020). Uncertainty quantification of fatigue SN curves with sparse data using hierarchical Bayesian data augmentation. *International Journal of Fatigue*, 134, 105511.
 21. He, J., **Chen, J.**, & Guan, X. (2020). Lifetime distribution selection for complete and censored multi-level testing data and its influence on probability of failure estimates. *Structural and Multidisciplinary Optimization*, 62, 1-17.
 22. Wei, H., Carrion, P., **Chen, J.**, Imanian, A., Shamsaei, N., Iyyer, N., & Liu, Y. (2020). Multiaxial high-cycle fatigue life prediction under random spectrum loadings. *International Journal of Fatigue*, 134, 105462.
 23. **Chen, J.**, Diao, B., He, J., Pang, S., & Guan, X. (2018). Equivalent surface defect model for fatigue life prediction of steel reinforcing bars with pitting corrosion. *International Journal of Fatigue*, 110, 153-161.

Under Review Journal Articles

24. Balamurugan, R., **Chen, J.**, Meng, C., & Liu, Y. (2023). Data-driven Approaches for Fatigue Prediction of Ti-6Al-4V Parts Fabricated by Laser Powder Bed Fusion. *International Journal of Fatigue* (under review).
25. Meng, C., **Chen, J.**, Hase, L., & Liu, Y. (2023). Image-based Study on Fatigue Crack Initiation Mechanism of Ti-6Al-4V Fabricated by Laser Powder Bed Fusion. *Additive Manufacturing* (under review).

CONFERENCE PROCEEDINGS AND PRESENTATIONS

1. **Chen, J.**, Liu, Y., & Chen, W. (2023) Neural Optimization Machine for Design with Neural Network Based Objectives. In *International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*.
2. **Chen, J.**, & Liu, Y. (2023) Probabilistic Fatigue Data Analysis using Physics-guided Mixture Density Networks” *ASME Aerospace Structures, Structural Dynamics, and Materials Conference*.
3. **Chen, J.**, Meng, C., Gao, Y., & Liu, Y. (2023). Multi-Fidelity Data Aggregation for Information Fusion in Simulation and Experiment. In *AIAA SCITECH 2023 Forum*.
4. **Chen, J.**, Shivankar, S., & Liu, Y. Fatigue Life prediction under Arbitrary Loadings using

- Subcycle Fatigue Crack Growth and Equivalent Initial Flaw Size Model. In ICMFF13, 2022.
5. **Chen, J.**, Gao, Y., & Liu, Y. (2022). Convolutional neural networks for multi-fidelity data aggregation. In AIAA SCITECH 2022 Forum (p. 2144).
 6. **Chen, J.**, Meng, C., & Liu, Y. (2021, November). Imaging-based fatigue mechanism investigation of additively manufactured Ti-6Al-4V. In ASME International Mechanical Engineering Congress and Exposition (Vol. 85574, p. V003T03A009). American Society of Mechanical Engineers.
 7. **Chen, J.**, & Liu, Y. (2021). Probabilistic Physics-guided Neural Network for Fatigue Analysis of Additively Manufactured Ti-6Al-4V. In Engineering Mechanics Institute Conference 2021 and Probabilistic Mechanics & Reliability Conference 2021.
 8. **Chen, J.**, & Liu, Y. (2021). A new framework for fatigue life prediction under random loading conditions. In AIAA Scitech 2021 Forum (p. 1352).
 9. **Chen, J.**, & Liu, Y. (2021). Physics-guided machine learning for multi-factor fatigue analysis and uncertainty quantification. In AIAA Scitech 2021 Forum (p. 1242).
 10. **Chen, J.**, & Liu, Y. (2020, November). Bayesian information fusion of multimodality nondestructive measurements for probabilistic mechanical property estimation. In ASME International Mechanical Engineering Congress and Exposition (Vol. 84669, p. V014T14A006). American Society of Mechanical Engineers.
 11. **Chen, J.**, & Liu, Y. (2020). Uncertainty quantification of fatigue properties with sparse data using hierarchical Bayesian model. In AIAA Scitech 2020 Forum (p. 0680).
 12. **Chen, J.**, & Liu, Y. (2020). Multimodality data fusion for probabilistic strength estimation of aging materials using Bayesian networks. In AIAA Scitech 2020 Forum (p. 1653).
 13. **Chen, J.**, & Liu, Y. (2019, September). Multimodality information fusion for aging pipe strength and toughness estimation using Bayesian networks. In 11th Annual Conference of the Prognostics and Health Management Society, PHM 2019. Prognostics and Health Management Society.
 14. **Chen, J.**, & Liu, Y. (2019, September). Probabilistic aging pipe strength estimation using multimodality information fusion. In Annual Conference of the PHM Society (Vol. 11, No. 1).
 15. Wei, H., **Chen, J.**, Carrion, P., Imanian, A., Shamsaei, N., Iyyer, N., & Liu, Y. (2019). Multiaxial high-cycle fatigue modelling for random loading. In MATEC Web of Conferences (Vol. 300, p. 12005). EDP Sciences.

POSTERS

1. Crack-surface Analysis of Elastomers Using Transfer Learning, Annual Meeting of Center for Hierarchical Materials Design, Chicago, IL, 2022
2. Multimodality Information Fusion for Aging Pipe Strength and Toughness Estimation Using Bayesian Networks, Annual Conference of the Prognostics and Health Management Society, Scottsdale, AZ, 2019

RESEARCH EXPERIENCE

1. NU-Johns Hopkins University-Carnegie Mellon University-Georgia Institute of Technology-Purdue University-University of California at Santa Barbara-University of Massachusetts Lowell Collaboration Funded by **DEVCOM ARL**: High-throughput Materials Discovery for Extremes 2023-present

- Developing multi-scale uncertainty quantification methods
- 2. NU-University of Wyoming-Lehigh University Collaboration Funded by **NSF**: Microscopic Mechanism of Surface Oxide Formation in Multi-Principal Element Alloys 2023-present
 - Developing an automated element prediction method from density of state using convolutional neural networks
 - Supervised a research assistant and an undergraduate student for design rule discovery
 - Wrote annual reports
- 3. NU-The Ohio State University-Case Western Reserve University-North Carolina Agricultural and Technical State University-The University of Tennessee Knoxville Collaboration Funded by **NSF**: Hybrid Autonomous Manufacturing, Moving from Evolution to Revolution (HAMMER) Engineering Research Center 2022-present
 - Supervising a Ph.D. student for process-property analysis and design using Bayesian Long Short-Term Memory Networks and Bayesian Optimization
- 4. NU Internal Collaboration Funded by **International Institute for Nanotechnology at NU**: Adaptive Sampling and High Throughput Data Analysis for Nanostructure Mega-Libraries 2022-present
 - Proposed a physics-based machine learning framework for multi-view classification of crystal structures from diffraction patterns
 - Developing an automated materials screening for catalyst design using Deep Learning based Bayesian optimization
 - Supervising a Ph.D. student and an undergraduate student for crystal boundary identification using rule-based and machine learning methods
- 5. NU-Michelin Collaboration Funded by **DOE-ReMADE-Michelin**: Development of Instruments and Techniques that Can Assess Tire Life and Increase Re-Manufacturing of Commercial Vehicle Tires 2022-present
 - Supervising a Ph.D. student for method development on defect prediction of tires with imbalanced dataset
- 6. NU-Hyundai Motor Company Collaboration Funded by **Hyundai**: Machine Learning and Bayesian Optimization for improving Electric Vehicle Systems 2022-present
 - Supervising a Ph.D. student and a master student for method development on Machine Learning and Bayesian Optimization for accelerate life testing
- 7. NU-Ford Motor Company Collaboration Funded by **Ford-Northwestern Alliance**: Deep-Learning Computer Vision Techniques for Optimal Design of Toughened Polymers 2022-2023
 - Supervising a Ph.D. student for paper writing
 - Supervised an undergraduate student for automated microstructure-property prediction using transfer learning
- 8. ASU-Carnegie Mellon University-Optimal Synthesis, Inc.-Southwest Research Institute-Vanderbilt University Collaboration Funded by **NASA**: Information Fusion for Real-Time National Air Transportation System Prognostics under Uncertainty 2021-2022
 - Proposed a multi-fidelity data aggregation method using convolutional neural networks
 - Proposed Physics-Guided Mixture Density Network for regression analysis and uncertainty quantification with arbitrary data distribution
 - Proposed a neural network-based approach for optimizing neural network models

9. ASU-Technical Data Analysis, Inc. Collaboration Funded by **NAVAIR**: Systematic Fatigue Test Spectrum Editing Using Wavelet Transformations 2019-2022
 - Proposed a physics-guided machine learning method for fatigue life modeling of additively manufactured Ti-6Al-4V considering the missing data problem
 - Proposed a piecewise stochastic rainflow counting method for probabilistic linear and nonlinear damage accumulation considering loading and material uncertainties
 - Generated and edited uniaxial and multiaxial fatigue loading spectrums, and experimentally tested fatigue lives of specimens
 - Supervised 3 master students for method development on fatigue life prediction
 - Wrote quarterly reports
10. ASU-University of Connecticut Collaboration Funded by **NSF**: Fatigue Damage Prognosis for Slender Coastal Bridges 2018-2020
 - Proposed Probabilistic Physics-guided Neural Network for fatigue data regression
 - Proposed a novel Hierarchical Bayesian data augmentation method for fatigue stress-life curves with uncertainty quantification considering sparse data problem
 - Wrote project reports
11. ASU-Gas Technology Institute Collaboration Funded by **DOT PHMSA**: Uncertainty Quantification and Reduction for Pipeline Assessment with Interactive Threats 2017-2020
 - Developed Bayesian model averaging approach for pipe strength prediction from multimodality surface measurements with uncertainty quantification
 - Supervised 1 Ph.D. student for method development on strength prediction using Bayesian networks
 - Wrote quarterly reports

PROFESSIONAL ACTIVITIES AND SERVICE

Contributions to Research Grants

1. International Institute for Nanotechnology (IIN) Physics-Informed Machine Learning for High Throughput Data Analysis of Nanostructure Mega-Libraries (NU, funded)
2. Navy Small Business Technology Transfer (STTR) N20A-T002 Machine Learning Tools to Optimize Metal Additive Manufacturing Process Parameters to Enhance Fatigue Performance of Aircraft Components (ASU, funded)
3. Defense Advanced Research Projects Agency (DARPA) DARPA-SN-23-73 Rapid Part Qualification (NU, pending)
4. Department of Energy (DOE) DE-FOA-0002958 Scientific Machine Learning for Complex Systems (NU, not funded)
5. National Science Foundation (NSF) NSF 22-559 Boosting Research Ideas for Transformative and Equitable Advances in Engineering (BRITE) (ASU, not funded)
6. Navy Small Business Innovation Research (SBIR) N221-067 Digital Engineering - Improved Reliability of Composites Pi-Joints for Use in Primary Aircraft Structures (ASU, not funded)
7. Air Force Collaboration for Innovative Research on Aircraft Structure (CIRAS) FA8650-21-S-2205 Probabilistic Physics-informed Machine Learning for Mechanical Property Prediction of Additively Manufactured Components (ASU, not funded)

Professional Society Memberships

1. American Institute of Aeronautics and Astronautics (AIAA) Non-Deterministic Approaches Technical Committee
2. AIAA Young Professional Group
3. The American Society of Mechanical Engineers (ASME)

Paper Reviewing

Journals

1. Fatigue & Fracture of Engineering Materials & Structures
2. International Journal of Fatigue
3. International Journal of Mechatronics and Manufacturing Systems
4. Journal of Bridge Engineering
5. Journal of Computing and Information Science in Engineering
6. Journal of Materials Processing Technology
7. Journal of Mechanical Design
8. Journal of the Royal Statistical Society: Series C
9. Journal of Zhejiang University-SCIENCE A
10. Mathematical Biosciences and Engineering
11. Multidiscipline Modeling in Materials and Structures
12. Nature Communications
13. Reliability Engineering & System Safety

Conferences

14. ASME IMECE Conference
15. ASME Turbo Expo Conference

Laboratory Management

Experiment equipment management and maintenance (Micro CT system - Skyscan 1272, MTS Landmark Servohydraulic Test Systems, MTS electron-mechanical testing machine, Zeiss EVO scanning electron microscope, FLIR high resolution thermal camera, etc.)

MENTORING ACTIVITIES

Postdoc/Student Mentor

Industry

1. Dr. Dong Hyun Ha, Hyundai Motor Company, 2022 – 2023

Ph.D. students

2. Vispi Karkaria, Mechanical Engineering, NU, 2022 – present
3. Tuba Dolar, Mechanical Engineering, NU, 2023 – present
4. Umar Farooq Ghumman, Mechanical Engineering, NU, 2022

Research assistant

5. Zhuoxin (Joy) Sun, Mechanical Engineering, NU, 2023

Master students

6. Julian Delgado, Mechanical Engineering, NU, 2023 – present
7. Vinamra Saxena, Mechanical Engineering, NU, 2022 – present
8. Shih-Chuan Tien, Mechanical Engineering, ASU, 2019 – 2021

9. Sushant Shivankar, Mechanical Engineering, ASU, 2019 – 2021
10. Antriksh Sharma, Mechanical Engineering, ASU, 2019 – 2021

Undergraduate students

11. Cesar Fuentes, Computer Engineering, University of Illinois Chicago, 2023 – present
12. Genmao Zhunag, Mechanical Engineering, NU, 2023
13. Michael Clark, Mechanical Engineering, NU, 2022
14. Luke Hase, Mechanical Engineering, ASU, 2021 – 2022
15. Newton Tam, Mechanical Engineering, ASU, 2021 – 2022

TEACHING ACTIVITIES

Certificate

Center for the Integration of Research, Teaching and Learning (CIRTL) Associate, NU, 2023

Assistant Instructor

1. ME 341 Computational Methods for Engineering Design (prepared slides, homework, quiz, and projects, grade, and gave lectures), NU, 2023
2. Engineering Design Under Uncertainty (gave lectures to Lab), NU, 2023
3. MAE 548 Probabilistic Methods for Engineering Design and Analysis (gave lectures on fundamental probability and Bayesian statistics), ASU, 2022
4. ASU 101 The ASU Experience (led lab tours), ASU, 2022

WORKSHOPS

1. Artificial Intelligence for Materials Science workshop, online, National Institute of Standards and Technology, 2023
2. Mentored Discussions of Teaching, Northwestern University, 2023
3. Artificial Intelligence for Materials Science, online, National Institute of Standards and Technology, 2022
4. Machine Learning for Materials Research, online, University of Maryland, 2022
5. Responsible Conduct for Research Training, online, Northwestern University, 2022