Curriculum Vitae

Wei Xie

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Google Scholar: https://scholar.google.com/citations?user=XFqh9y4AAAAJ&hl=en
Biopharmaceutical Analysis Training Lab (BATL): http://www.northeastern.edu/batl
Institute for Experiential AI (IEAI): https://ai.northeastern.edu/

Dr. Xie's research interests include interpretable and generative AI, multi-scale foundation model and ontology for Biological Systems-of-Systems (Bio-SoS), process analytical technologies (PATs), physics-informed machine learning (ML), causal reinforcement learning, computer simulation, digital twin, design of experiments (DoE), data-driven stochastic optimization, uncertainty quantification, sensitivity analysis, federated learning, symbolic learning, data analytics on advanced sensors and assays (e.g., multiomics, optical sensors, and isotopic tracers), and blockchain for complex Cyber-Physical System (CPS) risk management, mechanism learning, optimal design and control. The applications include: (1) biofoundry, manufacturing and delivery of biopharmaceuticals/organoids/tissues (i.e., monoclonal antibodies, cell/gene therapies, regenerative medicines, mRNA vaccines, and brain organoids); (2) 3D Bioprinting; (3) supply chains and healthcare systems; and (4) smart power grids with distributed renewable energy and storage.

Professional Experience

- Associate Professor, Department of Mechanical and Industrial Engineering (MIE), Northeastern University (NU) July 2025 - present
- Assistant Professor, Department of MIE, NU Fall 2018 - June 2025
- Associate Editor, INFORMS Journal on Computing (IJOC) April 2022 – present
- Associate Editor, ACM Transactions on Modeling and Computer Simulation (ACM TOMACS) Nov. 2017 – present
- Guest Associate Editor, Decision Sciences 2025 – presnt
- Co-editor, Proceedings of the 2024 Winter Simulation Conference
- The Northeastern University Representative Technical Activity Committee, National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) Jan. 2019 – present
- Core Faculty Member, the Institute for Experiential AI (IEAI), NU July 2021 – present
- Assistant Professor, Department of Industrial and Systems Engineering, Rensselaer Polytechnic Institute (RPI) (with one year maternity leave) Fall 2014 – Summer 2018

Education

Northwestern University, Evanston IL, USA

- Ph.D. Industrial Engineering and Management Sciences June 2014

– Dissertation Title: Statistical Uncertainty Analysis for Stochastic Simulation
– Advisors: Prof. Barry L. Nelson and Prof. Russell R. Barton

University of Nebraska-Lincoln, Lincoln NE, USA

- M.S. Computational Engineering Mechanics Aug. 2005
  – Thesis Title: Peridynamic Flux-Corrected Transport Algorithm for Shock Wave Studies
  – Advisor: Prof. Florin Bobaru
- Minor: Electrical Engineering (Signal Processing, Electromagnetic Waves and Fields)

Funding and Awards

Dr. Xie has been a principal investigator (PI) on $6.9 millions and PI/Co-PI on $15.5 millions (my share over $4 millions) of sponsored research with funding by National Science Foundation (NSF), National Institute of Standards and Technology (NIST), National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), National Institutes of Health (NIH), Advanced Research Projects Agency for Health (ARPA-H), the Gates Foundation, Massachusetts Life Sciences Center (MLSC), and industrial partners.

- My two papers - (1) "A Bayesian Framework for Quantifying Uncertainty in Stochastic Simulation" published at *Operations Research*; and (2) "Quantifying Input Uncertainty via Simulation Confidence Intervals" published at *INFORMS Journal on Computing*, - received the 2015 Outstanding Publication Award from the INFORMS Simulation Society.

- Received 2023 Constantinos Mavroidis Outstanding Translational Research Faculty Award from Northeastern University College of Engineering. This award acknowledges my contributions in research innovations, technology transfer, and workforce development for biopharmaceuticals manufacturing.

- NSF CAREER project, entitled "CAREER: Mechanism-Informed AI for Biological Systems-of-Systems to Accelerate Biomanufacturing Systems Integration and Innovations," is selected to be awarded by National Science Foundation [Grant CMMI-2442970]. PI (100%), $596,920. Period: September 2025 - August 2030.

  To support biomanufacturing systems integration and accelerate the development of flexible optimal robust manufacturing systems, this project will introduce innovative multi-scale hybrid modeling (mechanistic + statistical), sequential Bayesian inference, federated and active learning, and model-based reinforcement learning approaches, accounting for all source of uncertainty, to answer two fundamental questions: (1) how to create a unified knowledge representation that enables integration of heterogeneous data collected at molecular, cellular, and macroscopic scales in different production processes; and (2) how to enable sample-efficient and interpretable learning for fundamental mechanisms and optimal control strategies within and across different scales. See more information at `https://www.nsf.gov/awardsearch/showAward?AWD_ID=2442970&HistoricalAwards=false`.

- ARPA-H Project "Facilitating FDA Approval of Cell and Gene Therapies for Rare Diseases through Automation, Standardization, and Risk-based AI Technology (FAST)," Co-PI, Total $7,740,257 (my share $888,574).

- NIST Project "Biomanufacturing Modeling and Machine Learning (ML) Ontology Platform." This project is selected to be funded by NIST (70NANB24H293). Principle Investigator (PI), $244,235. Period: January 2025 - December 2025.

  We focus on creating an innovative ontology platform on biomanufacturing process modeling, data analytics, and machine learning (ML) approaches created by my research team, which can be generalized for the ML Lifecycle Ontology development; see more information at `https://coe.northeastern.edu/news/interoperable-ai-biomanufacturing-systems/`.

- Seed Project "An AI and Computational Biology Hybrid Approach to Understanding the Effects of Ionic Strength in RNA Synthesis" received the 2024 Experiential AI (EAI) PhD Funding Award, PI, $30k (collaborate with Prof. Mary Jo Ondrechen). Start from Fall 2024.

- Project on intelligent Digital Twin development for mRNA vaccine manufacturing: "Development of an In-Silico Hybrid (mechanistic and empirical) Digital Twin for In Vitro Transcription (IVT) Processes Used for Therapeutic mRNA Production," supported by industrial partner. PI (100%), $800k. Period: November 2023 - June 2025.

  To support a rapid response to pandemic, my research team is developing an intelligent Digital Twin mechanistic/hybrid model and the DoE approach for IVT process to improve the prediction and enable the fast optimal design of mRNA vaccine production processes.

- NIIMBL Project "Advanced FISH Assay and Mechanism Hybrid Surrogate to Improve mRNA Vaccine Potency Assessment and Prediction." This project is supported with an award from the NIIMBL and financial assistance from Bill & Melinda Gates Foundation Award #INV-038807 and National Institute of Standards and Technology (70NANB21H086). PI, $851k. Period: August 2023 - August 2025.

  The ongoing emergence of virus variants continuously challenges quality assurance/control (QC/QA) of mRNA vaccines and Lipid nanoparticle (LNP) delivery systems. This enforces the critical need for a multiplexed potency assay and a mechanistic surrogate that can provide a reliable prediction on the mRNA vaccine potency. The objective of this project is to develop and validate: (1) single-molecule RNA-fluorescence in situ hybridization (smFISH) to monitor RNA integrity, track where RNA molecules really go, and reveal critical pathways; and (2) multi-scale hybrid model for mRNA delivery and translation processes (accounting for mRNA-LNP particle and cell interactions, RNA folding/binding, RNA-protein interactions) to ensure reliable predictions of vaccine efficacy and critical quality attributes (CQAs) of mRNA-LNPs.

  Please see more information at `https://coe.northeastern.edu/news/xie-awarded-niimbl-grant-for-mrna-vaccine-potency-assessment-and-prediction/`.

- NIIMBL Project "Advanced Bioprocess Sensor and Analytical Technologies for Induced Pluripotent Stem Cell (iPSC) Culture Online Monitoring and Automation." This project is supported with an award from the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) and financial assistance from the U.S. Department of Commerce, National Institute of Standards and Technology (70NANB21H086) and Massachusetts Life Sciences Center (MLSC). PI, $2.112M. Period: May 2023 - April 2025.

  Large-scale manufacturing of induced pluripotent stem cells (iPSCs) is essential for cell therapies and regenerative medicines. In this project, we will create a robust online two-photon excitation (TPE) fluorescence optical sensor, innovative multi-scale bioprocess hybrid modeling, machine learning analytical and experimental technologies that can advance the scientific

understanding of cell response to micro-environmental perturbation, reduce cell-to-cell variations, and enhance end-to-end iPSC culture process monitoring and robust control to improve critical quality attributes (CQAs), including pluripotency, growth rate, and productivity.

Please see more information about this project at `https://coe.northeastern.edu/news/wei-xie-awarded-2-million-niimbl-stem-cell-research-grant/`.

- NIH Project (2R44AT010840-02A1) – "SBIR Phase II: Optical Redox Probe for Continuous Metabolic Monitoring during Natural Products Bioprocessing," Co-PI, $873k Award Number: R44AT010840. Period: January 2023 - July 2025.

- Project NIIMBL PC4.1-206, "Modularized PAT Online Training Platform to Accelerate the Workforce Innovation in Biopharmaceuticals Manufacturing." The project is supported with an award from NIIMBL, National Institute of Standards and Technology (70NANB17H002), Department of Commerce, and MLSC. PI, $2.124M. Period: September 2021 - February 2022.

  Driven by industry needs and biomanufacturing 4.0, this project develops a modularized extensible online training platform on leading-edge PATs including (1) integrated upstream and downstream biomanufacturing process mechanistic models; (2) process risk, sensitivity, predictive analysis; and (3) digital twin-based virtual lab (vLab) and real problem-derived case studies to facilitate experiential learning, reinforce mechanistic knowledge, and support problem-solving skills development. By integrating with the heavily instrumented biomanufacturing equipment at NEU, this training platform can provide large-scale, low-cost, and high-quality life-long customized training, support workforce innovation, and facilitate biomanufacturing 4.0.

  This project is selected as the representative workforce innovation project in the NIIMBL community (including $>$ 200 academic, industry, and government organizations); see the platform illustration in **Figure 1** and the NIIMBL annual report at `https://www.niimbl.org/wp-content/uploads/2024/01/NIIMBL-2022-2023-Annual-Report-Full.pdf`.

- Project: "Improved Supply Chain Management at Regeneron", supported by Regeneron Pharmaceutical Company, 100% PI, $90,000. Period: July 2015 - December 2016.

- My Ph.D. student, Hua Zheng, received: (1) the 2023 Yamamura Research Award; and (2) the 2020 John and Katharine Cipolla Ph.D. Merit Award. These awards are to recognize the research excellence among NU Mechanical and Industrial Engineering graduate students.

- My Ph.D. student, Bo Wang, received the 2017 INFORMS Best Student Paper Finalist Award from Quality, Statistics and Reliability (QSR) Section (coauthored with me). This award is to recognize the research excellence among INFORMS student members.

- My Ph.D. student, Yuan Yi, is a winner of 2017 RPI Industrial and Systems Engineering (ISE) research award because of the acceptance of paper, "An Efficient Budget Allocation Approach for Quantifying the Impact of Input Uncertainty in Stochastic Simulation" (coauthored with me). This award is to recognize the research excellence among RPI ISE graduate students.

- My paper "Interpretable biomanufacturing process risk and sensitivity analyses for quality-by-design and stability control" has been recognized as Wiley Top Cited Article 2022-2023.

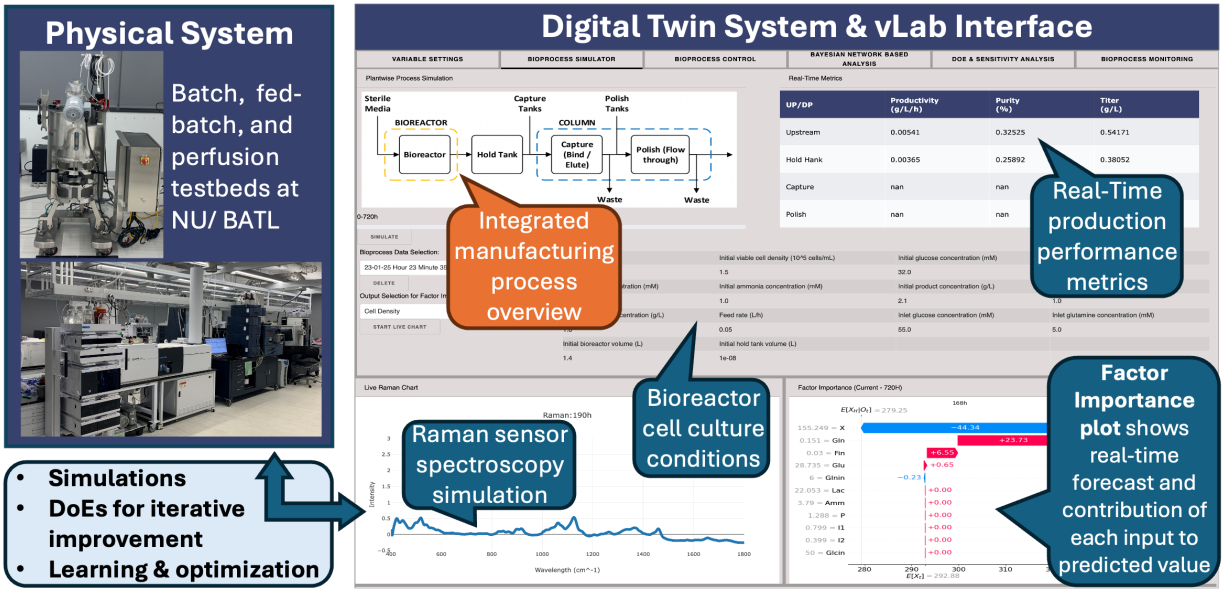

Figure 1: We develop a digital twin assisted virtual lab (vLab) and online PAT training platform, including a user-friendly interface and the back-end modules: (1) glycosylation simulator; (2) plantwide mechanistic simulator (CHO bioreactor + hold tank + chromatography); (3) Raman sensor simulator for process online monitoring; and (4) design of experiments, probabilistic causal analysis, and root cause analysis for integrated biomanufacturing process troubleshooting; (5) risk/sensitivity/predictive analyses and mechanistic model-based reinforcement learning for biomanufacturing process optimal control; and (6) real-world problem driven case studies. Since the vast majority of biologics in medicine are glycoproteins, one case study is a troubleshooting scenario in which the distribution of galactosylated glycoforms for a Chinese Hamster Ovary (CHO)-derived recombinant protein changes considerably after switching to a new chemically defined (CD) media. Another case study is associated with Raman sensor monitoring and dynamic decision making for integrated upstream cell culture and downstream chromatography purification.

News Article

- **2025/03. Northeastern COE Article** entitled "NSF CAREER Award for Generative AI-Driven Bioprocess Learning and Optimization To Advance Biomanufacturing," `https://coe.northeastern.edu/news/xie-receives-nsf-career-award-to-advance-ai-driven-biomanufacturing/` reported Dr. Xie's research on innovative bioprocess-specific AI for general biological ecosystems that can facilitate flexible and intelligent on-demand manufacturing systems for biopharmaceuticals.

- **2025/02. Northeastern Global News Article** entitled "Northeastern researcher receives CAREER award to advance biopharmaceutical manufacturing with AI," `https://news.northeastern.edu/2025/02/27/biopharmaceutical-manufacturing-with-ai/` reported Dr. Xie's research on AI-driven biomanufacturing could revolutionize life-saving drug production, making new treatments easier and faster to produce.

- **2024/10.** Dr. Xie was interviewed by the news magazine, **Genetic Engineering & Biotechnology News**, on challenges and opportunities of developing and using AI in bioprocessing; see the article entitled "Tackling AI Bottlenecks in Bioprocessing," `https://www.genengnews.com/topics/bioprocessing/tackling-ai-bottlenecks-in-bioprocessing/`.

- **2024/04. Northeastern Global News Article** entitled "Northeastern scientists propose AI framework for mass-manufacturing of stem cells for regenerative medicine," https://news.northeastern.edu/2024/04/03/regenerative-medicine-stem-cell-manufacturing/ reported Dr. Xie's research on interpretable AI and machine learning for large-scale manufacturing of regenerative medicines and cell therapies.

- **2024/01. Northeastern COE Article** entitled "Research to Optimize Large-Scale iPSC Manufacturing," https://coe.northeastern.edu/news/research-to-optimize-large-scale-ipsc-manufacturing/ reported Dr. Xie's recent study and research papers on multi-scale bioprocess modeling and optimization for iPSC cultures.

- **2023/12. Genetic Engineering & Biotechnology News Article** entitled "Optimizing iPSC Manufacturing," https://www.genengnews.com/topics/bioprocessing/optimizing-ipsc-manufacturing/ reported Dr. Xie's research study on multi-scale Biological System-of-Systems (Bio-SoS) mechanistic modeling that characterizes cell-to-cell interactions and spatial/metabolic heterogeneity. This Bio-SoS model with a modular design can facilitate the integration of heterogeneous data collected from different productions processes (i.e., 2D monolayer and 3D aggregate cultures), accelerate iPSC manufacturing scale-up, and support optimal control of cell therapy critical quality attributes (CQAs) consistency.

- **2023/06. Genetic Engineering & Biotechnology News Article** entitled "Hybrid Model for RNA Bioprocessing," https://www.genengnews.com/topics/bioprocessing/hybrid-model-for-rna-bioprocessing/ reported Dr. Xie's research study on RNA structure-function dynamics hybrid modeling to support fast and reliable prediction of multi-scale enzymatic reaction networks that can accelerate new drug discovery and manufacturing process development.

- **2023/03. Genetic Engineering & Biotechnology News Article** entitled "Modeling Uncertainty in Process Development," https://www.genengnews.com/topics/bioprocessing/modeling-uncertainty-in-process-development/ reported Dr. Xie's research study on biomanufacturing process uncertainty quantification, sensitivity analysis, and mechanism optimal learning.

- **2022/11. Genetic Engineering & Biotechnology News Article** entitled "Avoiding Errors by Thoroughly Understanding Bioprocess Mechanisms," https://www.genengnews.com/topics/bioprocessing/avoiding-errors-by-thoroughly-understanding-bioprocess-mechanisms/ reported Dr. Xie's research study on biomanufacturing process hybrid modeling, digital twin, and machine learning.

Research Summary: We briefly describe our research studies below. Our representative research focuses and peer-reviewed papers are summarized below in **Figure 2**.

- **Uncertainty Quantification (UQ) and Sensitivity Analysis (SA).** When simulation model is used to assess the performance of complex systems, there often exist various sources of uncertainties, including process inherent stochasticity, simulation estimation uncertainty, and model risk (induced because the simulation model is an approximation of the real system). Correctly quantifying all sources of uncertainty can facilitate optimal learning, guide risk reduction, and support optimal robust decision making. Since each experiment can be expensive, we create machine learning assisted UQ and SA frameworks to efficiently assess the impacts of uncertainties and guide most informative data collection to reduce risks.

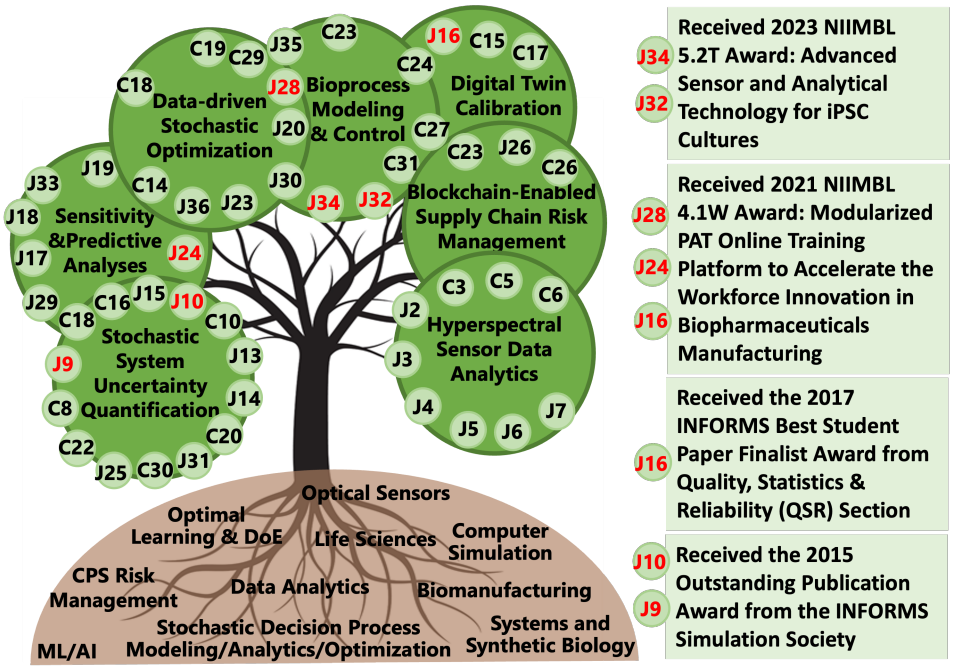

Figure 2: Selected research papers: Journal (J) and Conference (C) papers.

- **Bioprocess Hybrid Modeling, Optimal Robust Control, and Causal RL.** Driven by the critical challenges in biopharmaceutical manufacturing, including high complexity, high uncertainty, and very limited process data, we introduce multi-scale probabilistic knowledge graph (KG) mechanistic and hybrid models characterizing the risk- and science-based understanding of underlying mechanisms and causal interdependencies of inputs-outputs at molecular, cellular, and macroscopic levels. It can capture the important properties, including nonlinear reactions, partially observed states, and time-varying dynamics. Since this KG is built on molecular reactions, it can leverage the information from existing mechanistic models (such as metabolism) and facilitate learning from heterogeneous online/offline measurements.

  Bayesian KG, accounting for inherent stochasticity and model uncertainty, is created to support integrated bioprocess risk, sensitivity, and predictive analyses. We further develop a model-based RL scheme on the Bayesian KG that can provide an insightful prediction on how the effect of input factors propagates through bioprocess mechanism pathways and impacts on output trajectories. It can efficiently find process optimal control policies that are interpretable and robust against heterogeneous model uncertainty, and overcome the key challenges of biopharmaceutical manufacturing.

- **Data-driven Stochastic Optimization.** We create innovative data-driven stochastic optimization approaches to guide optimal and robust decision making hedging against model uncertainty, system inherent stochasticity, and finite sample average approximation error (or simulation estimation uncertainty). Since each experiment can be expensive, we propose optimal design of experiments (DoEs) balancing exploration and exploitation to efficiently allocate tight resources. By exploring the structure of stochastic programming, we create a Gaussian process (GP) based global-local metamodel and optimal learning-based DoE for dynamic decisions. In addition, we introduce green simulation assisted RL that can selectively reuse the most relevant historical observations and accelerate the optimal search. Our approaches demonstrate clear advantages compared to existing stochastic and robust optimizations.

- **Digital Twin and Stochastic Simulation Model Calibration.** Since mechanistic and hybrid model as digital twin is always an approximation of complex real system, our team develops various model-calibration approaches so that the calibrated models or simulators can better and more faithfully represent the mechanisms of the real system, which can provide a reliable decision guidance on process design/control and support mechanism learning.

- **Hyperspectral and Advanced Sensor Data Analytics.** Emerging sensing technologies, including multi-omics (e.g., genomics, transcriptomics, proteomics, and metabolomics) and optical sensors, enable the measurements at single molecules and cells, such as cellular metabolism, gene expression, and cells/metabolites/proteins concentrations. Hyperspectral sensors (e.g., Raman) can in real-time measure multiple active biochemical compositions and monitor product critical quality attributes (CQAs). Our collaborator, Physical Sciences Inc. (PSI), creates new two-photon excitation (TPE) fluorescence optical sensor enabling real-time simultaneous measurements on intracellular metabolites levels (i.e., NAD(P)H/FAD), flow speed, micro-environmental conditions, cell density and viability.

  We propose a multi-scale bioprocess KG hybrid model and machine learning (KG-ML) framework that can online monitor cell-to-cell interaction and cell response under micro-environmental perturbation. This KG-ML can integrate multi-scale data (at molecular, cellular, and macroscopic scales) collected from different production processes, support federated learning, and facilitate customized manufacturing for cell therapies and regenerative medicines.

- **Blockchain-Enabled IoT for Agriculture, Bio-drugs, and Food Supply Chains Regulation Compliance, Safety, Efficiency, and Automation.** Driven by the critical needs and challenges from bio-drugs and agriculture (e.g., industrial hemp - IH) regulated supply chains, including high complexity and variability, data tampering, and lack of an immutable information sharing/tracking system, Dr. Xie's team develops an intelligent blockchain-enabled Internet-of-Things (IoT) platform that can advance knowledge of bioprocess mechanisms, improve transparency, support interoperability, accelerate smart agriculture and biomanufacturing industry innovations; see more information at `https://www.intlpress.com/site/pub/pages/journals/items/jbr/content/vols/0001/0001/a001/index.php`.

  Built on parallel processing and state-sharding technology, a two-layer blockchain with proof-of-authority based smart contracts and a hierarchical automatic verification system was created, which can leverage the distributed resources from local authorities with state and federal regulators, accelerate quality control verification, and ensure regulatory compliance and data integrity. Then, a blockchain-enabled IoT platform with user-friendly mobile app was developed so that each participant can use a smart phone to real-time collect and upload their data to the cloud, and further share the process verification and tracking information through the blockchain network. By collaborating with multiple academic and industrial partners, this platform was validated during the real-world small-scale pilot phase 2020 in different states. It can improve end-to-end supply chain safety, throughput, efficiency, and transparency.

Technical Publication

Journal Papers (J)

J38. Hua Zheng[2], Wei Xie[1], Ilya O. Ryzhov[1], Keilung Choy[2]. Digital Twin Calibration with Model-Based Reinforcement Learning. Preprint. `https://arxiv.org/abs/2501.02205`

J37. Keqi Wang[2], Sarah W. Harcum[1], Wei Xie[1]. Multi-Scale Kinetics Modeling for Cell Culture Process with Metabolic State Transition. Preprint. `https://arxiv.org/abs/2412.03883`

J36. Hua Zheng[2], Wei Xie[1], Ben Feng (2024). Variance Reduction based Experience Replay for Policy Optimization. Preprint. https://arxiv.org/abs/2110.08902.

In this study, we introduced a novel likelihood-ratio based experience replay framework that can intelligently select the most relevant historical samples, balancing bias-variance and accounting for sample dependencies induced by Markovian noise and behavior policy interdependencies, to improve the policy gradient optimization.

J35. Bo Wang[2], Wei Xie[1], Tugce Martagan, Alp Akcay, Bram van Ravenstein (2024). Biomanufacturing Harvest Optimization with Small Data. *Production and Operations Management*. Volume 33, Issue 12. https://doi.org/10.1177/10591478241270130

Our proposed data-driven stochastic optimization framework includes hybrid model-based reinforcement learning and optimal policy structure analysis accounting for model uncertainty. This framework has been implemented in actual production lines of Merck since 2019, generated around 50% improvement in batch yield on average, and significantly decreased batch-to-batch variability.

J34. Hua Zheng[2], Sarah W. Harcum[1], Jinxiang Pei, Wei Xie[1] (2024). Stochastic Biological System-of-Systems Modelling for iPSC Culture. *Communications Biology - Nature*, 7.1 (2024): 39. https://www.nature.com/articles/s42003-023-05653-w.

We created a Biological System-of-Systems (Bio-SoS) multi-scale model characterizing induced Pluripotent Stem Cells (iPSC) aggregate culture mechanisms. This Bio-SoS modeling framework with a modular design demonstrates a promising capability of integrating heterogeneous data collected from different sources and assembling the digital twins for different production systems from 2D monolayer to 3D aggregate cell cultures.

J33. Junkai Zhao, Wei Xie[1], Jun Luo[1] (2024). Interpretable Sensitivity Analysis on Policy-Augmented Graphical Hybrid Model. *Naval Research Logistics (NLR)*. https://onlinelibrary.wiley.com/doi/10.1002/nav.22239.

J32. Keqi Wang[2], Wei Xie[1], Sarah W. Harcum[1] (2023). Metabolic Regulatory Network Kinetic Modeling with Multiple Isotopic Tracers for iPSCs. *Biotechnology and Bioengineering*. 121.4 (2023): 1335-1353. http://dx.doi.org/10.1002/bit.28609.

J31. Hua Zheng[2], Wei Xie[1], Keqi Wang[2], Zheng Li (2022). Opportunities of Hybrid Model-based Reinforcement Learning for Cell Therapy Manufacturing Process Control. https://arxiv.org/pdf/2201.03116.pdf

J30. Zicheng Wang, Wei Xie, Zhengchun Zhou, Hua Meng, Meng Yang (2024). Reinforcement Learning-Based MIMO Radar Multi-Target Detection Assisted by Bayesian Inference. *IEEE Transactions on Aerospace and Electronic Systems*. 29 March 2024. https://ieeexplore.ieee.org/document/10486820?source=authoralert.

J29. Wei Xie[1], Russell R. Barton, Barry L. Nelson, Keqi Wang[2] (2023). Stochastic Simulation Uncertainty Analysis to Accelerate Flexible Biomanufacturing Process Development. *European Journal of Operational Research* 310.1 (2023): 238-248. https://doi.org/10.1016/j.ejor.2023.01.055.

J28. Hua Zheng[2], Wei Xie[1], Ilya O. Ryzhov, Dongming Xie (2023). Policy Optimization in Dynamic Bayesian Network Hybrid Models of Biomanufacturing Processes, *INFORMS Journal on Computing* 35.1 (2023): 66-82. https://pubsonline.informs.org/doi/10.1287/ijoc.2022.1232.

For the cases with linear state transition, we proposed a model-based RL scheme on the mechanistic/hybrid KG model that provides an insightful prediction on how the effect of inputs propagates through bioprocess mechanism pathways and impacts on the outputs.

This KG-RL can find process control policies that are interpretable and robust against model risk, and overcome the key challenges of biopharmaceutical manufacturing.

J27. Hua Zheng[2], Jiahao Zhu[2], Wei Xie[1], Hua Zhong[1] (2021). Reinforcement Learning Assisted Oxygen Therapy for COVID-19 Patients Under Intensive Care, *BMC Medical Informatics and Decision Making*. (2021) 21:350. https://rdcu.be/cDrgs.

J26. Keqi Wang[2], Wei Xie[1], Wencen Wu[1], Jinxiang Pei, Qi Zhou (2022). Blockchain-Enabled Internet-of-Things Platform for End-to-End Supply Chain Risk Management, *Journal of Blockchain Research* 1.1 (2022): 1-17. https://intlpress.com/JDetail/18058083 58735183874.

J25. Wei Xie[1], C. Li, Y. Wu, P. Zhang[2] (2021). A Nonparametric Bayesian Framework for Uncertainty Quantification in Stochastic Simulation, *SIAM/ASA Journal on Uncertainty Quantification*. Vol. 9, Issue 4. https://epubs.siam.org/doi/epdf/10.1137/ 20M1345517.

J24. Wei Xie[1], Bo Wang[2], Cheng Li, Dongming Xie, Jared Auclair (2022). Interpretable Biomanufacturing Process Risk and Sensitivity Analyses for Quality-by-Design and Stability Control. *Naval Research Logistics*. Naval Research Logistics, 69.3 (2022): 461–483. https://onlinelibrary.wiley.com/doi/epdf/10.1002/nav.22019.

J23. Wei Xie[1], Yi, Y.[2], Z. Zhou, K. Wang[2]. Data-Driven Stochastic Optimization for Power Grids Scheduling under High Wind Penetration. *Energy Systems* 14.1 (2023): 41-65. https://doi.org/10.1007/s12667-021-00486-0.

J22. Hua Zheng[2], Ilya O. Ryzhov, Wei Xie[1], and Judy Zhong[1] (2021). Personalized Multimorbidity Management for Patients with Type 2 Diabetes Using Reinforcement Learning of Electronic Health Records. *Drugs* 21.1 (2021): 350. https://link.springer.com/ article/10.1007/s40265-020-01435-4.

J21. Zhang, Q, B. Wang[2], W. Xie[1] (2022). A Pooled Quantile Estimator for Parallel Simulations, *Journal of Simulation*. Volume 16, 2022, Issue 1, pp. 73-83. https://www.ta ndfonline.com/doi/full/10.1080/17477778.2020.1758597.

J20. Xie, W.[1] Y. Yi[2], H. Zheng[2] (2021). Global-Local Metamodel Assisted Two-Stage Optimization via Simulation, *ACM Transactions on Modeling and Computer Simulation* (TOMACS) 31.1 (2020): 1-34. https://dl.acm.org/doi/abs/10.1145/3411080.

J19. Canan G. Corlu, Alp Akcay, Wei Xie (2020). Stochastic Simulation under Input Uncertainty: A Review, *Operations Research Perspectives* 7 (2020) 100162. https://www.sc iencedirect.com/science/article/pii/S221471602030052X.

J18. Liang Wang, Hong Wan, Yanfang Li, Wei Xie. Developing Partially Observable Markov Decision Process for Colonoscopy Screening Strategies, submitted.

J17. Xie, W.[1], P. Zhang[2], R. Chen, Z. Zhou (2019). A Nonparametric Bayesian Framework for Short-Term Wind Power Probabilistic Forecast, *IEEE Transactions on Power Systems* 34.1 (2018): 371-379. https://www.osti.gov/servlets/purl/1493433.

J16. Wang, B.[2], Q. Zhang, W. Xie[1] (2019). Bayesian Sequential Data Collection for Stochastic Simulation Calibration Using Detailed Sample Paths, *European Journal of Operational Research*, 277.1 (2019) 300-316. https://www.sciencedirect.com/science/ar ticle/pii/S0377221719301109.

[1]Denotes the corresponding author
[2]Denotes my Ph.D. students

J15. Xie, W.[1], C. Li, P. Zhang[2] (2017). A Factor-Based Bayesian Framework for Risk Analysis in Large-Scale Stochastic Simulations, *ACM Transactions on Modeling and Computer Simulation*, Vol. 27, Issue 4.

J14. Yi, Y.[2], W. Xie[1] (2017). An Efficient Budget Allocation Approach for Quantifying the Impact of Input Uncertainty in Stochastic Simulation, *ACM Transactions on Modeling and Computer Simulation*, Vol. 27, Issue 4.

J13. Xie, W.[1], B. L. Nelson[3], R. R. Barton[3] (2016). Multivariate Input Uncertainty in Output Analysis for Stochastic Simulation, *ACM Transactions on Modeling and Computer Simulation,* Vol. 27, Issue 1, No.5.

J12. Bostanabad, R., A. T. Bui, W. Xie, D. W. Apley, W. Chen (2016). Stochastic Microstructure Characterization and Reconstruction via Supervised Learning. *Acta Materialia,* Vol. 103, pp. 89-102.

J11. Vishvanathan, V., L. Hollebeek, E. Malthouse, E. Mashowska, S. J. Kim, W. Xie (2017). The Dynamics of Consumer Engagement with Mobile Technologies. *Service Science*, Vol. 9, pp. 36-49.

J10. Xie, W., B. L. Nelson[3], R. R. Barton[3] (2014). A Bayesian Framework for Quantifying Uncertainty in Stochastic Simulation. *Operations Research,* Vol. 62, No. 6, pp. 1439-1452.

J9. Barton, R. R.[3], B. L. Nelson[3], W. Xie (2014). Quantifying Input Uncertainty via Simulation Confidence Intervals. *INFORMS Journal on Computing,* Vol. 26, No. 1, pp. 74-87.

J8. Pei, J., D. Klabjan[3], W. Xie (2013). Approximations to Auctions of Digital Goods with Share-averse Bidders. *Electronic Commerce Research and Applications,* Vol. 13, No. 2, pp. 128-138.

J7. Al-Qadi, I.L.[3], W. Xie, R. Roberts (2010). Optimization of Antenna Configuration in Multiple-frequency Ground Penetrating Radar System for Railroad Substructure Assessment. *NDT & E International,* Vol. 43, No. 1, pp. 20-28.

J6. Al-Qadi, I.L.[3], W. Xie, D.L. Jones, R. Roberts (2010). Development of a Time-Frequency Approach to Quantify Railroad Ballast Fouling Condition Using Ultra-Wide Band Ground-Penetrating Radar Data. *International Journal of Pavement Engineering,* Vol. 11, No. 4, pp.269-279.

J5. Al-Qadi, I.L.[3], W. Xie, R. Roberts, Z. Leng (2010). Data Analysis Techniques for GPR Used for Assessing Railroad Ballast in High Radio-Frequency Environment, *Journal of Transportation Engineering,* Vol. 136, No. 4, pp.392-399.

J4. Al-Qadi, I.L.[3], W. Xie, M.A. Elseifi (2008). Frequency Determination from Vehicular Loading Time Pulse to Predict Appropriate Complex Modulus in MEPDG. *Journal of the Association of Asphalt Paving Technologists*, Vol. 77, pp.739-772.

J3. Al-Qadi, I.L.[3], W. Xie, R. Roberts (2008). Scattering Analysis of Ground-Penetrating Radar Data to Quantify Railroad Ballast Contamination. *Journal of Nondestructive Testing and Evaluation,* Vol. 41, No. 6, pp.441-447.

J2. Al-Qadi, I.L.[3], W. Xie, R. Roberts (2008). Time-Frequency Approach for Ground Penetrating Radar Data Analysis to Assess Railroad Ballast Condition. *Research in Nondestructive Evaluation*, Vol. 19, No. 4, pp.219-237.

J1. Xie, W., J. Xie[3] (2003). Design of Mechanism Morphology and Mass Distribution for Control. *Machine Design and Research*, Vol. 19, No. 1, pp.31-33. (in Chinese)

[3]Denotes my former advisor

Conference Papers (C)

C39. Keilung Choy[2], Wei Xie[1], and Keqi Wang[2] (2025). A Symbolic and Statistical Learning Framework to Discover Bioprocessing Regulatory Mechanism: Cell Culture Example. *Proceedings of the 2024 Winter Simulation Conference* (WSC). IEEE, 2025. https://arxiv.org/abs/2505.03177.

C38. Keilung Choy[2] and Wei Xie[1] (2024). Adjoint Sensitivity Analysis for Multi-Scale Bioprocess Stochastic Reaction Network. *Proceedings of the 2024 Winter Simulation Conference* (WSC). IEEE, 2024. https://arxiv.org/abs/2405.04011.

C37. Fuqiang Cheng[2], Wei Xie[1], and Hua Zheng[2] (2024). Digital Twin Calibration for Biological System-of-Systems: Cell Culture Manufacturing Process. *Proceedings of the 2024 Winter Simulation Conference* (WSC). IEEE, 2024. https://arxiv.org/abs/2405.03913.

C36. Wandi Xu[2] and Wei Xie[1] (2024). Linear Noise Approximation Assisted Bayesian Inference on Mechanistic Model of Partially Observed Stochastic Reaction Network. *Proceedings of the 2024 Winter Simulation Conference* (WSC). IEEE, 2024. https://arxiv.org/abs/2405.02783.

C35. Junkai Zhao, Jun Luo, Wei Xie, and Zixuan Bai (2024). Sensitivity Analysis on Interaction Effects of Policy-Augmented Bayesian Networks. *Proceedings of the 2024 Winter Simulation Conference.*

C34. Hua Zheng[2], Wei Xie[1], Paul Whitford, Ailun Wang, Chunsheng Fang, Wandi Xu (2023). Structure and Function Dynamics Hybrid Modeling: RNA Degradation. *Proceedings of the 2023 Winter Simulation Conference.* IEEE, 2023: 480-491. https://ieeexplore.ieee.org/document/10407123

C33. Keqi Wang[2], Wei Xie[1], Hua Zheng[2] (2023). Stochastic Molecular Reaction Queueing Network Modeling for In Vitro Transcription Process. *Proceedings of the 2023 Winter Simulation Conference*, pp. 1900-1911. https://informs-sim.org/wsc23papers/158.pdf

C32. Junkai Zhao, Wei Xie, Jun Luo (2023). Policy-augmented Bayesian Network Optimization with Global Convergence. *Proceedings of the 2023 Winter Simulation Conference*, pp. 3553-3564. https://ieeexplore.ieee.org/document/10407257

C31. Wei Xie[1], Giulia Pedrielli (2022). From Discovery to Production: Challenges and Novel Methodologies for Next Generation Biomanufacturing. *Proceedings of the 2022 Winter Simulation Conference* (invited advanced tutorial paper), pp. 238-252. https://ieeexplore.ieee.org/document/10015464

C30. Wei Xie[1], Keqi Wang[2], Hua Zheng[2], Ben Feng (2022). Sequential Importance Sampling for Hybrid Model Bayesian Inference to Support Bioprocess Mechanism Learning and Robust Control. *Proceedings of the 2022 Winter Simulation Conference.* IEEE, 2022: 2282-2293. https://ieeexplore.ieee.org/document/10015302

C29. Hua Zheng[2], Wei Xie[1] (2022). Green Simulation based Policy Optimization with Partial Historical Trajectory Reuse. *Proceedings of the 2022 Winter Simulation Conference*, pp. 168-179. https://ieeexplore.ieee.org/document/10015295

C28. Wei Xie, Paul Pei, Jared Auclair, Hua Zheng, Keqi Wang (2022). A Digital-Twin Assisted Online PAT and Machine Learning Training Platform for Biopharmaceutical Manufacturing 4.0 and Workforce Innovations. *Proceedings of the 2022 ASEE Zone 1 conference.* (abstract)

C27. Hua Zheng[2], Wei Xie, Ben Feng (2020). Green Simulation Assisted Reinforcement Learning with Model Risk for Biomanufacturing Learning and Control. *Proceedings of the 2020 Winter Simulation Conference,* pp. 337-348. https://ieeexplore.ieee.org/abstract/document/9384107

C26. Keqi Wang[2], Wei Xie, Bo Wang[2], Wencen Wu, Jinxiang Pei, Mike Baker, Qi Zhou (2020). Simulation-Based Digital Twin Development for Blockchain Enabled End-to-End Industrial Hemp Supply Chain Risk Management. *Proceedings of the 2020 Winter Simulation Conference,* pp. 3200-3211. https://ieeexplore.ieee.org/document/9384115

C25. Wei Xie, B. Kris Jaeger-Helton, Jared Auclair, Jinxiang Pei, Hua Zheng (2020). STEM Education and Industry Workforce Training for Smart Biopharmaceutical Manufacturing. *Proceedings of the 2020 ASEE Zone 1 conference.*

C24. Bo Wang[2], Wei Xie, Tugce Martagan, Alp Akcay, Canan Gunes Corlu (2019). Stochastic Simulation Model Development for Biopharmaceutical Production Process Risk Analysis and Stability Control. *Proceedings of the 2019 Winter Simulation Conference,* pp. 1989-2000. https://ieeexplore.ieee.org/abstract/document/9004778

C23. Wei Xie, Wencen Wu, Bo Wang[2], Jie You, Zehao Ye[4], Qi Zhou (2019). Simulation-based Blockchain Design to Secure Biopharmaceutical Supply Chain. *Proceedings of the 2019 Winter Simulation Conference,* pp. 797-808. https://ieeexplore.ieee.org/document/9004696

C22. Wei Xie, Pu Zhang[2], Bo Wang[2] (2019). Metamodel-Assisted Sensitivity Analysis for Controlling the Impact of Input Uncertainty. *Proceedings of the 2019 Winter Simulation Conference,* pp. 3681-3692. https://ieeexplore.ieee.org/document/9004730

C21. Wei Xie, Jared Auclair, and Jinxiang Pei. "An Integrated Research, Education/Training, and Industry Practice Framework to Accelerate the Innovation in Biopharmaceuticals Manufacturing and Eliminate Drug Shortage". 2019 ASEE Zone I Conference & Workshop, Niagara Falls, NY, 2019, April. ASEE Conferences, 2019. https://peer.asee.org/33775 Internet. 26 Aug, 2020

C20. Xie, W.[1], B. Wang[2], Q. Zhang (2018). Metamodel-Assisted Risk Analysis for Stochastic Simulation with Input Uncertainty. *Proceedings of the 2018 Winter Simulation Conference,* pp. 1766-1777. https://ieeexplore.ieee.org/document/8632416

C19. Yi, Y.[2], W. Xie[1], Z. Zhou (2018). Simulation-based Stochastic Programming to Guide Real-Time Scheduling for Smart Power Grids under Cyberattacks. *Proceedings of the 2018 Winter Simulation Conference,* pp. 1180-1191. https://ieeexplore.ieee.org/document/8632289

C18. Xie, W.[1], P. Zhang[2], I. Ryzhov (2018). A Simulation-Based Prediction Framework for Stochastic System Dynamic Risk Management. *Proceedings of the 2018 Winter Simulation Conference,* pp. 1886-1897. https://ieeexplore.ieee.org/document/8632476

C17. Xie, W.[1], P. Zhang[2], Q. Zhang (2017). A Stochastic Simulation Calibration for Real-Time System Control. *Proceedings of the 2017 Winter Simulation Conference,* pp. 1914-1925. https://ieeexplore.ieee.org/document/8247927

C16. Zhang, Q. and W. Xie (2017). Asymmetric Kriging Emulator For Stochastic Simulation. *Proceedings of the 2017 Winter Simulation Conference,* pp. 1762-1772. https://ieeexplore.ieee.org/document/8247914

[4]Denotes my master students

C15. Wang, B.[2], Q. Zhang, W. Xie[1] (2017). Bayesian Sequential Calibration Using Detailed Sample Paths. *Proceedings of the 2017 Winter Simulation Conference,* pp. 1962-1973. https://ieeexplore.ieee.org/document/8247931

C14. Xie, W.[1], Y. Yi[2] (2016). A Simulation-Based Prediction Framework for Two-Stage Dynamic Decision Making. *Proceedings of the 2016 Winter Simulation Conference,* pp. 2304-2315. https://ieeexplore.ieee.org/document/7822271

C13. Xie, W.[1], C. Li, H. Sun[2] (2015). Quantification Input Uncertainty for Dependent Input Models with Factor Structure. *Proceedings of the 2015 Winter Simulation Conference,* pp. 667-678. https://ieeexplore.ieee.org/document/7408205

C12. Yi, Y.[2], W. Xie[1], E. Zhou (2015). A Sequential Experiment Design for Input Uncertainty Quantification in Stochastic Simulation. *Proceedings of the 2015 Winter Simulation Conference,* pp. 447-458. https://ieeexplore.ieee.org/document/7408186

C11. Zhou, E., W. Xie (2015). Simulation Optimization when Facing Input Uncertainty. *Proceedings of the 2015 Winter Simulation Conference,* pp. 3714-3724. https://ieeexplore.ieee.org/abstract/document/7408529

C10. Xie, W.[1], B. L. Nelson[3], R. R. Barton[3] (2014). Statistical Uncertainty Analysis for Stochastic Simulation with Dependent Input Models. *Proceedings of the 2014 Winter Simulation Conference,* pp. 674-685. https://ieeexplore.ieee.org/document/7019931

C9. Xie, W., B. L. Nelson[3], J. Staum (2010). The Influence of Correlation Functions on Stochastic Kriging Metamodels. *Proceedings of the 2010 Winter Simulation Conference,* pp. 1067-1078. https://ieeexplore.ieee.org/document/5679083

C8. Barton, R. R.[3], B. L. Nelson[3], W. Xie (2010). A Framework for Input Uncertainty Analysis. *Proceedings of the 2010 Winter Simulation Conference,* pp. 1189-1198. https://ieeexplore.ieee.org/document/5679071

C7. Al-Qadi, I.L.[3], R. Roberts, E. Tutumluer, Z. Leng, W. Xie (2009). New Ground Penetrating Radar Analysis Techniques for Ballast Assessment. *Technology Digest* TD-09-028. AAR, TTCI, Pueblo, CO, USA.

C6. Al-Qadi, I.L.[3], W. Xie, R. Roberts (2008). Scattering Analysis of Railroad Ballast Using Ground-Penetrating Radar. *Transportation Research Board (TRB) 87th Annual Meeting.*

C5. Beak, J., I.L Al-Qadi[3], W. Xie, W.G. Buttler (2008). In-Situ Assessment of Interlayer Systems to Abate Reflective Cracking in Hot-Mix Asphalt Overlays. *Transportation Research Board (TRB) 87th Annual Meeting*, 2084(1), 104-113. https://journals.sagepub.com/doi/10.3141/2084-12

C4. Al-Qadi, I.L.[3], W. Xie, R. Roberts (2007). Flaw Quantification of Railroad Ballast: A New Analysis Approach of Ground Penetrating Radar's Reflection Data. *Transportation Research Board (TRB) 86th Annual Meeting.*

C3. Popovics, J., N. Ryden, A. Gibson, I.L. Al-Qadi[3], D.S. Alzate, W. Xie (2007). New Developments in NDE Methods for Pavements. *AIP Conference Proceedings,* vol. 975, no. 1, pp. 1320-1327. https://pubs.aip.org/aip/acp/article-abstract/975/1/1320/964245/NEW-DEVELOPMENTS-IN-NDE-METHODS-FOR-PAVEMENTS?redirectedFrom=fulltext

C2. Xie, W., I.L. Al-Qadi[3], R. Roberts, E. Tutumluer, J. Boyle (2006). Quantification of Railroad Ballast Condition Using Ground Penetrating Radar Data. *6th International NDE Conference on Civil Engineering.*

C1. Al-Qadi, I.L.[3], J.S. Popovics, K. Jiang, W. Xie, G.P. Getrangolo (2006). Structural Assessment of Kingery Bridge Piers Using Combined Nondestructive Testing Methods. *6th International NDE Conference on Civil Engineering.*

Presentations (P)

P94. Invited presentation on "Optimal Experimental Design for Biomanufacturing Digital Twin Calibration and Process Control," the 2026 SIAM conference on Uncertainty Quantification (SIAM UQ26). Minneapolis, Minnesota, March 22-25, 2026.

P93. A Symbolic and Statistical Learning Framework to Discover Bioprocessing Regulatory Mechanism: Cell Culture Example. Winter Simulation Conference, Seattle, WA. December 7-10, 2025.

P92. Invited presentation on "Sequential Bayesian Learning on Multi-scale Probabilistic Knowledge Graph Foundation Model for Biomanufacturing Process Mechanisms Federated Learning," American Society of Mechanical Engineering (ASME) Rising Stars of Mechanical Engineering Celebration and Showcase, ASME International Mechanical Engineering Congress and Exposition (IMECE), Memphis, Tennessee, November 18, 2025.

P91. Bayesian Inference on Multi-Scale Probabilistic Knowledge Graph Foundation Model to Support Flexible Biomanufacturing Process Monitoring and Mechanism Learning, ASME 2025 International Mechanical Engineering Congress and Exposition (IMECE2025), Memphis, TN, November 16–20, 2025 (presented by my student).

P90. Bioprocess Mechanism Bayesian Learning and Monitoring. 2025 INFORMS Annual Meeting, Atlanta, Georgia. October 26-29, 2025

P89. Received the invitation serving as a panelist in the "Promotion Preparation and Faculty Panel" session. 2025 New Faculty Orientation. Northeastern, August 20, 2025.

P88. Invited presentation on "Digital Twin Calibration and Optimal Control for Biomanufacturing Processes," Digital Transformation and AI Track, Bioprocessing Summit, Boston, August 18-21, 2025.

P87. Invited presentation on "AI Platform Development for Biological Systems Integration and Mechanisms Learning," Young Scholars' Program, July 9th, Northeastern University, Boston. (NSF CAREER outreach)

P86. Invited presentation on "Advanced Bioprocessing Sensor and Analytical Technologies for Induced Pluripotent Stem Cell Culture Online Monitoring and Automation," the NIIMBL National Meeting 2025, June 24-26, Washington, D.C.

P85. Invited presentation on "Digital Twin Calibration with Model-Based Reinforcement Learning," the IMSI Workshop Speaker Invitation, Uncertainty Quantification and Machine Learning for Complex Physical Systems, May 19-23, 2025.

P84. Invited presentation on "Biomanufacturing Modeling and Machine Learning Ontology" and panel discussion on biomanufacturing system ML and ontology, 2025 Industrial Digital Ecosystem Summit, April 8-11, 2025, Rockville, Maryland.

P83. Multi-Scale Kinetics Modeling and Advanced Assays for mRNA-Lipid Nanoparticle Potency Assessments, COE PhD Research Expo, Northeastern University, Boston, February 24, 2025 (poster presented by my student).

P82. A Novel Bayesian Inference Approach for Biomanufacturing Process Mechanistic Models Inspired by Langevin Diffusion, COE PhD Research Expo, Northeastern University, Boston, February 24, 2025 (poster presented by my student).

P81. Digital Twin Calibration Driven by Biomanufacturing, COE PhD Research Expo, Northeastern University, Boston, February 24, 2025 (poster presented by my student).

P80. Multiscale Modelling for iPSC Aggregate Culture, COE PhD Research Expo, Northeastern University, Boston, February 24, 2025 (poster presented by my student).

P79. Adjoint Sensitivity Analysis for Multi-Scale Bioprocess Stochastic Reaction Network. Winter Simulation Conference, Orlando, Florida, December 15-18, 2024 (presented by my student).

P78. Linear Noise Approximation Assisted Bayesian Inference on Mechanistic Model of Partially Observed Stochastic Reaction Network. Winter Simulation Conference, Orlando, Florida, December 15-18, 2024 (presented by my student).

P77. Digital Twin Calibration for Biological System-of-Systems: Cell Culture Manufacturing Process. Winter Simulation Conference, Orlando, Florida, December 15-18, 2024.

P76. Langevin Diffusion-Based Linear Noise Approximation for Bioprocessing Mechanistic Model Bayesian Inference. INFORMS Annual Meeting, Washington, October 20-23, 2024 (presented by my student).

P75. Variance Reduction Based Experience Replay for Policy Optimization. INFORMS Annual Meeting, Washington, October 20-23, 2024.

P74. Sample Efficient Reinforcement Learning for Process Optimal Control. Seminar Talk. The IEOR department at University of California Berkeley, California. September 9, 2024. `https://events.berkeley.edu/IEOR/event/267466-berkeley-ieor-seminar-series-wei-xie-northeastern`

P73. The Role of AI/ML in Cell Therapy Manufacturing. Session "AI/ML and Digital Twin Approaches in Cell Therapy Manufacturing." The 16th Annual Bioprocessing Summit, August 19-22, 2024, Boston, MA. - invited speaker. `https://www.bioprocessingsummit.com/cell-therapy-manufacturing#2`

P72. Calibrating Digital Twin with Model-Based Reinforcement Learning. Joint Statistical Meetings (JSM) - Statistics & Data Science, August 3-8, 2024, Portland, Oregon.

P71. PC 5.2-127: Advanced Bioprocess Sensor and Analytical Technologies for Induced Pluripotent Stem Cell (iPSC) Culture Online Monitoring and Automation. The 2024 NIIMBL National Meeting, in Washington, DC. June 27, 2024.

P70. Stochastic Biological System-of Systems Modelling and PAT for iPSC Cultures. The 2024 NIIMBL National Meeting, in Washington, DC. June 26, 2024.

P69. Structure and Function Dynamics Hybrid Modeling: RNA Degradation, Winter Simulation Conference, in San Antonio, Texas. December 10-13, 2023.

P68. Stochastic Molecular Reaction Queueing Network Modeling for In Vitro Transcription Process, Winter Simulation Conference, in San Antonio, Texas. December 10-13, 2023.

P67. Multi-scale Bioprocess Hybrid Modeling, Mechanism Learning, and Optimization. Statistics and Biostatistics seminar presentation. University of Waterloo, Ontario, Canada. November 15, 2023.

P66. Bayesian Knowledge Graph assisted Reinforcement Learning for Biomanufacturing Process Prediction and Optimal Control. Seminar Talk. Texas A&M. College Station, TX. October 19-20, 2023.

P65. Reinforcement Learning Based Process Control with Digital Twin Model Calibration. INFORMS Annual Meeting, Phoenix, Arizona, October 15-18, 2023 (presented by my student).

P64. Biological System-of-Systems Framework for iPSC Culture in Aggregates. INFORMS Annual Meeting, Phoenix, Arizona, October 15-18, 2023.

P63. A Unified Analytical Platform to Accelerate Induced Pluripotent Stem Cells (iPSCs) Manufacturing Process Development and Scale-Up. NIIMBL Project Call 7.1 Summit. Invited poster presentation. Washington D.C., September 13, 2023.

P62. Multi-scale Bioprocess Knowledge Graph Hybrid Modeling and Interpretable AI/ML. Seminar talk, NIST Systems Integration Division. Online presentation, August 28, 2023. Onsite visit, September 14, 2023.

P61. Challenges and Opportunities for the Innovations on Biomanufacturing Process Modeling, Analysis, and Control. ASME conference IDETC/CIE. Boston, August 20-23, 2023.

P60. Experience Replay for Policy Optimization – Let AI remember and intelligently learn from the past. Seminar Talk. North Carolina State University. April 14, 2023.

P59. Induced Pluripotent Stem Cells Culture Modeling and Process Analysis. The fifth annual COE PhD Research Expo. February 27, 2023 (Poster presentation by my student)

P58. Modularized PAT Online Training Platform to Accelerate the Workforce Innovation in Biopharmaceuticals Manufacturing. The fifth annual COE PhD Research Expo. February 27, 2023 (Poster presentation by my student)

P57. Blockchain-Enabled IoT Platform for End-to-End Supply Chain Risk Management. The fifth annual COE PhD Research Expo. February 27, 2023 (Poster presentation by my student)

P56. Green Simulation based Policy Optimization with Partial Historical Trajectory Reuse, Winter Simulation Conference, Singapore, December 11-14, 2022.

P55. From Discovery to Production: Challenges and Novel Methodologies for Next Generation Biomanufacturing, Winter Simulation Conference, Singapore, December 11-14, 2022.

P54. Sequential Importance Sampling for Hybrid Model Bayesian Inference to Support Bioprocess Mechanism Learning and Robust Control, Winter Simulation Conference, Singapore, December 11-14, 2022.

P53. Risk-based Modeling and Machine Learning Technology for Bioprocess Monitoring and Control. 4th Annual Next-Gen Bioprocessing Conference, Boston, 2022 (invited as distinguished speaker).

P52. Modularized PAT Online Training Platform to Accelerate Workforce Innovation in Biopharmaceuticals Manufacturing. The NIIMBL Member Forum, October 27, 2022. Online.

P51. Green Simulation Assisted Policy Gradient to Accelerate Stochastic Process Control. INFORMS Annual Meeting, October 16-19, 2022. Indianapolis, IN.

P50. Blockchain-Enabled IoT Platform for End-to-End Supply Chain Risk Management. INFORMS Annual Meeting, October 16-19, 2022. Indianapolis, IN.

P49. Probabilistic Knowledge Graph Hybrid Model-based Reinforcement Learning for Integrated Biomanufacturing Process Policy Optimization. Seminar Talk. Eindhoven University of Technology. October 13, 2022.

P48. Variance Reduction based Experience Replay for Policy Optimization. Seminar Talk. George Mason University. September 23, 2022.

P47. Hybrid Model-based Reinforcement Learning for Cell Therapy Manufacturing Mechanism Learning and Process Control. Bioprocessing Summit, August 15-18, 2022. Boston (invited presentation)

P46. Modularized PAT Online Training Platform to Accelerate the Workforce Innovation in Biopharmaceuticals Manufacturing. The 2022 NIIMBL Annual Meeting, July 26-28, 2022. Washington, D.C.

P45. Mixture Importance Sampling Assisted Reinforcement Learning for Process Control with Partial Trajectory Reuse. Production and Operations Management Society (POMS) conference, April 21-25, 2022

P44. Knowledge Graph Hybrid Model-based Bayesian Reinforcement Learning for Cell Therapy Manufacturing Process Control. Production and Operations Management Society (POMS) conference, April 21-25, 2022

P43. Stochastic Simulation Uncertainty Analysis to Accelerate Modular Biomanufacturing Process Digital Twin Development. Production and Operations Management Society (POMS) conference, April 21-25, 2022

P42. Green Simulation Assisted Policy Gradient To Accelerate Stochastic Process Control. INFORMS Annual Meeting, October, 2021 (My PhD student presented)

P41. Policy Optimization in Bayesian Network Hybrid Models of Biomanufacturing Processes. INFORMS Annual Meeting, October, 2021.

P40. Probabilistic Knowledge Graph Assisted Reinforcement Learning for Biomanufacturing Process Control. Production and Operations Management Society (POMS) conference, May, 2021.

P39. Blockchain-Enabled Internet-of-Things Platform for End-to-End Industrial Hemp Supply Chain. Production and Operations Management Society (POMS) conference, May, 2021

P38. Optimizing Biomanufacturing Harvesting Decisions under Limited Historical Data. Production and Operations Management Society (POMS) conference, May, 2021

P37. STEM Education and Industry Workforce Training for Smart Biopharmaceutical Manufacturing. The 2020 ASEE Zone 1 conference (Online) (My coauthor presented)

P36. Simulation-Based Digital Twin Development for Blockchain Enabled End-to-End Industrial Hemp Supply Chain Risk Management. Winter Simulation Conference, Dec. 2020, Online (My PhD student presented)

P35. Green Simulation Assisted Reinforcement Learning with Model Risk for Biomanufacturing Learning and Control. Winter Simulation Conference, Dec. 2020, Online (My PhD student presented)

P34. End-to-end Biopharmaceuticals Production Process Risk and Sensitivity Analyses for Quality by Design and Stability Control. SUNY Polytechnic Institute - Seminar Talk. April, 2020.

P33. Interpretable AI for End-to-End Biopharmaceutical Production Process Risk Analysis and Facilitation of QbD, ISPE Facilities of the Future Conference, San Francisco, January, 2020. ISPE: International Society for Pharmaceutical Engineering (invited)

P32. Simulation-based Blockchain Design to Secure Biopharmaceutical Supply Chain, Winter Simulation Conference, Washington D.C., December, 2019.

P31. End-to-End Interpretable Production Process Risk and Sensitivity Analysis for PAT, QbD and Stability Control, NIIMBL Summit Meeting, Washington D.C., October, 2019.

P30. A Systematic Risk Analysis and Sensitivity Analysis Framework to Facilitate Biopharmaceutical Production Learning and Stability Improvement, INFORMS Annual Meeting, Seattle, October, 2019.

P29. A Simulation-based Decision Framework for Stable, Flexible and Efficient Biomanufacturing Development, INFORMS Annual Meeting, Seattle, October, 2019.

P28. Data-Driven Stochastic Optimization for Power Grids Scheduling under High Wind Penetration, Applied Energy Symposium MIT A+B, Boston, May 2019.

P27. Data Integrity, Big Data Analytics and Interpretable AI for End-to-End Biomanufacturing Risk Management, 2019 NIIMBL Technology Workshop I – Process Intensification, Boston, April 2019.

P26. An Integrated Research, Education and Industry Practice Framework to Accelerate the Innovations in Biopharmaceuticals Manufacturing and Eliminate Drug Shortage, ASEE conference, Niagara Falls, NY, April 2019.

P25. Metamodel-Assisted Risk Analysis for Stochastic Simulation with Input Uncertainty, Winter Simulation Conference, Gothenburg, Sweden, December 2018.

P24. A Simulation-Based Prediction Framework for Stochastic System Dynamic Risk Management, Winter Simulation Conference, Gothenburg, Sweden, December 2018.

P23. A Metamodel-Assisted Framework for Two-Stage Stochastic Programming via Simulation, INFORMS Annual Meeting, Phoenix, November 2018.

P22. Distributional Metamodel for Stochastic Simulation Risk Quantification, INFORMS Annual Meeting, Phoenix, November 2018.

P21. A Simulation-Based Prediction and Optimization Framework for Bio-pharmaceutical Supply Chain Dynamic Risk Management, Joint Statistical Meeting, Vancouver, July 2018.

P20. Data-Driven Stochastic Optimization for Power Grids Scheduling under High Wind Penetration, Technical Conference: Increasing Real-Time and Day-Ahead Market Efficiency and Enhancing Resilience through Improved Software, hosted by Federal Energy Regulatory Commission, Washington D.C., June 2018.

P19. A Stochastic Simulation Calibration Framework for Real-Time System Control, Winter Simulation Conference, Las Vegas, NV, December 2017.

P18. A Simulation Optimization for Two-Stage Decision Making, INFORMS Annual Meeting, Houston, Texas, October 2017.

P17. A Simulation Calibration Framework for the Production Control, INFORMS Annual Meeting, Houston,Texas, October 2017.

P16. A Stochastic Simulation Calibration Framework for the Production Control, SRC conference, Piscataway, New Jersey, May 2017

P15. A Simulation-Based Prediction Framework for Two-Stage Dynamic Decision Making, Winter Simulation Conference, Washington, D.C., December 2016.

P14. Quantification Input Uncertainty for Dependent Input Models with Factor Structure, Winter Simulation Conference, Huntington Beach, CA, December 2015.

P13. An Efficient Design of Experiments for Stochastic Simulation: Quantifying Input Uncertainty, INFORMS Annual Meeting, Philadelphia, PA, November 2015.

P12. Statistical Uncertainty Quantification for Stochastic Simulation with Dependent Input Models, Albany Chapter of the American Statistical Association, Albany, NY, May 2015.

P11. A Bayesian Framework for Statistical Uncertainty Quantification in Stochastic Simulation, CSE Seminar at Rensselaer Polytechnic Institute, Troy, NY, May 2015.

P10. Statistical uncertainty analysis for stochastic simulation with dependent input models, Winter Simulation Conference, Savannah, GA, Dec. 2014.

P9. Multivariate input uncertainty in output analysis for stochastic simulation, INFORMS Annual Meeting, San Francisco, Nov. 2014.

P8. A Bayesian framework for quantifying uncertainty in stochastic simulation, INFORMS Annual Meeting, San Francisco, Nov. 2014.

P7. Modeling the effect of engagement and disengagement with mobile apps on customer purchase behavior, Marketing EDGE Professor's Institute, Cincinnati, Jan. 2014.

P6. Statistical uncertainty analysis for stochastic simulation, INFORMS Annual Meetings, Mineapolis, Oct. 2013.

P5. The influence of correlation functions on stochastic kriging metamodels, Winter Simulation Conference, Baltimore, Dec. 2010.

P4. Approximate dynamic programming for serial multi-echelon system with economies of scale, INFORMS Annual Meeting, Washington DC, Oct. 2008.

P3. Development of a time-frequency approach to quantify railroad ballast fouling condition using UWB GPR data, Transportation Research Board, Washington DC, 2008.

P2. Scattering analysis of railroad ballast using ground penetrating radar, Transportation Research Board, Washington DC, 2007.

P1. Quantification of Railroad Ballast Condition Using Ground Penetrating Radar Data, 6th International NDE Conference on Civil Engineering, St. Louis, 2006.

Current and Previous Students and Postdoc

My Ph.D. students received job offers from academic universities and top technology companies, including Facebook Meta AI research, Microsoft, Amazon, and Goldman Sachs.

- **Current Ph.D. Students and Postdoc**
  - Wandi Xu, January 2023 - present
    - Research Topics: (1) Bayesian model inference for stochastic reaction network regulation mechanism learning and predictive analytics; and (2) Sequential importance sampling for knowledge graph hybrid model Bayesian inference, latent state online monitoring, and mechanism learning
    - Finished one WSC paper and close to finish a journal paper on multi-scale bioprocess mechanistic/hybrid model Bayesian inference to support heterogeneous data integration, latent state online monitoring, and federated learning on underlying mechanisms
  - Fuqiang Cheng, August 2023 - present
    - Research Topics: (1) digital twin calibration and reinforcement learning to improve multi-scale bioprocess characterization and optimization accounting for underlying mechanisms from molecular to cellular to macro-scale dynamics; (2) integrated metabolic and gene networks
    - Finished one WSC paper
  - Yuling Yang, January 2024 - present

    - Research Topics: (1) Bayesian reinforcement learning, policy structure analysis, and optimization for integrated upstream and downstream biomanufacturing process control; (2) multi-scale bioprocess mechanistic model, ML, and predictive analytics for integrated RNA delivery and translation process, accounting for particle-to-particle interactions (such as interactions of RNAs, nanoparticles, proteins, and cells); and (3) RNA structure-function dynamics hybrid modeling for enzymatic reaction networks and biomolecular conformational change
  - Keilung Choy, January 2024 - present
    - Research Topics: (1) stochastic reaction network uncertainty quantification and sensitivity analysis on stochastic differential equations (SDEs); (2) model-based reinforcement learning, and optimal design of experiments to accelerate biomanufacturing process mechanism learning and automation; and (3) digital twin development, calibration, and sequential design of experiments for mRNA manufacturing
    - Finished two WSC papers
  - Yuming Zeng, start from Fall 2025
  - Faranak Hatami (in-coming post-doc)
- **Past Ph.D. students**
  - Keqi Wang, June 2019 – July 2025 (Northeastern University)
    - Research Topics: (1) a blockchain enabled IoT platform for end-to-end supply chain risk management; (2) mammalian cell and iPSC metabolic and gene regulatory network modeling and mechanisms learning with multiple isotopic tracers; and (3) hybrid modeling and digital twin development for In Vitro Transcription (IVT) Processes Used for Therapeutic mRNA Production
    - Finished four journal papers and three Winter Simulation Conference (WSC) papers; supported the preparation and revision of four peer-reviewed papers
  - Hua Zheng, June 2019 – July 2024 (Northeastern University)
    - Thesis Title: Sample-Efficient Reinforcement Learning and Its Applications (graduated in April 2024)
    - Finished five journal papers and three Winter Simulation Conference papers; support the revision of one journal paper
    - Received a job offer from *Facebook Meta AI research*
  - Bo Wang, September 2016 – December 2020 (Northeastern University)
    - Thesis Title: Simulation and Artificial Intelligent Methodologies for End-to-End Bio-Pharmaceutical Manufacturing and Supply Chain Risk Management
    - Finished four journal papers and four Winter Simulation Conference papers; finalist for 2017 INFORMS best student paper on Quality, Statistics and Reliability; 2018 summer intern at Argonne National Laboratory; 2019 Data Scientist summer intern at Microsoft
    - Received a job offer from *Microsoft* - knowledge graph team.
  - Pu Zhang, June 2015 – August 2018 (RPI)
    - Thesis Title: Data Analytics and Simulation Methodologies for Adaptive Supply Chain Risk Management in Bio-Pharmaceutical Manufacturing
    - Finished three journal papers and two Winter Simulation Conference papers
    - Received job offers from *Goldman Sachs* and *Amazon*
  - Yuan Yi, October 2014 – August 2018 (RPI)

    - Thesis Title: Data-Driven Stochastic Optimization for Cyber-Physical System Reliability Management: Smart Power Grids with Renewable Energy
    - Finished three journal papers and three Winter Simulation Conference papers; 2017 summer intern at Argonne National Laboratory; single winner of 2017 RPI Industrial and Systems Engineering research award

- **Past Master Students**
  - Zhengyu Ke, April 2022 – September 2022
    - Modularized process analytical technology (PAT) online training platform development to accelerate the workforce innovation in biopharmaceuticals manufacturing
  - JiaHao Zhu, November 2020 – August 2021
    - Thesis Title: EHR based Interpretable Reinforcement Learning to Facilitate Automatic Personalized Treatment during the COVID-19 Pandemic

      During the COVID-19 pandemic, there is a global shortage of health care workers to care for all the patients. Leveraging the information from Electronic Health Record (EHR) and existing pathological knowledge, we will first develop a probabilistic knowledge graph for the clinical care decision process, modeling the causal interactions between a patient's background, medical interventions, and health outcomes. Then, we will propose the predictive analytic to improve the prediction of treatment outcome, and further introduce the reinforcement learning to guide the online learning and automatic personalized treatment.
  - Zehao Ye, January 2019 – May 2019 (Northeastern University)
    - Research Topic: Simulation-Based Blockchain Development for Global Biopharmaceutical Supply Chain to Improve Drug Safety
  - Yidan Wang, October 2018 – May 2019 (Northeastern University)
    Co-advise with Dr. Kayse Maass
    - Research Topic: Data Analytics and Simulation Modeling to Study Mental Health Crisis and Disparities - A Case Study of the Olmsted County at Minnesota (collaborate with Mayo Clinic)

- **Undergraduate Research Projects**
  Dr. Xie involves undergraduate students in research through a series of capstone projects on smart biomanufacturing since 2019 and published multiple ASEE papers with the collected data demonstrating the educational effectiveness of the developed AI/ML training and digital twin assisted vLab; see papers C21, C25, and C28. These capstone projects have the objectives to seamlessly transform the research results to practice, advance the STEM multi-disciplinary education, and develop workforce training materials/platform to: (1) accelerate biopharmaceutical manufacturing innovation, support the development of science- and risk-based standards that enable more flexible, efficient and rapid manufacturing capabilities with state-of-the-art interpretable AI; (2) improve data integration, big data analytics and AI/ML to facilitate end-to-end biomanufacturing risk management and production automation; and (3) build reliable and efficient quality control into the production process in the real complex biomanufacturing environment.
  - Capstone Project: "Digital Twin Assisted Online Platform for Process Analytical Technology Training" Fall 2022 - Spring 2023
  - Capstone Project: "Induced Pluripotent Stem Cell (iPSC) Culture Online Monitoring and Automation" Fall 2022 - Spring 2023

- Capstone Project: "Biopharmaceutical Manufacturing Process Digital Twin and Risk Based Interpretable AI" Fall 2022 - Spring 2023
- Capstone Project: "Integrated Biopharmaceutical Manufacturing Process Monitoring and Control" Fall 2021 - Spring 2022
- Capstone Project: "Smart Biopharmaceutical Manufacturing for STEM Education and Industry Workforce Training - Phase III" Fall 2021 - Spring 2022
- Capstone Project: "Smart Biopharmaceutical Manufacturing for STEM Education and Industry Workforce Training – Phase II" Fall 2020 - Spring 2021
- Capstone Project: "Smart Biopharmaceutical Manufacturing for STEM Education and Industry Workforce Training – Phase I" Fall 2019 - Spring 2020

Teaching Experience

Northeastern University

- Teaching
  - IE 6200 Engineering Probability and Statistics Fall 2024 – present
  - IE 7280 Statistical Methods in Engineering Fall 2023 – present
  - IE 7215 Simulation Analysis Spring 2019 – present
  - IE 4510 Simulation Modeling and Analysis Spring 2019 – present

Rensselaer Polytechnic Institute

- Teaching
  - ISYE 4290/6620 Discrete-Event Simulation Modeling Fall 2017
  - ISYE 4210/6600 Design of Manufacturing Systems and Supply Chains Spring 2016,2017,2018
  - ISYE 4140 Statistical Analysis Fall 2014 - Fall 2015

Northwestern University

- Co-teaching
  - IMC 451 Statistics and Marketing Research Fall 2013

Industrial Professional Training and Experiences in Biomanufacturing

- Serve as Technical Activity Committee (TAC) for The National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) December 2018 - present
  - The NIIMBL mission is to accelerate biopharmaceutical manufacturing innovation, support the development of standards that enable more efficient and rapid manufacturing capabilities, and educate and train a world-leading biopharmaceutical manufacturing workforce. The TAC focus on ensuring that relevant and high-quality projects are being pursued to achieve NIIMBL objectives.
- Intact Protein Analysis Special Program with Hands-on Training June 2019
- International Council for Harmonisation (ICH) – Q1 Stability Training October 2018
- PDA/FDA Joint Regulatory Conference September 2018

Service and Memberships

External Professional Activities

- Communications Editor for INFORMS-Simulation (I-Sim) 2022 - present
  Please see previous years' I-Sim newsletters at `https://connect.informs.org/simulation/simulation-resources/newsletter`
- Guest Associate Editor, Decision Sciences
- Proceedings co-editor for 2024 Winter Simulation Conference (WSC)
- Serve on the Best Theoretical Paper (BTP) Committee for WSC 2024
- Track Chair for the "Uncertainty Quantification & Robust Simulation" track for 2025 Winter Simulation Conference (WSC)
- Track Chair for the "Uncertainty Quantification & Robust Simulation" track for 2024 Winter Simulation Conference (WSC)
- Session Organizer for the "Simulation and Optimal Learning", INFORMS 2024 Annual Meeting in Seattle, Washington, October 20-23, 2024.
- Conference Organizer for the "Advanced Manufacturing for Bioeconomy and Circular Economy" topic, the ASME 2024 IDETC/CIE conference, August 25–28, 2024, Washington, DC, USA.
- Session Organizer for the "Digital Twin Calibration and Uncertainty Quantification", 2024 Joint Statistical Meetings (JSM), August 3–8, 2024. Portland, Oregon.
- Session Organizer for "Simulation Optimization and Reinforcement Learning", in Multi-stage Stochastic Programming and Reinforcement learning stream, International Symposia on Mathematical Programming (ISMP), July 21-26, 2024. Montreal, Canada.
- Serve on the Best Theoretical Paper (BTP) Committee for WSC 2023
- Track Chair for the "Uncertainty Quantification & Robust Simulation" track for 2023 Winter Simulation Conference (WSC)
- Session Chair for the "Coarse-Grained Simulations of DNA and RNA Systems with oxDNA and oxRNA Models: Tutorial" for 2023 Winter Simulation Conference (WSC)
- Session Chair for the "Modeling and Analysis of Biopharmaceutical Manufacturing Systems" session for INFORMS 2023 Annual Meeting
- Session Chair for the "Simulation & AI" session for INFORMS 2023 Annual Meeting
- Session Chair for the "Simulation-based Stochastic Optimization" session for INFORMS 2023 Annual Meeting
- Session Chair for Advanced Tutorial: "Blockchain: a Review from the Perspective of Operations Research" for WSC 2022
- Session Chair for "Random Processes and Optimization" for WSC 2022
- Session Chair for "Decision Making under Input Uncertainty" for WSC 2022
- Session Chair for "Simulation and AI" for INFORMS 2022 Annual Meeting
- Session organizer for INFORMS 2022 I-Sim session
- Track Chair for the "Analysis Methodology" track for 2022 Winter Simulation Conference (WSC)
- Session Chair for the "Machine Learning" under "Healthcare Operations Management" track for 2022 POMS conference, April, 2022
- Session Chair for the "Simulation in Healthcare" under "Healthcare Operations Management" track for 2022 POMS conference, April, 2022
- Session Organizer and Chair for the "Simulation and Reinforcement Learning" for 2021 Institute for Operations Research and The Management Sciences (INFORMS), October, 2021. California

- Track Chair for the "Analysis Methodology" track for 2021 Winter Simulation Conference (WSC), December 2021, Phoenix, Arizona
- Track Chair for the "Advanced Tutorial" track for 2021 Winter Simulation Conference, December 2021, Phoenix, Arizona
- Session Organizer and Chair for "Modeling and Optimization of Biomanufacturing Operations" for 2021 Production and Operations Management Society (POMS) conference, April-May 2021
- Session Organizer and Chair for "Analytics in Manufacturing Operations" for 2021 Production and Operations Management Society (POMS) conference, April-May 2021
- Session Organizer and Chair for "Design and Development of Blockchain" for 2021 Production and Operations Management Society (POMS) conference, April-May 2021
- Track Chair for the Analysis Methodology track for 2020 Winter Simulation Conference
- Session Chair for "Digital Twins and Innovative Simulations in Industry" for 2020 Winter Simulation Conference
- Session Chair for "Blockchain: A Review from The Perspective of Operations Researchers" for 2020 Winter Simulation Conference
- Session Chair for "Estimation Methodology" for 2020 Winter Simulation Conference
- Planning committee, the fourth annual Woman of Color in the Academy Conference
- Session Chair for the 2019 Winter Simulation Conference (WSC)
- Session Chair for the 2019 INFORMS Annual Meeting
- Moderators / Scribes for Session "Multivariate Sensors, Data Acquisition and Analysis for Product Quality and In-line Lot Release", the NIIMBL Tech Workshop: Big Data Analysis for Biomanufacturing, June 2019, Washington D.C.
- Host the NIIMBL Tech Workshop: Process Intensification, April 2019, Boston (with Jared Auclair)
- Co-chair for the Analysis Methodology track for 2019 Winter Simulation Conference
- Track-Coordinator for the Analysis Methodology track for 2018 Winter Simulation Conference
- Organizer for symposium on "Simulation Analysis Methodologies for Decision Making in Smart Manufacturing", 2019 ASME International Manufacturing Science & Engineering Conference (MSEC)
- Session Organizer for 2018 Joint Statistical Meetings (JSM)
- Session Chair for 2018 INFORMS Annual Meeting - Simulation Optimization Session
- Session Chair for 2017 Winter Simulation Conference (WSC)
- WSC Diversity Committee and Chair (2015 - 2018)

Internal Professional Activities

- Qualification Exam committee for PhD candidate, Jianhong Chen Fall, 2025
- Qualification Exam committee for PhD candidate, Jianan Zheng Nov. 13, 2024
- Qualification Exam committee for PhD candidate, Mengxu Xie November 6, 2024
- Judge for COE PhD Research Expo at Northeastern February 27, 2023
- Judge for COE PhD Research Expo at Northeastern March 2022

- Biotech Futures: Panelist for Career Exploration (links Boston high schools students with biotech, life sciences, STEM careers – with attendance > 70) April 12, 2021
- Ph.D. Candidate Qualifying Exam Committee Fall 2019 - present
- Mechanical and Industrial Engineering Faculty Awards Committee Fall 2020 - present
- Judge for the Research Poster and Engineering as Art competitions Fall 2020
- Judge for COE PhD Research Expo at Northeastern February 2019
- Graduate committee Spring 2017 - Summer 2018
- Undergraduate committee Fall 2015 - Spring 2016
- Undergraduate advisor for 2019 class Fall 2015 - Spring 2016
- Ph.D. thesis committee chairman
  - Hua Zheng, Department of Mechanical and Industrial Engineering at Northeastern University, thesis "Sample-Efficient Reinforcement Learning and Its Applications" (2024)
  - Bo Wang, Department of Mechanical and Industrial Engineering at Northeastern University, thesis "Simulation and Artificial Intelligent Methodologies for End-to-End Bio-Pharmaceutical Manufacturing and Supply Chain Risk Management" (2020)
  - Yuan Yi, Department of Industrial and Systems Engineering at RPI, thesis "Data-Driven Stochastic Optimization for Reliability Management: Smart Power Grids with Renewable Energy" (2018)
  - Pu Zhang, Department of Industrial and Systems Engineering at RPI, thesis "Data Analytics and Simulation Methodologies for Adaptive Supply Chain Risk Management in Bio-pharmaceutical Manufacturing" (2018)
- Ph.D. thesis committee
  - Kunmei Li, Mechanical and Industrial Engineering at Northeastern University, thesis "Analysis and Modification of Mutual Information-Based Feature Selection Methods Regarding Data Imbalance and Incompleteness." (Advisor: Prof Nasser Fard)
  - Yilin Yin, Mechanical and Industrial Engineering at Northeastern University, thesis "Data-driven Learning Framework for Patient Survival and Mortality Prediction." (Advisor: Chou, Joe)
  - Yanhui Jiang, Mechanical and Industrial Engineering at Northeastern University, thesis "Multiphysics Encoded Hierarchical Learning for Multiscale Data-Driven Modeling of Complex Materials."
  - Jie You, Computer System Engineering at RPI, thesis "Cooperative Filtering, Identification, and Mapping for Spatially Distributed Systems Using Mobile Sensor Networks."
  - Hari Prasadh, Industrial and Systems Engineering at RPI, thesis "Design of Experiments for Nonlinear Regression Models without using Prior Point Parameter Estimates."

Proposal Review Panel

- NSF Cyber-Physical Systems (CPS) Program
- NSF Manufacturing Systems Integration (MSI) Program
- NSF and BioMADE (Bioindustrial Manufacturing and Design Ecosystem) Program

- National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL)
- Department of Defense (DoD) programs
- U.S. Department of Energy (DoE) – Biological and Environmental Research (BER)
- U.S. Department of Energy (DoE) – Basic Energy Sciences (BES)

Paper Referee

Scientific Reports – Nature
Management Science (MS)
Operations Research (OR)
European Journal of Operational Research (EJOR)
INFORMS Journal on Computing (JoC)
INFORMS Journal on Data Science
Manufacturing and Service Operations Management (MSOM)
IISE Transactions
ACM Transactions on Modeling and Computer Simulation (ACM TOMACS)
Naval Research Logistics
Cell Systems
IEEE Transactions on Automation Science and Engineering
Biotechnology and Bioengineering
Discover Chemical Engineering
IEEE Transactions on Power Systems
IEEE Access
Statistical Analysis and Data Mining
Automatica
International Journal of Production Research
Journal of Simulation
Proceedings of the Winter Simulation Conference
Computers and Operations Research
Flexible Services and Manufacturing Journal

Member

Institute for Operations Research and The Management Sciences (INFORMS)
National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL)
Production and Operation Management Society (POMS)
Parenteral Drug Association (PDA)
Transportation Research Board (TRB)