

Curriculum Vitae

Name: Chao Hu
Title: Collins Aerospace Professor in Engineering Innovation
Associate Professor
School of Mechanical, Aerospace, and Manufacturing Engineering
University of Connecticut
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Research Interests

- Engineering Design under Uncertainty, Prognostics and Health Management (PHM), Physics-Informed Machine Learning for PHM, Design for Failure Recovery of Lithium-ion Batteries

Education

- **Ph.D., Mechanical Engineering** *Aug. 2007–Aug. 2011*
University of Maryland, College Park, MD
Dissertation Title: “Advances in System Reliability-Based Design and Prognostics and Health Management (PHM) for System Resilience Analysis and Design”
Advisor: Dr. Byeng D. Youn Co-Advisor: Dr. Bongtae Han
- **B.E., Engineering Physics** *Sep. 2003–Jul. 2007*
Tsinghua University, Beijing, China

Work Experience

- **Associate Professor**, University of Connecticut, CT *Aug. 2022–Present*
- **Associate Professor**, Iowa State University, IA *Aug. 2021–Aug. 2022*
- **Assistant Professor**, Iowa State University, IA *Aug. 2015–Aug. 2021*
- **Principal Scientist**, Medtronic, Inc., MN *Jun. 2014–Jul. 2015*
- **Senior Reliability Engineer**, Medtronic, Inc., MN *Oct. 2011–May 2014*
- **Graduate Research Assistant**, University of Maryland, College Park, MD *Aug. 2007–Aug. 2011*
- **Researcher and Co-Teacher**, Seoul National University, Seoul, South Korea *Sep. 2010–May 2011*

Awards and Recognitions

- Collins Aerospace Professor in Engineering Innovation (University of Connecticut) *2024–2027*
- Best Student Paper Award (Annual Reliability & Maintainability Symposium) *2023*
- Highly Cited Research Paper 2020 (Applied Energy) *2022*
- Papers of Distinction Award – 9 out of 118 Accepted (ASME Design Automation Conference) *2022*
- ASME Reviewers of the Year Award (Journal of Mechanical Design) *2019*
- Best Track Paper Award (IISE Annual Conference, Engineering Economy Track) *2019*
- ASME Design Automation Young Investigator Award *2018*
- NSF CISE Research Initiation Initiative (CRII) Award *2016*

- Highly Cited Research Paper 2012-2013 (Applied Energy) 2015
- Star of Excellence Individual Award (Medtronic, Inc.) 2014
Awarded to 2 out of over 20,000 employees
- Ford Motor Company - Best Paper Award (ASME Design Automation Conference) 2013
- Best Paper Award (IEEE PHM Conference, IEEE Reliability Society) 2012
- Nomination of Eni Award 2013: “Nobel Prize of Energy Research” (Eni Award Commission) 2012
- Top 10 Best Paper Award out of 118 Accepted (ASME Design Automation Conference) 2012
- Top 10 Best Paper Award out of 122 Accepted (ASME Design Automation Conference) 2011
- C. Raymond Knight Scholarship Award (University of Maryland, College Park) 2010

Teaching Experience

- **Instructor**, University of Connecticut *Jan. 2023 –Present*
 Probabilistic Machine Learning for Engineering Design and Health Prognostics, Spring 2024 (11 graduate students, N.A.)
 Design of Machine Elements, Fall 2023 (41 undergraduate students, 3.8 out of 5)
 Basic Concepts of Continuum Mechanics, Spring 2023 (27 graduate students, 4.1)
- **Instructor**, Iowa State University *Sep. 2015 –Present*
 Mechanical Component Design, Spring 2022 (52 undergraduate students, student rating: 4.3 out of 5)
 Probabilistic Engineering Analysis and Design, Spring 2022 (12 graduate students, 4.67)
 Manufacturing Engineering, Spring 2021 (49 undergraduate students, student rating: 4.6)
 Mechanical Component Design, Fall 2020 (63 undergraduate students, student rating: 3.9)
 Probabilistic Engineering Analysis and Design, Spring 2020 (10 graduate students, N.A.)
 Manufacturing Engineering, Fall 2019 (75 undergraduate students, 4.6)
 Mechanical Component Design, Fall 2019 (52 undergraduate students, 4.2)
 Probabilistic Engineering Analysis and Design, Spring 2019 (20 graduate students, 4.5)
 Mechanical Component Design, Fall 2018 (74 undergraduate students, 3.8)
 Probabilistic Engineering Analysis and Design, Spring 2018 (15 graduate students, 4.9)
 Mechanical Component Design, Fall 2017 (75 undergraduate students, 4.3)
 Mechanical Component Design, Spring 2017 (88 undergraduate students, 4.0)
 Manufacturing Engineering, Fall 2016 (81 undergraduate students, 4.1)
 Manufacturing Engineering, Spring 2016 (89 undergraduate students, 4.4)
 Manufacturing Engineering, Fall 2015 (59 undergraduate students, 4.0)
- **Co-Teacher**, Seoul National University *Sep. 2010 –May. 2011*
 Engineering Mathematics (undergraduate course with 45 students)
 Advances in Reliability-Based Design (graduate course with 12 Students)
- **Teaching Assistants**, University of Maryland, College Park *Sep. 2007 –Aug. 2009*
 Thermodynamics (undergraduate course with 32 Students)
 Electronics and Instrumentation II (undergraduate course with 26 Students)
 Statistical Methods for Product Development (two undergraduate courses with 87 students in total)
 Fluid Mechanics (undergraduate course with 29 students)

Advising Experience

(* denotes my role as students' co-advisors)

▪ Postdocs

Name	Research Topic, Current Job	Expected Date of Completion
Dr. Steve Paul	Deep Learning and IIoT for Bearing Prognostics	<i>Feb. 2025</i>
Dr. Mohammad S. Behtash	Design for Remanufacturing and Battery Charging Control	<i>Apr. 2024</i>
Dr. Venkat P. Nemani	Deep Learning and IIoT for Bearing Prognostics, Data Scientist at Corteva Agriscience	<i>Oct. 2019 – Mar. 2022 (Completed)</i>
Dr. Zhixiong Li	Ensemble Learning for Machinery Failure Prognostics, Faculty of Mechanical Engineering at Opole University of Technology, Opole, Poland	<i>Sep. 2016 – Sep. 2017 (Completed)</i>

▪ Ph.D. Students

Name	Dissertation Title/Topic, Current Job	Expected Date of Completion
Benjamin Nowacki	Physics-Informed Machine Learning for Battery Fast Charging	<i>Dec. 2026</i>
Yang Kang Chua	Real-Time Machine Learning for Structural Health Monitoring	<i>Aug. 2026</i>
Austin Bray	Digital Twins for Predictive Maintenance (Co-Advisor: Dr. Hongyi Xu)	<i>Aug. 2026</i>
Sina Navidi	Physics-Informed Machine Learning for Battery Degradation Diagnostics	<i>Aug. 2026</i>
Tingkai Li	Machine Learning for Battery Life Prediction	<i>Aug. 2025</i>
Adam Thelen	Machine learning-based aging models for estimating battery state of health and predicting future degradation	<i>Aug. 2023 (Graduated)</i>
Hao Lu	Advances in Deep Learning and IIoT Toward Industry-Scale Machine Health Monitoring	<i>May 2023 (Graduated)</i>
Jinqiang Liu	Data-driven early prediction and modeling of lithium-ion battery capacity degradation (Co-Advisor: Dr. Zhaoyu Wang)	<i>Dec. 2022 (Graduated)</i>
Vahid Barzegar*	Real-Time Machine Learning for High-Rate State Estimation (Advisor: Dr. Simon Laflamme)	<i>Dec. 2022</i>
Dr. Todd Thompson	Comparative Studies on Fatigue Strength Estimation and Kriging-Assisted Reliability-Based Design Optimization, Staff Applied Mechanics Engineer at John Deere	<i>Aug. 2022 (Graduated)</i>
Dr. Yu-Hui Lui*	Computational and Data-Enabled Approaches for Modeling and Prognostics of Engineered Systems (Advisor: Dr. Shan Hu)	<i>Dec. 2021 (Graduated)</i>
Dr. Sheng Shen	Data-Driven Approaches for Battery State Estimation and Early Cycle Life Prediction, Machine Learning Engineer at Tula Technology	<i>Nov. 2020 (Graduated)</i>
Dr. Meng Li	Advances in Reliability Analysis and Health Prognostics Using Probabilistic Machine Learning, Data Scientist at National Oilwell Varco	<i>Jun. 2020 (Graduated)</i>

Name	Dissertation Title/Topic, Current Job	Expected Date of Completion
Dr. Mohammad K. Sadoughi	Data-Driven Approaches for Improving Failure Resilience of Engineered Systems, Research Scientist at Amazon	May 2019 (Graduated)
Dr. Austin Downey	Dense Sensor Networks for Health Monitoring and Prognostics of Mesoscale Structures (Co-Advisor: Dr. Simon Laflamme), Assistant Professor at the University of South Carolina	Jul. 2018 (Graduated)

▪ M.S. Students

Name	Dissertation Title/Topic	Date of Completion
Ankush Mishra	Design and Multistage Decision Making for Remanufacturing	May 2023 (Graduated)
Matthew Nelson*	Multi-step ahead state estimation with hybrid algorithm for high-rate dynamic systems (Advisor: Dr. Simon Laflamme)	Aug. 2022 (Graduated)
Yifei Li	Ensemble Bias-Correction based State of Charge Estimation of Lithium-Ion Batteries	Dec. 2017 (Graduated)
Sumin Seong*	Design Optimization Under Uncertainty for Reliable Power Generation Performance of Piezoelectric Energy Harvester (Advisor: Dr. Soobum Lee at the University of Maryland, Baltimore County)	May 2015 (Graduated)

▪ Undergraduates

Name	Research Topic	Date of Completion
Benjamin Lombard Akshay Zaveri Mohammad Mundiwala Aidan Lawlor	Basics of Machine Learning	Dec. 2023
Rithin Armstrong Benjamin Nowacki Charli Zaretsky	Machine Learning for Battery Life Prediction	May 2023
Gabriel Fountain Cade Allen	Algorithms for Reliability-Based Design Optimization Physics-Informed Deep Learning for Bearing Failure Prognostics	Dec. 2022 May 2022
Austin Bray Jacob Claus Khai Shawn Khaw	Machine Learning for Bearing Failure Prognostics Machine Learning for Battery Early Life Prediction	May 2022 May 2022
Tingkai Li Kate Lyon	Machine Learning for Battery Early Life Prediction Machine Learning for Battery Early Life Prediction	Dec. 2021 May 2021
Evan Hartman Austin Bray	Machine Learning for Bearing Failure Prognostics	May 2021
Adam Thelen	Recurrent Neural Network for Real-Time State Estimation	May 2020

Name	Research Topic	Date of Completion
Yingying Huang Amrita Ghosh Carter Foughty	On-board Monitoring and Correction of Shaft Unbalance	May 2020
Tyler Markve Patrick Black	Battery Lifetime Prediction Using Dynamic Charge/Discharge Profiles	May 2020
Nick Schnoebelen Jonathan McGill	Physics-Informed Deep Learning for Bearing Failure Prognostics	Dec. 2019
Martin Martinez	Physics-Informed Deep Learning for Bearing Fault Diagnostics	Aug. 2019
Dalton Louks	Machine Learning for Bearing Fault Diagnostics	May 2019
Zhi-Fang Tan	Deep Learning for State-of-Health Monitoring of Lithium-Ion Battery	Dec. 2018
Jhamaree Elam	Data-Driven Prognostics of Lithium-Ion Battery Using Gaussian Process Regression	Aug. 2018
Max Hendricks	Deep Learning for Bearing Fault Diagnostics	Aug. 2018
Garrett D. Bunge Aditya K. Ranawat	Deep Learning for Bearing Fault Diagnostics	May 2018
Olivia Pfeiffer	Prognostics of Bearings in Wind Turbine Gearboxes	Aug. 2017
Nicole Essner Nolgie O.O. Colón	Vibration-based Fault Diagnostics and Failure Prognostics of Wind Turbine Gearbox	Aug. 2016
Jajun Ryu	Maximum Entropy Modeling with Discrete Data	May 2016
Ha Lim Jeong Cole J. Tenold Stetsen Greiner	Online Detection of Lithium Plating for Lithium-Ion Battery through High Precision Coulometry	May 2016
John Bavlsik	Data-Driven Prognostics of Lithium-Ion Battery Using Bilinear Kernel Regression	Dec. 2015

Research Grants

[†] Denotes industry-sponsored project.

[‡] Denotes industry collaboration involved (no industry funding).

Overview: PI/Co-PI on 30 research grants totaling \$6.9M, including from government agencies (NSF, DOE, DOT, and DOD) and industry. Among them, Hu's share supporting his activities is about \$4.1M, of which the total amount serving as PI is about \$3.5M.

Title of Grant, Role	Agency	Dollar Amount	Beginning and End Dates
Collaborative Research: Concurrent Design Integration of Products and Remanufacturing Processes for Sustainability and Life Cycle Resilience [‡] , UConn PI (UIUC PI: Dr. Yumeng Li)	National Science Foundation	\$240,000	05/2024–04/2027
Battery State of Health and Remaining Useful Life Estimation [†] , sole PI	The MathWorks, Inc.	\$120,000	08/2023–08/2026

Title of Grant, Role	Agency	Dollar Amount	Beginning and End Dates
Data-Driven Design Decision Support for Remanufacturing of High-Value Components in Industrial and Agricultural Equipment [‡] , PI (UD PI: Gül E. Kremer, UIUC PIs: Pingfeng Wang and Harrison Kim, Mississippi State PI: Junfeng Ma)	Department of Energy	\$505,796	04/2023–03/2025
STTR Phase II: Probabilistic and Explainable Deep Learning for the Intuitive Predictive Maintenance of Industrial and Agricultural Equipment [‡] , Co-PI (PI: Andrew Zimmerman at Grace Technologies)	National Science Foundation	\$1M	12/2022–12/2024
Topology-Aware Learning and Modeling of High-Rate Dynamic Systems, PI (Co-PI: Simon Laflamme)	Air Force Office of Scientific Research	\$540,000	08/2022–08/2025
CDS&E: Health-Aware Optimization of Battery Charging for Proactive Prevention of Lithium Plating, PI (Co-PIs: Pranav Shrotriya and Cajetan I Nlebedim)	National Science Foundation	\$396,312	08/2022–07/2025
Physics-Based Probabilistic Prognostics for Battery Health Management [‡] , UConn PI (ISU PI: Shan Hu, ISU Co-PI: Simon Laflamme)	National Science Foundation	\$384,825	08/2022–05/2024
RTML: Small: Collaborative: A Programming Model and Platform Architecture for Real-time Machine Learning for Sub-second Systems, UConn PI (ISU PI: Simon Laflamme)	National Science Foundation	\$240,000	08/2022–09/2024
Predicting Battery Lifetime with Early-Life Data for Grid Applications [‡] , UConn PI (ISU PIs: Anne Kimber, Zhaoyu Wang, and Gül E. Kremer)	Iowa Economic Development Authority	\$280,070	08/2022–01/2024
From the Landfill to the Grid: Repurposing Used Batteries for Resilient Grid Storage [‡] , UConn PI (ISU PI: Cary Pint)	Iowa Economic Development Authority	\$294,859	12/2021–12/2023
Quantification of financial and environmental benefits tradeoff in multi-generational product family development considering Re-X performances [‡] , ISU Co-PI (UIUC PIs: Harrison Kim and Pingfeng Wang, ISU PI: Gül E. Kremer)	Department of Energy	\$500,000	07/2021–06/2023
Design Iteration Support Tool to Sustain Remanufacturability [‡] , Co-PI (PI: Gül E. Kremer, Other Co-PIs: Kyung J. Min and Matthew C. Frank)	Department of Energy	\$248,638	07/2021–06/2023
STTR Phase I: Probabilistic and Explainable Deep Learning for the Intuitive Predictive Maintenance of Industrial and Agricultural Equipment [‡] , Co-PI (PI: Andrew Zimmerman at Grace Technologies)	National Science Foundation	\$256,000	12/2020–11/2021
Deep Learning and IIoT for Predictive Maintenance of Industrial Equipment (Phase II) [†] , sole PI	Iowa Regents Innovation Fund	\$100,000	07/2020–05/2021
Onboard Monitoring of Shaft Unbalance and Bearing Health (Phase 2) [†] , sole PI	Vermeer Corporation	\$85,000	08/2020–08/2021

Title of Grant, Role	Agency	Dollar Amount	Beginning and End Dates
Data-Driven Design Decision Support for Re-X of High-Value Components in Industrial and Agricultural Equipment [‡] , PI (Co-PI: Gül E. Kremer) [REMADE Project Showcase]	Department of Energy	\$100,000	09/2019–09/2020
Onboard Monitoring of Shaft Unbalance and Bearing Health (Phase 1) [†] , sole PI	Vermeer Corporation	\$35,000	09/2019–03/2020
PFI-TT: Physics-based Deep Transfer Learning for Predictive Maintenance of Industrial and Agricultural Machinery [‡] , PI (Co-PIs: Matthew J. Darr, Simon Laflamme, and Carey E. Novak)	National Science Foundation	\$290,094	08/2019–01/2022
Deep Learning and IIoT for Predictive Maintenance of Industrial Equipment [†] , sole PI	Iowa Regents Innovation Fund	\$105,800	07/2019–07/2020
Reliability Analysis of Hydraulic Drive Systems (Phase II) [†] , sole PI	Deere & Company	\$35,000	06/2019–09/2019
Intelligent Fault Diagnostics of Rolling-Element Bearings [†] , sole PI	Grace Engineered Products and ISU	\$39,351	01/2019–09/2019
High-Fidelity Performance/Degradation Modelling of Utility-Scale Battery Energy Storage Systems, PI (Co-PIs: Zhaoyu Wang and Venkataramana Ajjarapu)	Electric Power Research Center	\$162,000	07/2018–06/2021
Reliability Analysis of Hydraulic Drive Systems [†] , sole PI	Deere & Company	\$98,000	01/2018–04/2019
Validation of Computer Models for Engineering Systems with Multiple Dynamic Responses, sole PI	Center for e-Design	\$15,000	09/2017–09/2018
Predictive Modeling with Automated Analytics for Intelligent Bearing Prognostics [†] , sole PI	Iowa Regents Innovation Fund	\$50,000	07/2017–05/2018
Data-Driven Dynamic Reliability Assessment of Lithium-Ion Battery Considering Degradation Mechanisms [‡] , PI (Co-PI: Shan Hu)	National Science Foundation	\$330,000	08/2016–07/2020
Efficient Reliability-based Design Optimization of Engineered Systems with Multiple Inter-Dependent Components, sole PI	Center for e-Design	\$30,000	08/2016–08/2018
Lifetime Prediction of Hybrid Energy Storage Devices in Operating and Storage Conditions [‡] , ISU PI (Prime Contractor: Carbon Solutions Inc.)	US Army SBIR Phase II	\$120,000	07/2016–07/2021
CRII: CPS: Designing Complex Cyber-Physical Systems for Failure Resilience, sole PI [NSF Computer Systems Research Spotlight Project]	National Science Foundation	\$175,000	06/2016–05/2019
Model Validation and Uncertainty Quantification of Medical Devices [†] , sole PI	Medtronic	\$30,000	06/2016–03/2018
On-Board Prediction of Remaining Useful Life of Lithium-Ion Battery, sole PI	Department of Transportation	\$50,000	03/2016–02/2017

Publications

+ Denotes student/postdoc co-author.

* Denotes corresponding author.

- Overview: 81 journal articles published/accepted; one book, three book chapters; two US patents filed and one patent pending; four paper awards.
- Citation Highlights (statistics as of December 2023): Google Scholar citations: $h = 37$, and 5,754 cites in total; several journal articles were among the top 3% most cited articles of the respective journals; a total of 16 articles had received more than 100 cites each per the Google Scholar data.

Journal Articles (Under Review/Revision)

1. Razmarashooli A.*, Chua Y.K.⁺, Barzegar V.⁺, Salazar D., Laflamme S., Hu C., Downey, A., Dodson J., and Schrader P.T., “Real-Time State Estimation of Nonstationary Systems Using Topological Data Analysis Features,” Under Review, *Mechanical Systems and Signal Processing*, 2024.
2. Yazdekhashti A., Fussell L., Hu C., Kremer G.E., and Ma J.*, “Incorporating Truck-Drone Bimodal Delivery System into Mobile Additive Manufacturing Considering Preferred Delivery Time-Window and Optimal Printing Sequence Corresponding,” Under Review, *International Journal of Production Economics*, 2023.
3. Liu J.⁺, Thelen A.⁺, Mishra, A.⁺, Hu C.*, Yang X.G., and Wang Z., “Empirical Capacity Fade Knowledge-Augmented End-to-end Learning for Battery Early Capacity-Trajectory Prediction,” Under Review, *eTransportation*, 2023.
4. Tabassum M., Nemani V.P.⁺, Hu C., and Kremer G.E.*, “A Novel Design Optimization Framework to Sustain Remanufacturability,” Under Revision, *Journal of Cleaner Production*, 2023.

Journal Articles (Published/Accepted)

5. Navidi S.⁺, Thelen A.⁺, Li T.⁺, and Hu C.*, “Physics-Informed Machine Learning for Battery Degradation Diagnostics: A Comparison of State-of-the-Art Methods,” *Energy Storage Materials*, v68, p.103343 (27pp), 2024.
6. Thelen A.⁺, Huan X., Paulson N., Onori S., Hu Z., and Hu C.*, “Probabilistic Machine Learning for Battery Prognostics: Review and Perspectives,” Accepted, *npj Materials Sustainability*, 2024.
7. Li T.⁺, Zhou Z.⁺, Thelen A.⁺, Howey, D. and Hu C.*, “Predicting Battery Lifetime under Varying Usage Conditions from Early Aging Data,” v5, n4, 2024, p.101891 (23pp), *Cell Reports Physical Science*, 2024.
8. Behtash M.⁺, Liu X., Wang P., and Hu C.*, “Reman Co-Design: A Combined Design and Remanufacturing Optimization Framework for the Sustainable Design of High-Value Components,” *Journal of Mechanical Design*, v146, n2, p.020901 (13pp), 2024.
9. Lu H.⁺, Thelen A.⁺, Fink O., Hu C.*, and Laflamme S., “Federated Learning with Uncertainty-Based Client Clustering for Fleet-Wide Fault Diagnosis,” *Mechanical Systems and Signal Processing*, v210, 111068 (25pp), 2024.
10. Nemani V.⁺, Biggio L., Huan X., Hu Z., Fink O., Tran A., Wang Y., Du X., Zhang X.*, and Hu C.*, “Uncertainty Quantification in Machine Learning for Engineering Design and Health Prognostics: A Tutorial,” *Mechanical Systems and Signal Processing*, v205, p.110976, 2023.
11. Thelen A.⁺, Zohair M., Ramamurthy J., Jiao W., Ojha M., Ishtiaque M.U., Kingston T.A., Pint C.L.*, and Hu C.*, “Sequential Bayesian Optimization for Accelerating the Design of Sodium Metal Battery Nucleation Layers,” *Journal of Power Sources*, v581, 233508 (14pp), 2023.
12. Mishra A.⁺, Liu X., Hu C., and Wang P.*, “Reliability-Informed End-of-Use Decision Making for a Product Family Using Two-stage Stochastic Optimization,” *Applied Mathematical Modeling*, v121, p364–385, 2023.

13. Lu H.⁺, Nemani V.P.⁺, Barzegar V.⁺, Allen C.⁺, Hu C.*[,] Laflamme S., Sarkar S., and Zimmerman A.T., “A physics-informed feature weighting method for bearing fault diagnostics,” *Mechanical Systems and Signal Processing*, v191, p.110171, 2023.
14. Nemani V.P.⁺, Thelen A.⁺, Hu C.*[,] and Daining S., “Degradation-Aware Ensemble of Diverse Learners for Remaining Useful Life Prediction,” *Journal of Mechanical Design*, v145, n3, p.031706, 2023.
15. Thompson T.*[,] Liu J.⁺, and Hu C., “A Comparative Analysis of Step Stress and Staircase Testing for Fatigue Strength Estimation of an Engine Component,” *Fatigue & Fracture of Engineering Materials & Structures*, v46, n2, p667–681, 2023.
16. Thelen A.⁺, Zhang X., Fink O., Lu Y., Ghosh S., Youn B.D., Todd M.D., Mahadevan S., Hu C., and Hu Z.*[,] “A Comprehensive Review of Digital Twin - Part 2: Roles of Uncertainty Quantification and Optimization, a Battery Digital Twin, and Perspectives,” *Structural and Multidisciplinary Optimization*, v66, n1, p.1 2023.
17. Nelson M.⁺, Laflamme S.*[,] Hu C., Moura A.G., Hong J., Downey A., Lander P., Wang Y., Blasch E. and Dodson J., “Generated datasets from dynamic reproduction of projectiles in ballistic environments for advanced research (DROPBEAR) testbed,” *IOP SciNotes*, v3, n4, p.044401, 2022.
18. Thelen A.⁺, Zhang X., Fink O., Lu Y., Ghosh S., Youn B.D., Todd M.D., Mahadevan S., Hu C.*[,] and Hu Z., “A Comprehensive Review of Digital Twin - Part 1: Modeling and Twinning Enabling Technologies,” *Structural and Multidisciplinary Optimization*, v65, n12, p354, 2022.
19. Lui Y.H.⁺, Shahriar M., Pan Y., Hu C., and Hu S.*[,] “Surrogate Modeling of Acoustic Field-Assisted Particle Patterning Process with Physics-Informed Encoder-Decoder Approach,” *Structural and Multidisciplinary Optimization*, 65(11), p.333, 2022.
20. Nemani V.P.⁺, Bray, A.⁺, Thelen A.⁺, Hu C.*[,] and Daining S., “Health Index Construction with Feature Fusion Optimization for Predictive Maintenance of Physical Systems,” *Structural and Multidisciplinary Optimization*, 65(12), p.349, 2022.
21. Thelen A.⁺, Li M.⁺, Hu C.*[,] Bekyarova E., Kalinin S., and Sanghadasa M., “Augmented model-based framework for battery remaining useful life prediction,” *Applied Energy*, v324, 119624 (pp18), 2022.
22. Nelson M.*[,] Barzegar V.⁺, Laflamme S., Hu C., Downey A., Bakos J., Thelen A.⁺, and Dodson J., “Multi-Step Ahead State Estimation with Hybrid Algorithm for High-Rate Dynamic Systems,” *Mechanical Systems and Signal Processing*, v182, 109536 (14pp), 2022.
23. Lu H.⁺, Barzegar V.⁺, Nemani V.P.⁺, Thelen A.⁺, Hu C.*[,] Laflamme S., and Zimmerman A., “Joint training of a predictor network and a generative adversarial network for time series forecasting: A case study of bearing prognostics,” *Expert Systems with Applications*, v203, 117415 (pp19), 2022.
24. Thelen A.⁺, Lui Y.H.⁺, Shen S.⁺, Laflamme S., Hu S., and Hu C.*[,] “Integrating Physics-Based Modeling and Machine Learning for Degradation Diagnostics of Lithium-Ion Batteries,” *Energy Storage Materials*, v50, p668–695, 2022.
25. Nemani V.P.⁺, Liu J.⁺, Ahmed N., Cartwright A., Kremer G.E., and Hu C.*[,] “Reliability-Informed Economic and Energy Evaluation for Bi-Level Design for Remanufacturing: A Case Study of Transmission and Hydraulic Manifold,” *Journal of Mechanical Design*, v144, n8, 08214 (17pp), 2022.
26. Nemani V.P.⁺, Lu H.⁺, Thelen A.⁺, Hu C.*[,] and Zimmerman A., “Ensembles of Probabilistic LSTM Predictors and Correctors for Bearing Prognostics Using Industrial Standards,” *Neurocomputing*, v491, p575–596, 2022.
27. Giahri R.*[,] MacKenzie C., and Hu C., “Optimizing the Flexible Design of Hybrid Renewable Energy Systems,” *Engineering Economist*, v67, n1, p25–51, 2022.
28. Barzegar V.*[,] Laflamme S., Hu C., and Dodson J., “Ensemble of Recurrent Neural Networks with Long Short-Term Memory Cells for High-Rate Structural Health Monitoring,” *Mechanical Systems and Signal Processing*, v164, 108201 (15pp), 2022.
29. Yang Y.H., Wei H.P., Han B.*[,] and Hu, C., “Implementation and Performance Evaluation of a Bivariate

- Cut-HDMR Metamodel for Semiconductor Packaging Design Problems with a Large Number of Input Variables,” *Materials*, v14, n16, 4619 (16pp), 2021.
30. Shen S.⁺, Lu H.⁺, Sadoughi M.⁺, Hu C.*⁺, Nemani V.⁺, Thelen A.⁺, Webster K., Darr M., Kenny S., and Sidon J., “A Physics-Informed Deep Learning Approach for Bearing Fault Detection,” *Engineering Applications of Artificial Intelligence*, v103, 104295 (15pp), 2021.
 31. Li M.⁺, Shen S.⁺, Barzegar V.⁺, Sadoughi M.⁺, Hu C.*⁺, and Laflamme S., “Kriging-Based Reliability Analysis Considering Predictive Uncertainty Reduction,” *Structural and Multidisciplinary Optimization*, v63, p2721–2737, 2021.
 32. Li M.⁺, Nemani V.P.⁺, Liu J.⁺, Lee M.A., Ahmed N., Kremer G.E., and Hu C.*⁺, “Reliability-Informed Life Cycle Warranty Cost and Life Cycle Analysis of Newly Manufactured and Remanufactured Units,” *Journal of Mechanical Design*, v143, n11, 112001 (14pp), 2021.
 33. Barzegar V.*⁺, Laflamme S., Hu C., and Dodson J., “Multi-time Resolution Ensemble LSTMs for Enhanced Feature Extraction in High-Rate Time Series,” *Sensors*, v21, n6, 1954 (18pp), 2021.
 34. Gargh P., Sarkar A., Lui Y.H.⁺, Shen S.⁺, Hu C., Hu S., Nlebedim I.C., and Shrotriya P.*⁺, “Correlating Capacity Fade with Film Resistance Loss in Fast Charging of Lithium-ion Battery,” *Journal of Power Sources*, v485, 229360 (7pp), 2021.
 35. Lui Y.⁺, Li M.⁺, Downey A.⁺, Shen S.⁺, Nemani V.P.⁺, Ye H., VanElzen C., Jain G., Hu S., Laflamme S., and Hu C.*⁺, “Physics-Based Prognostics of Implantable-Grade Lithium-Ion Battery for Remaining Useful Life Prediction,” *Journal of Power Sources*, v485, 229327 (15pp), 2021.
 36. Liu J.⁺, Hu C.*⁺, Kimber A., and Wang Z., “Uses, Cost-Benefit Analysis, and Markets of Energy Storage Systems for Electric Grid Applications,” *Journal of Energy Storage*, v32, 101731 (16pp), 2020.
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51. Xi Z.*, Jing R., Wang P., and Hu C., “A Copula-based Sampling Method for Data-driven Prognostics and Health Management,” *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 4-7 2013, Portland, OR. **[Ford Motor Company - Best Paper Award]**
52. Youn B.D.*, Park K.M., Hu C., Yoon, J.T., and Bae Y.C., “Health Diagnostics of Water-Cooled Power Generator Stator Windings Using a Directional Mahalanobis Distance (DMD),” *2013 IEEE International Conference on Prognostics and Health Management (PHM)*, Jun 24-27 2013, Gaithersburg, MD.
53. Hu C., Youn B.D.*, and Kim T., “Statistical Health Grade System against Mechanical failures of Power Transformers,” *Annual Conference of the Prognostics and Health Management (PHM) Society 2012*, Sep 23-27 2012, Minneapolis, MN.
54. Hu C., Youn B.D.*, Wang P., and Yoon, J.T., “An Ensemble Approach for Robust Data-Driven Prognostics,” *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 12-15 2012, Chicago, DC. **[Top 10 Best Paper Award out of 122 Accepted]**
55. Hu C., Youn B.D.*, and Kim T., “Semi-Supervised Learning with Co-Training for Data-Driven Prognostics,” *2012 IEEE International Conference on Prognostics and Health Management (PHM)*, Jun 18-21 2012, Denver, CO. **[Best Paper Award]**

56. Hu C., Youn B.D.*, and Chung J., "Online Estimation of Lithium-Ion Battery State-of-Charge and Capacity with a Multiscale Filtering Technique," *Annual Conference of the Prognostics and Health Management (PHM) Society 2011*, Sep 25-29 2011, Montreal, Canada.
57. Hu C., Youn B.D.*, and Kim T., "Semi-Supervised Learning with Co-Training for Data-Driven Prognostics," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 28-31 2011, Washington, DC.
58. Youn B.D.*, Hu C., and Wang P., "Resilience-Driven System Design of Complex Engineered Systems," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 28-31 2011, Washington, DC. [**Top 10 Best Paper Award out of 118 Accepted**]
59. Hu C. and Youn B.D.*, "An Asymmetric Dimension-Adaptive Tensor-Product Method for Reliability Analysis," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 28-31 2011, Washington, DC.
60. Youn B.D.*, Hu C., and Wang P., "Resilience-Driven System Design of Complex Engineered Systems," *9th World Congress on Structural and Multidisciplinary Optimization (WCSMO-9)*, June 13-17 2011, Granship, Shizuoka, Japan.
61. Wang P., Youn B.D.*, and Hu C., "A Probabilistic Detectability-Based Structural Sensor Network Design Methodology for Prognostics and Health Management," *Annual Conference of the Prognostics and Health Management (PHM) Society 2010*, Oct 10-16 2010, Portland, OR.
62. Hu C., Youn B.D.*, and Wang P., "Ensemble of Data-Driven Prognostic Algorithms with Weight Optimization and K-Fold Cross Validation," *Annual Conference of the Prognostics and Health Management (PHM) Society 2010*, Oct 10-16 2010, Portland, OR.
63. Wang P., Youn B.D.*, and Hu C., "A Generic Sensor Network Design Framework Based on a Detectability Measure," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 15-18 2010, Montreal, Quebec, Canada.
64. Hu C., Youn B.D.*, and Wang P., "Ensemble of Data-Driven Prognostic Algorithms with Weight Optimization and K-Fold Cross Validation," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 15-18 2010, Montreal, Quebec, Canada.
65. Xi Z., Youn B.D.*, and Hu C., "Effective Random Field Characterization Considering Statistical Dependence for Probability Analysis and Design," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 15-18 2010, Montreal, Quebec, Canada.
66. Hu C., Youn B.D.*, Chung J., and Ortanez R., "A Multiscale Framework with Extended Kalman Filter for Lithium-Ion Battery SOC and Capacity Estimation," *15th International Meeting on Lithium Batteries (IMLB)*, June 27-July 2 2010, Montreal, Quebec, Canada.
67. Hu C. and Youn B.D. *, "An Asymmetric Dimension-Adaptive Tensor-Product Method for Reliability Analysis," *AIAA 2010-2109, 51th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, Apr 12-15 2010, Orlando, FL.
68. Hu C. and Youn B.D. *, "Adaptive-Sparse Polynomial Chaos Expansion for Reliability Analysis and Design of Complex Engineering Systems," *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, Aug 30-Sep 2 2009, San Diego, CA.
69. Wang P., Youn B.D. *, and Hu C., "A Generalized Complementary Intersection Method (CIM) for System Reliability Analysis," *AIAA 2009-2109, 50th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, May 4-7 2009, Palm Springs, CA.

Invited Talks

1. Hu C., “Uncertainty-Aware Federated Learning for Machine Health Monitoring,” *8th Intelligent Maintenance Conference*, Sep 13 2023, Lausanne, Switzerland.
2. Hu C., “Physics-Informed Machine Learning for Battery Degradation Diagnostics,” *Honda Research Institute Europe*, Jun 22 2023, Offenbach am Main, Germany.
3. Hu C., “Physics-Informed Machine Learning for Battery Degradation Diagnostics: A Comparative Study,” *2023 Battery Safety Workshop*, Jun 9 2023, Charlotte, NC.
4. Hu C., “Physics-Informed Machine Learning for Battery Degradation Diagnostics,” *Research Seminar Series by the Department of Industrial and Systems Engineering at PolyU*, Apr 25 2023, hosted online.
5. Hu C., “Integrating Physics-Based Modeling and for Degradation Diagnostics of Lithium-ion Batteries,” *40th Annual International Battery Seminar & Exhibit*, Mar 23 2023, Orlando, FL.
6. Hu C., “Physics-Informed Machine Learning for Battery Degradation Diagnostics,” *Research Seminar Series by the Department of Mechanical Engineering at Indian Institute of Technology Kanpur (IIT Kanpur)*, Mar 3 2023, hosted online.
7. Hu C., “Physics-Informed Machine Learning for Battery Degradation Diagnostics and Early Life Prediction,” *Data Science Seminar at Beyond Limits*, Jan 11 2023, hosted online.
8. Hu C., “Battery Capacity Forecasting and Early Life Prediction,” *12th Annual Battery Safety Summit*, Oct 14 2022, Tysons Corner, VA.
9. Hu C., “Physics-Informed Machine Learning for Degradation Diagnostics,” *K1st World Symposium*, Nov 17 2022, Stanford, CA.
10. Hu C., “Physics-Informed Machine Learning for Battery Prognostics – Challenges, Data Acquisition, and Methodologies,” *Joint 9th IFAC Symposium on Mechatronic Systems and 16th International Conference on Motion and Vibration Control*, Sep 8 2022, Los Angeles, CA.
11. Hu C., “Physics-Informed Machine Learning for Battery Degradation Diagnostics and Prognostics,” *2nd Digital Twin International Conference (DigiTwin 2022)*, Sep 27 2022, hosted online.
12. Hu C., “Physics-Informed Machine Learning for Battery Prognostics – Challenges, Data Acquisition, and Methodologies,” School of Mechanical Engineering, Xi’an Jiaotong University, Jun 9 2022, hosted online.
13. Hu C., “Physics-informed machine learning for battery prognostics – challenges, data acquisition, and methodologies,” *2022 IEEE International Conference on Prognostics and Health Management (PHM)*, Jun 8 2022, hosted online. [**Tutorial Presentation**]
14. Hu C., “Physics-Informed Machine Learning for Battery Health Prognostics – Challenges, Data Acquisition, and Methodologies,” *2021 GIST Mini Symposium on Artificial Intelligence for Mechanical Engineering*, Dec 9 2021, hosted online.
15. Hu C., “Battery Capacity Forecasting and Early Life Prediction,” *3rd Asia Pacific Conference of the Prognostics and Health Management Society (PHM Asia Pacific 2021)*, Sep 8 2021, hosted online. [**Tutorial Presentation**]
16. Hu C., “Introduction to Battery Prognostics and Early Life Prediction,” *2021 IEEE International Conference on Prognostics and Health Management (PHM)*, Jun 7 2021, hosted online. [**Tutorial Presentation**]
17. Hu C., “Toward Reliable Design of Engineered Systems: Design under Uncertainty and Health Prognostics,” The University of Central Florida, Apr 9 2021, hosted online.
18. Hu C., “Toward Reliable Design of Engineered Systems: Design under Uncertainty and Health Prognostics” The Iowa Chapter of ASME, Feb 19 2021, hosted online.

19. Hu C., Kremer G.E., Nemani V.P., and Liu J., “Data-Driven Design for Remanufacturing of High-Value Components in Industrial and Agricultural Equipment,” Project Webinar Hosted by the REMADE Institute, Jan 7 2021, hosted online.
20. Hu C., “Engineering Design under Uncertainty and Probabilistic Failure Prognostics – Methods, Progress, and Challenges,” *International Conference on Uncertainty Quantification & Optimisation*, Nov 16 2020, hosted online. [**Keynote Presentation**]
21. Hu C., Javadi, N., and Thelen A., “Shaft Unbalance Correction and Bearing Health Monitoring,” Vermeer Corporation, Nov 3 2020, hosted online.
22. Hu C., “ISU Research on Battery Reliability and Lifetime Prediction: Challenges, Long-Term Tests and Methodologies,” ISU Electric Power Research Center/MISO Energy Storage Webinar — Session 7, Oct 23 2020, hosted online.
23. Hu C. and Nemani V., “Data-Drive Design Decision Support for Re-X of High-Value Components in Industrial and Agricultural Equipment,” John Deere, Aug 7 2020, hosted online.
24. Hu C., “Reliability Analysis of Hydraulic Drive Systems,” Deere & Company, Dec 17 2019, Ankeny, IA.
25. Hu C., “Predicting Transition in Capacity Fade Trend Using Physics-Based Prognostics,” *10th Annual Battery Safety Summit*, Oct 24 2019, Alexandria, VA.
26. Hu C., “Intelligent Failure Prognostics for Predictive Maintenance in Industrial Applications,” Rutgers, The State University of New Jersey, Sep 24 2019, Piscataway, NJ.
27. Hu C. and Sadoughi M., “Physics-Based Deep Learning for Bearing Fault Diagnostics,” Vermeer Corporation, Mar 12 2019, Ames, IA.
28. Hu C., “Intelligent Failure Prognostics for Industry Applications,” Minnesota Reliability Consortium (MRC) Meeting, Nov 13 2018, Minneapolis, MN.
29. Hu C., “Intelligent Failure Prognostics for Industry Applications,” Grace Engineered Products Inc., Sep 28 2018, Davenport, IA.
30. Hu C., “Intelligent Failure Prognostics of Lithium-Ion Energy Storage and Renewable Energy Systems,” Invited Guest Lecture, School of Mechanical Engineering, Xi’an Jiaotong University, Jul 17 2017, Xi’an, China.
31. Hu C., “Data-Driven Failure Prognostics of Complex Engineered Systems using Ensemble Prediction,” Invited Speaker, *Asia Pacific Conference of the Prognostics and Health Management Society 2017*, Jul 12-15 2017, Jeju, Korea. (Track on Data-Driven Prognostics)
32. Hu C. and Sadoughi M., “Gaussian Process (Kriging) for Design of Simulation Experiments,” Medtronic PLC, May 22 2017, Minneapolis, MN.
33. Hu C., “Intelligent Failure Prognostics of Agriculture and Farming Equipment,” John Deere, May 10 2017, Ankeny, IA.
34. Hu C., “Design for Reliability and Failure Prevention of Lithium-Ion Batteries: Physics-Based Degradation Modeling and Prognostics and Health Management (PHM),” Invited Guest Lecture, Electrical Power Research Center (EPRC) Spring Meeting, Iowa State University, Apr 13 2017, Ames, IA.
35. Hu C., “Prognostics and Health Management (PHM) of Lithium-Ion Energy Storage and Renewable Energy Systems,” Invited Guest Lecture, Department of Electrical and Computer Engineering, Iowa State University, May 11 2016, Ames, IA.
36. Hu C., “Data-Driven Failure Prognostics of High-Value Engineered Systems using Deep Learning and Ensemble Prediction,” Invited Talk, Center for Nondestructive Evaluation, Iowa State University, Apr 19 2016, Ames, IA.

37. Hu C., “Toward Life-Cycle Reliability Management: Reliability-Based Design and Prognostics and Health Management,” Invited Guest Lecture, Wind Energy Science, Engineering & Policy (WESEP) Program, Iowa State University, Oct 29 2015, Ames, IA.
38. Hu C., “Toward Life-Cycle Reliability Management: Reliability-Based Design and Prognostics and Health Management,” Iowa State University, Feb 12 2015, Ames, IA.
39. Hu C., “Design for Resilience of Energy Storage Systems,” Boise State University, Dec 8 2014, Boise, ID.
40. Hu C., “Toward Life-Cycle Reliability Management: Reliability-Based Design and Prognostics and Health Management,” City University of Hong Kong, Sep 26 2014, Hong Kong SAR.
41. Hu C., “Toward Life-Cycle Reliability Management: Reliability-Based Design and Prognostics and Health Management,” University of Maryland, Baltimore County, Mar 14 2014, Baltimore, MD.
42. Hu C., “Life-Cycle Reliability Management: Prognostics and Health Management,” Minnesota Reliability Consortium (MRC) Meeting, Jan 15 2013, Minneapolis, MN.
43. Hu C., “Achieving Reliable Engineering Product Design through Reliability-Based Design and Prognostics and Health Management (PHM),” Medtronic Technical Forum, Dec 9 2011, Minneapolis, MN.
44. Hu C., Youn B.D., and Chung J., “Online Estimation of Lithium-Ion Battery State-of-Charge and Capacity with a Multiscale Filtering Technique,” *Annual Conference of the Prognostics and Health Management (PHM) Society 2011*, Sep 25–29 2011, Montreal, Canada. (Battery Management System Workshop).

Professional Services and Membership

- Associate Editor, *IEEE Sensors Journal* 2023–Present
- Conference Chair, *ASME 50th Design Automation Conference (DAC)* 2023–Present
- Associate Editor, *ASME Journal of Mechanical Design* 2022–Present
- Program Chair, *ASME 49th Design Automation Conference (DAC)* 2022–2023
- Review Editor, *Structural and Multidisciplinary Optimization* 2021–Present
- Co-Guest Editor, Special Section on “Knowledge-Reinforced Machine Learning for Reliability Modeling and System Optimization” in *Applied Mathematical Modeling* 2022–2023
- Co-Guest Editor, Special Section on “Joint Special Issue on Advances in Design and Manufacturing for Sustainability” in *ASME Journal of Mechanical Design* and *ASME Journal of Manufacturing Science and Engineering* 2022–2023
- Lead Guest Editor, Special Issue on “Physics-Informed Machine Learning Enabling Fault Feature Extraction and Robust Failure Prognosis” in *Mechanical Systems and Signal Processing* 2021–2023
- Lead Guest Editor, Special Issue on “Advanced Optimization Enabling Digital Twin Technology” in *Structural and Multidisciplinary Optimization* 2021–2023
- Member, ASME Design Automation Executive Committee 2021–Present
- Session Chair, Optimization algorithms - II (14th World Congress of Structural and Multidisciplinary Optimization) 2021
- Session Co-Chair, Robust design and reliability-based design optimization – III and Machine learning for design optimization - I (14th World Congress of Structural and Multidisciplinary Optimization) 2021
- Session Co-Chair, Energy Storage System Design: Thermal, Structural, and Electrical Considerations (2020 IEEE Transportation Electrification Conference and Expo) 2020
- Panelist, NSF CMMI Division, Dynamics, Control and Systems Diagnostics Program 2021–Present

- Panelist, NSF IIP Division, Partnerships for Innovation Program *2020–Present*
- Panelist, NSF CNS Division, Cyber-Physical Systems Program *2019–Present*
- Session Co-Chair and Review Coordinator, Uncertainty Quantification in Simulation and Model Verification & Validation (ASME Computers and Information in Engineering Conference) *2017–Present*
- Panelist, NSF ECCS Division, Energy, Power, Control, and Network Program *2017–Present*
- Session Chair and Review Coordinator, Design for Resilience and Failure Recovery (ASME Design Automation Conference) *2016–Present*
- Panelist, NSF CMMI Division, Engineering and Systems Design Program *2016–Present*
- Co-Guest Editor, Special Section on “Prognostics and Health Management (PHM) in Smart Structures and Systems” in *Smart Structures and Systems* *2018*
- Track Chair, Data-Driven Prognostics I (Asia Pacific Conference of the PHM Society) *2017*
- Co-Guest Editor, Special Issue on “Battery Energy Storage and Management Systems” in *IEEE Access* *2017*
- Co-Guest Editor, Special Issue on “Complex System Health Management based on Condition Monitoring and Test Data” in *IEEE Access* *2016*
- Panel Chair, Battery Prognostics and Health Management (IEEE PHM Conference) *2014*
- Session Chair, Lithium-Ion Battery Health Prognostics (IEEE PHM Conference) *2014*
- Session Chair, Medical Equipment PHM (IEEE PHM Conference) *2013*
- Panelist, PHM Design Techniques & Algorithms (IEEE PHM Conference) *2012*
- Members, IEEE and IEEE Reliability Society *2013–Present*
- Member, American Society of Mechanical Engineers *2009–Present*