

Joel A. Paulson

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I. PERSONAL HISTORY AND PROFESSIONAL EXPERIENCE

A. Education

Massachusetts Institute of Technology, Ph.D., Chemical Engineering, 2016
Massachusetts Institute of Technology, M.S.CEP, Chemical Engineering, 2013
University of Texas, Austin, Texas, B.S. with Highest Honors, Chemical Engineering, 2011

B. Honors and Awards

National Science Foundation CAREER Award, 2023
Winner, College of Engineering Lumley Research Award, OSU, 2022
Winner, Application Paper Prize at IFAC World Congress, 2020
Finalist for Young Author Prize at IFAC World Congress, 2017
National Science Foundation Graduate Research Fellowship, 2011-2016
Director's Student Presentation Award Finalist, AIChE CAST division, 2016
School of Engineering Graduate Student Award for Extraordinary Teaching and Mentoring, MIT, 2015
(*only 1 chosen per year across all departments*)
Outstanding Graduate Teaching Assistant Award, Chemical Engineering, MIT, 2015
Goodwin Medal Nominee, MIT, 2015
Robert T. Haslam Fellowship, MIT, 2015
Best Poster Presentation Award, Chemical Engineering, UT Austin, 2011
National Merit Scholarship, 2008
Semifinalist, Siemens Research Competition, 2007

C. List of Positions since Final Degree

Assistant Professor, Department of Chemical and Biomolecular Engineering, OSU, 2019-date
Core Faculty, The Sustainability Institute (SI), OSU, 2019-date
Affiliate Faculty, Translational Data Analytics Institute, OSU, 2020-date
Affiliate Faculty, The Driving Dynamics Lab, Center for Automotive Research, OSU, 2020-date
Co-Founder, SirenOpt Inc., 2022-date

D. Other Professional Employment

Postdoctoral Scholar, Department of Chemical and Biomolecular Engineering,
University of California, Berkeley, California, 2016-2019
Visiting Research Scientist, Department of Electrical, Computer, and Biomedical Engineering,
University of Pavia, Italy, 2014

E. Invited Talks

1. Stochastic nonlinear model predictive control with probabilistic constraints. *Identification and Control of Dynamic Systems Laboratory, University of Pavia*, July 2014.
2. Fast stochastic model predictive control of high-dimensional systems. *Department of Chemical and Biomolecular Engineering, University of California, Berkeley*, January 2015.
3. Model predictive control of a continuous end-to-end pharmaceutical manufacturing pilot plant. *Process Systems Engineering Consortium, University of California, Santa Barbara*, August 2015.
4. Advanced control methods for complex chemical and biological systems. *Department of Chemical and Life Science Engineering, Virginia Commonwealth University*, January 2018.

5. Advanced control methods for complex chemical and biological systems. *Department of Chemical and Biomolecular Engineering, The Ohio State University*, February 2018.
6. Advanced control methods for complex chemical and biological systems. *Department of Chemical Engineering, University of Texas at Austin*, February 2018.
7. Arbitrary polynomial chaos for uncertainty quantification of correlated random variables in nonlinear systems. *AIChE Webinar Series-CAST*, March 2018.
8. Parameter estimation and model reduction. *Center for Reproducible Biomedical Modeling, Online Seminar*, June 2019.
9. Advances in learning-based model predictive control and its application to biochemical systems. *The University of British Columbia*, February 2021.
10. Accelerating multiscale process design with Bayesian optimization: Progress, challenges, and opportunities. *AIChE Virtual Process Development Symposium*, June 2021.
11. A tutorial on physics-informed Bayesian optimization for multi-scale process design and operation. *Big Data and Industry 4.0 Session, AIChE Spring Meeting*, April 2022.
12. Toward fully integrated design and predictive control of complex systems under uncertainty using multi-fidelity optimization methods. *Advanced Manufacturing and Processing Conference, AIChE*, June 2022.
13. No-regret Bayesian optimization with unknown equality and inequality constraints using exact penalty functions. *IFAC Symposium on Dynamics and Control of Process Systems, including Biosystem*, June 2022. **[Keynote presentation]**.
14. Structure-exploiting Bayesian optimization: How to quickly find global solutions in the presence of noisy unknown functions? *University of Minnesota*, October 2022.
15. A Bayesian approach for data-efficient flexibility analysis of expensive black-box models. *Foundations of Computer Aided Process Operations / Chemical Process Control*, January 2023.
16. Physics-informed Bayesian optimization for multi-scale process design and operation. *Dow Data Science Seminar*, February 2023.
17. The Next Epoch of Model Predictive Control: Exploiting Machine Learning Methods for Approximation and Design. *Industry 4.0 Session, AIChE Spring Meeting*, March 2023.

G. Organized Workshops

1. Machine Learning and Model Predictive Control. Organized by Ali Mesbah and Joel A. Paulson. *IFAC Symposium on Advanced Control of Chemical Processes*, June 2021.
 - a. Advertisement: <https://www.adchem2021.org/workshop-machine-learning>
 - b. Code available: https://github.com/joelpaulson/ADCHEM_ML_MPC_Workshop_2021
2. Fusion of Machine Learning and MPC: What Advances are on the Horizon? Organized by Ali Mesbah and Joel A. Paulson. *American Control Conference*, June 2022.
3. The Next Epoch of Model Predictive Control: Exploiting Machine Learning Methods for Approximation and Design. Organized by Joel A. Paulson and Ali Mesbah. *IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems*, June 2022.
 - a. Advertisement: <http://dycops2022.org>
 - b. Code available: https://github.com/joelpaulson/DYCOPS22_ML_MPC_Workshop
4. Bayesian Optimization Tutorial. Organized by Joel A. Paulson. *Great Lakes PSE Student Workshop, Carnegie Mellon University*, April 2023.
 - a. Code available: https://github.com/joelpaulson/Great_Lakes_PSE_Workshop_2023
5. A Tutorial on Policy Learning Methods for Advanced Controller Representations. Organized by Joel A. Paulson and Ali Mesbah. *American Control Conference*, June 2023.

H. Review Panels

- Reviewer, AIChE Journal Best Paper Initiative, 2019
- Reviewer, Ohio State Sustainability Research Seed Grant Program, 2020
- Reviewer (x2), National Science Foundation, 2021
- Reviewer (x2), President Research Excellence Seed Funding Program, OSU, 2021
- Reviewer (x2), President Research Excellence Seed Funding Program, OSU, 2022
- Reviewer, President Research Excellence Seed Funding Program, OSU, 2023
- Reviewer, Joint National Natural Science Foundation of China and Israel Science Foundation Research Grant Program, 2021
- Reviewer, National Science Foundation, 2023
- Reviewer, Translational Data Analytics Institute Seed Grant Program, OSU, 2023
- Reviewer, New Frontiers Initiative, University of Illinois, 2023

I. Industrial Collaborations and Consulting

- Artemys Foods – discussions on sustainable process development (2019)
- Owens Corning – discussions on process optimization (2020)
- Dow – discussions on process optimization (2021)
- Mitsubishi Electric Research Laboratories – discussions on Bayesian optimization (2021)

II. PUBLICATIONS

A. Doctoral Thesis

- *Modern Control Methods in Chemical Process Systems*, Massachusetts Institute of Technology, Cambridge, Massachusetts, 2016.

B. Book Chapters

1. J.A. Paulson, S. Streif, R. Findeisen, R.D. Braatz, and A. Mesbah. Fast stochastic model predictive control of end-to-end continuous pharmaceutical manufacturing. In *Process Systems Engineering for Pharmaceutical Manufacturing*, edited by Ravendra Singh and Zhihong Yuan, Elsevier, Amsterdam, Netherlands, Chapter 14, pages 353-378, 2018.
2. J.A. Paulson, E. Harinath, L.C. Foguth, and R.D. Braatz, Control and systems theory for advanced manufacturing. In *Emerging Applications of Control and Systems Theory*, edited by R. Tempo, S. Yurkovich, P. Misra, Springer, 63-79, 2018.
3. E. Harinath, L.C. Foguth, J.A. Paulson, and R.D. Braatz. Model predictive control of polynomial systems. In *Handbook of Model Predictive Control*, edited by Saša V. Raković and William S. Levine, Birkhäuser, 221-237, 2019.

C. Journal Papers

1. D.A. Slanac, A. Lie, J.A. Paulson, K.J. Stevenson, and K.P. Johnston. Bifunctional catalyst for alkaline ORR via promotion of ligand and ensemble effects at Ag/MnOx nanodomains. *The Journal of Physical Chemistry C*, 116:11032–11039, 2012.
2. J.A. Paulson, A. Mesbah, X. Zhu, M. Molaro, and R.D. Braatz. Control of self-assembly in micro- and nano-scale systems. *Journal of Process Control*, 27:38–49, 2015.

3. Y. Son, Q.H. Wang, J.A. Paulson, C. Shih, K. Tvrdy, B. AlFeeli, R.D. Braatz, M.S. Strano. Layer number dependence of MoS₂ photoconductivity using photocurrent spectral atomic force microscope imaging. *ACS Nano*, 9:2843–2855, 2015.
4. B. Jiang, X. Zhu, D. Huang, J.A. Paulson, and R.D. Braatz. A combined canonical variate analysis and fisher discriminant analysis (CVA–FDA) approach for fault diagnosis. *Computers & Chemical Engineering*, 77:1–9, 2015.
5. M. Wang and J.A. Paulson. An adaptive model predictive control strategy for nonlinear distributed parameter systems using the Type-2 Takagai-Sugeno model. *International Journal of Fuzzy Systems*, 18:792–805, 2015.
6. D.O. Bellisario, J.A. Paulson, R.D. Braatz, and M.S. Strano. An analytic solution for exciton generation, reaction, and diffusion in nanotube and nanowire-based solar cells. *The Journal of Physical Chemistry Letters*, 7:2683–2688, 2016.
7. J.A. Paulson, E.A. Buehler, R.D. Braatz, and A. Mesbah. Stochastic model predictive control with joint chance constraints. *International Journal of Control*, 1–14, 2017.
8. J.A. Paulson, M. Martin-Casas, and A. Mesbah. Input design for online fault diagnosis of nonlinear systems with stochastic uncertainty. *Industrial & Eng. Chemistry Research*, 56:9593–9605, 2017.
9. A. Mesbah, J.A. Paulson, R. Lakerveld, and R.D. Braatz. Model predictive control of an integrated continuous pharmaceutical manufacturing pilot plant. *Organic Process Research & Development*, 21:844–854, 2017.
10. J.A. Paulson and A. Mesbah. An efficient method for stochastic optimal control with joint chance constraints for nonlinear systems. *International Journal of Robust and Nonlinear Control*, 2017.
11. T.A.N. Heirung, J.A. Paulson, J. O’Leary, and A. Mesbah. Stochastic model predictive control-how does it work? *Computers & Chemical Engineering*, 114:158–170, 2018.
12. D. Gidon, B. Curtis, J.A. Paulson, D.B. Graves, and A. Mesbah. Model-based feedback control of a kHz-excited atmospheric pressure plasma jet. *IEEE Transactions on Radiation and Plasma Medical Sciences*, 2:129–137, 2018.
13. T.A.N. Heirung, J.A. Paulson, S. Lee, and A. Mesbah. Model predictive control with active learning under model uncertainty: when, why, and how? *AIChE Journal*, 64:3071–3081, 2018.
14. J.A. Paulson, T.L.M Santos, and A. Mesbah. Mixed stochastic-deterministic tube MPC for offset-free tracking in the presence of plant-model mismatch. *Journal of Process Control*, 83:102–120, 2019.
15. J.A. Paulson and A. Mesbah. Optimal Bayesian experiment design for nonlinear dynamic systems with chance constraints. *Journal of Process Control*, 77:151–171, 2019.
16. J.A. Paulson, M. Martin-Casas, and A. Mesbah. Fast uncertainty quantification for dynamic flux balance analysis using non-smooth polynomial chaos expansions. *PLOS Computational Biology*, 15, e1007308, 2019.
17. J.A. Paulson and A. Mesbah. Approximate closed-loop robust model predictive control with guaranteed stability and constraint satisfaction. *IEEE Control Systems Letters*, 4:719–724, 2020.
18. A. Mesbah, J.A. Paulson, and R.D. Braatz. An internal model control design method for failure-tolerant control with multiple objectives. *Computers & Chemical Engineering*, 4:106955, 2020.
19. Y. Xu, A.M. Rather, S. Song, J.-C. Fang, R.L. Dupont, U.I. Kara, Y. Chang, J.A. Paulson, R. Qin, X. Bao, and X. Wang. Ultrasensitive and selective detection of SARS-CoV-2 using thermotropic liquid crystals and image-based machine learning. *Cell Reports Physical Sciences*, 1:100276, 2020.

20. J.A. Paulson and A. Mesbah. Data-driven scenario optimization for automated controller tuning with probabilistic performance guarantees. *IEEE Control Systems Letters*, 5:1477–1482, 2020.
21. J. O’Leary, R. Mao, E.J. Pretti, J.A. Paulson, J. Mittal, and A. Mesbah. Deep learning for characterizing the self-assembly of three-dimensional colloidal systems. *Soft Matter*, 17:989–999, 2020.
22. A.D. Bonzanini, J.A. Paulson, G. Makrygiorgos, and A. Mesbah. Fast approximate learning-based multistage nonlinear model predictive control using Gaussian processes and deep neural networks. *Computers & Chemical Engineering*, 145:107174, 2021.
23. F. Sorourifar, N. Choksi, and J.A. Paulson. Computationally efficient integrated design and predictive control of flexible energy systems using multi-fidelity simulation-based Bayesian optimization. *Optimal Control Applications and Methods*, 2021.
24. J.A. Paulson, G. Makrygiorgos, and A. Mesbah. Adversarially robust Bayesian optimization for efficient auto-tuning of generic control structures under uncertainty. *AIChE Journal*, e17591, 2021.
25. J.A. Paulson and C. Lu. COBALT: COstrained Bayesian optimizATIOn of computatiOnally expensive grey-box models exploiting derivaTive information. *Computers & Chemical Engineering*, 160:107700, 2022.
26. J. O’Leary, J.A. Paulson, and A. Mesbah. Stochastic Physics Informed Neural Ordinary Differential Equations. *Journal of Computational Physics*, 468:111466, 2022.
27. T. Zhao, E. Yurtsever, J.A. Paulson, and G. Rizzoni. Formal certification methods for automated vehicle safety assessment. *IEEE Transactions on Intelligent Vehicles*, 2022.
28. A. Kudva, F. Sorourifar, and J.A. Paulson. Constrained robust Bayesian optimization of expensive noisy black-box functions with guaranteed regret bounds. *AIChE Journal*, 68:12, e17857, 2022.
29. M. Tuttle, E.M. Brackman, F. Sorourifar, J.A. Paulson, and S. Zhang. Predicting the solubility of organic energy storage materials based on functional group identity and substitution pattern. *Journal of Physical Chemistry Letters*, 14:1318–1325, 2023.
30. F. Sorourifar, Y. Peng, I. Castillo, L. Bui, J. Venegas, and J.A. Paulson. Combining knowledge and neural ODEs for learning industrial chemical reactions. Submitted to *Industrial & Eng. Chemistry Research*, 2023.
31. C. Lu and J.A. Paulson. No-regret constrained Bayesian optimization of noisy and expensive hybrid models using differentiable quantile function approximations. Submitted to *Journal of Process Control*, 2023.
32. J.A. Paulson, F. Sorourifar, C.R. Laughman, and A. Chakrabarty. Self-optimizing vapor compression cycles online with Bayesian optimization under local search region constraints. Submitted to *Journal of Dynamic Systems, Measurement, and Control*, 2023.
33. U. Shah, J.A. Paulson, and B. Bakshi. Integrated design and control of techno-ecological systems. In preparation.
34. F. Sorourifar and J.A. Paulson. A continuous multi-fidelity Bayesian optimization approach for efficient integrated process design and advanced control. In preparation.
35. K.J. Chan, J.A. Paulson, and A. Mesbah. End-to-end calibration of embedded control using multi-objective Bayesian optimization and deep learning: An application to cold atmospheric plasmas. In preparation.

D. Peer-reviewed Proceedings Publications

1. J.A. Paulson, D.M. Raimondo, R. Findeisen, R.D. Braatz, and S. Streif. Guaranteed active fault diagnosis for uncertain nonlinear systems. In *Proceedings of the European Control Conference*, 926–931, Strasbourg, June 2014.
2. J.A. Paulson, A. Mesbah, S. Streif, R. Findeisen, and R.D. Braatz. Fast stochastic model predictive control of high-dimensional systems. In *Proceedings of the 53rd IEEE Conference on Decision and Control*, 2802–2809, Los Angeles, 2014.
3. J.A. Paulson, S. Streif, and A. Mesbah. Stability for receding-horizon stochastic model predictive control with chance constraints. In *Proceedings of the American Control Conference*, 937–943 Chicago, 2015.
4. A. Mesbah, J.A. Paulson, R. Lakerveld, and R.D. Braatz. Plant-wide model predictive control for a continuous pharmaceutical process. In *Proceedings of the American Control Conference*, 4301–4307, Chicago, 2015.
5. M. Torchio, N.A. Wolff, D.M. Raimondo, L. Magni, U. Krewer, B. Gopaluni, J.A. Paulson, and R.D. Braatz. Real-time model predictive control for the optimal charging of a Lithium-ion battery. In *Proceedings of the American Control Conference*, 4536–4541, Chicago, 2015.
6. L.C. Foguth, J.A. Paulson, R.D. Braatz, and D.M. Raimondo. Fast robust model predictive control of high-dimensional systems. In *Proceedings of the European Control Conference*, 2009–2014, Linz, 2015.
7. A.E. Lu, J.A. Paulson (co-first author), N.J. Mozdziejcz, A. Stockdale, A.N. Ford Versypt, K.R. Love, J.C. Love, and R.D. Braatz. Control systems technology in the advanced manufacturing of biologic drugs. In *Proceedings of the 2015 IEEE Conference on Control Applications*, 1505–1515, Sydney, 2015.
8. J.A. Paulson, E. Harinath, L.C. Foguth, and R.D. Braatz. Nonlinear model predictive control of systems with probabilistic time-invariant uncertainties. In *Proceedings of the 5th IFAC Conference on Nonlinear Model Predictive Control*, 16–25, Seville, 2015.
9. J.A. Paulson, M.C. Molaro, D.O. Bellisario, M.S. Strano, and R.D. Braatz. Mathematical modeling and analysis of carbon nanotube photovoltaic systems. In *Proceedings of the 11th IFAC Symposium on Dynamics and Control Process Systems*, 442–447, Trondheim, 2016.
10. T. Muehlfordt, J.A. Paulson, R. Findeisen, and R.D. Braatz. Output feedback model predictive control with probabilistic uncertainties for linear systems. In *Proceedings of the American Control Conference*, 2035–2040, Boston, 2016.
11. A.E. Lu, J.A. Paulson, and R.D. Braatz. pH and conductivity control in an integrated biomanufacturing plant. In *Proceedings of the American Control Conference*, 1741–1746, Boston, 2016.
12. E. Buehler, J.A. Paulson, and A. Mesbah. Lyapunov-based stochastic nonlinear model predictive control: Shaping the state probability density functions. In *Proceedings of the American Control Conference*, 5389–5394, Boston, 2016.
13. E. Harinath, L.C. Foguth, J.A. Paulson, and R.D. Braatz. Nonlinear model predictive control using polynomial optimization methods. In *Proceedings of the American Control Conference*, 1–6, Boston, 2016.
14. S. Lucia, J.A. Paulson, R. Findeisen, and R.D. Braatz. On stability of stochastic linear systems via polynomial chaos expansions. In *Proceedings of the American Control Conference*, 5089–5094, Seattle, 2017.

15. J.A. Paulson, L. Xie, and A. Mesbah. Offset-free robust MPC of systems with mixed stochastic and deterministic uncertainty. In *Proceedings of the IFAC World Congress*, 3589–3594, Toulouse, 2017.
16. J.A. Paulson, E. Buehler, and A. Mesbah. Arbitrary polynomial chaos for uncertainty propagation of correlated random variables in dynamic systems. In *Proceedings of the IFAC World Congress*, 3607–3612, Toulouse, 2017.
17. J.A. Paulson, T.A.N. Heirung, R.D. Braatz, and A. Mesbah. Closed-loop active fault diagnosis for stochastic linear systems. In *Proceedings of the American Control Conference*, 735–741, Milwaukee, 2018.
18. T.L.M. Santos, J.A. Paulson, and A. Mesbah. Offset-free stochastic model predictive control with enlarged feasibility region. In *Proceedings of the American Control Conference*, 742–748, Milwaukee, 2018.
19. J.A. Paulson and A. Mesbah. Nonlinear model predictive control with explicit backoffs for stochastic systems under arbitrary uncertainty. In *Proceedings of the IFAC Conference on Nonlinear Model Predictive Control*, 622–633, Madison, 2018.
20. J.A. Paulson and A. Mesbah. Shaping the closed-loop behavior of nonlinear systems under probabilistic uncertainty using arbitrary polynomial chaos. In *Proceedings of the 57th IEEE Conference on Decision and Control*, 6307–6313, Miami, 2018.
21. J.A. Paulson, T.A.N. Heirung, and A. Mesbah. Fault-tolerant tube-based robust nonlinear model predictive control. In *Proceedings of the American Control Conference*, 1648–1654, Philadelphia, 2019.
22. S. Bhonsale, P. Nimmegeers, D. Telen, J.A. Paulson, A. Mesbah, and J. Van Impe. On the implementation of generalized polynomial chaos in dynamic optimization under stochastic uncertainty: A user perspective. In *Proceedings of the 29th European Symposium on Computer Aided Process Engineering*, 541–546, Eindhoven, 2019.
23. A.D. Bonzanini, J.A. Paulson, D.B. Graves, and A. Mesbah. Toward safe dose delivery in plasma medicine using projected neural network-based fast approximate NMPC. In *Proceedings of the IFAC World Congress*, 5353–5359, Berlin, 2020. **[Winner of Application Paper Prize]**
24. J.A. Paulson and A. Mesbah. A low-complexity tube controller using contractive invariant sets. In *Proceedings of the Conference on Decision and Control*, 899–904, Jeju Island, Korea, 2020.
25. A.D. Bonzanini, J.A. Paulson, and A. Mesbah. Safe learning-based model predictive control under state-dependent uncertainty using scenario trees. In *Proceedings of the Conference on Decision and Control*, 2448–2454, Jeju Island, Korea, 2020.
26. K.J. Chan, J.A. Paulson, and A. Mesbah. Deep learning-based nonlinear model predictive control with offset-free tracking for embedded applications. In *Proceedings of the American Control Conference*, 3466–3472, New Orleans, 2021.
27. N. Choksi and J.A. Paulson. Simulation-based integrated design and control with embedded mixed-integer MPC using constrained Bayesian optimization. In *Proceedings of the American Control Conference*, 2114–2120, New Orleans, 2021.
28. D. Krishnamoorthy, J.A. Paulson, and A. Mesbah. An adaptive correction scheme for achieving offset-free asymptotic performance in deep learning-based economic MPC. In *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, 1–6, Virtual, 2021.

29. F. Sorourifar, G. Makrygiorgos, A. Mesbah, and J.A. Paulson. A data-driven automatic tuning method for MPC under uncertainty using constrained Bayesian optimization. In *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, 1–8, Virtual, 2021.
30. J.A. Paulson, K. Shao, and A. Mesbah. Probabilistically robust Bayesian optimization for data-driven tuning of arbitrary control structures with Gaussian process emulators. In *Proceedings of the Conference on Decision and Control*, 3633–3639, Austin, 2021.
31. A. Kudva, F. Sorourifar, and J.A. Paulson. Efficient robust global optimization for simulation-based problems using decomposed Gaussian processes: Application to MPC calibration. In *Proceedings of the American Control Conference*, 2091–2097, Atlanta, 2022
32. A. Mesbah, K.P. Wabersich, A.P. Schoellig, M.N. Zeilinger, S. Lucia, T. Badgewell, and J.A. Paulson. Fusion of machine learning and MPC under uncertainty: What advances are on the horizon? In *Proceedings of the American Control Conference*, 342–357, Atlanta, 2022.
33. B. Bakshi and J.A. Paulson. Sustainability and industry 4.0: Obstacles and opportunities. In *Proceedings of the American Control Conference*, 2449–2460, Atlanta, 2022.
34. C. Lu and J.A. Paulson. No-regret Bayesian optimization with unknown equality and inequality constraints using exact penalty functions. In *Proceedings of the IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems*, 895-902, Busan, Korea, 2022.
35. J.A. Paulson, F. Sorourifar, and A. Chakrabarty. Efficient multi-step look-ahead Bayesian optimization with local search constraints. In *Proceedings of the Conference on Decision and Control*, 123–129, Cancun, Mexico, 2022.
36. A.D. Bonzanini, J.A. Paulson, G. Makrygiorgos, and A. Mesbah. Scalable estimation of invariant sets for mixed-integer nonlinear systems using active deep learning. In *Proceedings of the Conference on Decision and Control*, 3431–3437, Cancun, Mexico, 2022.
37. A. Kudva and J.A. Paulson. A Bayesian optimization approach for data-efficient flexibility analysis of expensive black-box models. *Foundations of Computer Aided Process Operations / Chemical Process Control*, San Antonio, 2022.
38. J.A. Paulson, F. Sorourifar, C.R. Laughman, and A. Chakrabarty. LSR-BO: Local Search Region constrained Bayesian Optimization for performance optimization of vapor compression systems. In *Proceedings of the American Control Conference*, 2023 (accepted).
39. T.X. Nghiem, J. Drgona, C. Jones, Z. Nagy, R. Schwan, B. Dey, A. Chakrabarty, S. Di Cairano, J.A. Paulson, A. Carron, W.S. Cortez, and D.L. Vrabie. Physics-informed machine learning for modeling and control of dynamical systems. In *Proceedings of the American Control Conference*, 2023 (accepted).
40. J.A. Paulson, F. Sorourifar, and A. Mesbah. A tutorial on derivative-free policy learning methods for interpretable controller representations. In *Proceedings of the American Control Conference*, 2023 (accepted).
41. D. Krishnamoorthy and J.A. Paulson. Multi-agent black-box optimization using a Bayesian approach to alternating direction method of multipliers. In *Proceedings of the IFAC World Congress*, 2023 (accepted).
42. G. Makrygiorgos, A. Mesbah, and J.A. Paulson. Gradient-accelerated Bayesian optimization for globally optimal policy search-based reinforcement learning. In *Proceedings of the IFAC World Congress*, 2023 (accepted).

43. G. Makrygiorgos, J.A. Paulson, and A. Mesbah. No-regret Bayesian optimization with gradients using local optimality-based constraints: Application to closed-loop policy search. Submitted to *Proceedings of the Conference on Decision and Control*, 2023.
44. K.J. Chan, J.A. Paulson, and A. Mesbah. Safe explorative Bayesian optimization – Towards personalized treatments in plasma medicine. Submitted to *Proceedings of the Conference on Decision and Control*, 2023.

**Note each paper has an associated presentation*

E. Meeting Abstracts

1. D.A. Slanac, A. Lie, J.A. Paulson, K.J. Stevenson, and K.P. Johnston. High oxygen reduction activity from electroless co-deposition of Ag and MnOx nanodomains on carbon. *AIChE Annual Meeting*, Minneapolis, 2011. Abstract 40b.
2. J.A. Paulson, A. Mesbah, S. Streif, R. Findeisen, and R.D. Braatz. Stochastic model predictive control of high-dimensional systems: An end-to-end continuous pharmaceutical manufacturing case study. *AIChE Annual Meeting*, Atlanta, 2014. Abstract 610b.
3. A. Mesbah, J.A. Paulson, S. Streif, R. Findeisen, and R.D. Braatz. Stochastic output feedback control of nonlinear systems with probabilistic uncertainties: Application to control of polymorphic transformations in batch crystallization. *AIChE Annual Meeting*, Atlanta, 2014. Abstract 206a.
4. J.A. Paulson, T.A. Hatton, and R.D. Braatz. Simple method for analytically determining normalization constants for eigenfunctions of Sturm-Liouville problems: Application to the Graetz problem for combined heat and mass transfer. *AIChE Annual Meeting*, San Francisco, 2016. Abstract 22h.
5. J.A. Paulson. Advanced control for next-generation material synthesis and smart manufacturing. *AIChE Annual Meeting*, Minneapolis, 2017. Abstract 7gv.
6. J.A. Paulson, T.A.N. Heirung, M. Martin-Casas, A. Mesbah. Closed-loop active fault diagnosis for uncertain nonlinear systems. *AIChE Annual Meeting*, Minneapolis, 2017. Abstract 12e.
7. J.A. Paulson, V. Bavdekar, A. Mesbah. Sample-free stochastic nonlinear model predictive control. *AIChE Annual Meeting*, Minneapolis, 2017. Abstract 564b.
8. A. Mesbah, J.A. Paulson, D. Gidon, and D.B. Graves. Effective dose delivery in plasma medicine using a robust MPC approach for mixed stochastic and deterministic uncertainty. *AIChE Annual Meeting*, Minneapolis, 2017. Abstract 170c.
9. T.A.N. Heirung, J.A. Paulson, R.D. Braatz, and A. Mesbah. A tractable method for closed-loop active fault diagnosis of stochastic linear systems. *AIChE Annual Meeting*, Minneapolis, 2017. Abstract 284c.
10. J.A. Paulson, L.C. Foguth, E. Harinath, and R.D. Braatz. Perspectives on the control of advanced manufacturing systems. *AIChE Annual Meeting*, Pittsburgh, 2018. Abstract 257a.
11. J.A. Paulson and A. Mesbah. Generalized chaos expansions with arbitrary multivariate probability measures: Applications in closed-loop performance verification for stochastic dynamic systems. *AIChE Annual Meeting*, Pittsburgh, 2018. Abstract 257c.
12. J.A. Paulson, T.L.M. Santos, and A. Mesbah. Stochastic-tube MPC for offset-free tracking in the presence of plant-model mismatch. *AIChE Annual Meeting*, Pittsburgh, 2018. Abstract 359b.

13. L.C. Foguth, E. Harinath, J.A. Paulson, and R.D. Braatz. Integrated quality by design for continuous pharmaceutical manufacturing: Accounting for dynamics and feedback. *AIChE Annual Meeting*, Pittsburgh, 2018. Abstract 328f.
14. J.A. Paulson and A. Mesbah. A Deep learning-based approach for explicit offset-free tracking nonlinear model predictive control. *AIChE Annual Meeting*, Orlando, 2019. Abstract 243g.
15. J.A. Paulson and A. Mesbah. Optimal Bayesian experiment design for constrained nonlinear dynamic systems using stochastic surrogate models. *AIChE Annual Meeting*, Orlando, 2019. Abstract 369e.
16. J.A. Paulson, M. Martin-Casas, and A. Mesbah. Fast uncertainty quantification in dynamic flux balance analysis models using sparse multi-element polynomial chaos. *AIChE Annual Meeting*, Orlando, 2019. Abstract 444b.
17. T.A.N. Heirung, J.A. Paulson, and A. Mesbah. Contingency planning for fault tolerance in robust nonlinear MPC. *AIChE Annual Meeting*, Orlando, 2019. Abstract 522g.
18. J.A. Paulson, A. Bonzanini, G. Makrygiorgos, and A. Mesbah. Fast approximate multistage NMPC with online scenario tree generation using active deep learning. *AIChE Annual Meeting*, 2020. Abstract 299f.
19. A. Bonzanini, J.A. Paulson, and A. Mesbah. Learning-based MPC with state-dependent uncertainty using adaptive scenario trees. *AIChE Annual Meeting*, 2020. Abstract 17f.
20. F. Sorourifar, G. Makrygiorgos, A. Mesbah, and J.A. Paulson. Goal-oriented model learning with high-fidelity simulations using MPC-embedded Bayesian optimization. *AIChE Annual Meeting*, 2020. Abstract 434g.
21. U. Shah, J.A. Paulson, and B.R. Bakshi. Towards integration of design and operation of techno-ecological synergistic systems. *AIChE Annual Meeting*, 2020. Abstract 718c.
22. J.A. Paulson. Efficient evaluation of generic viability-based resilience metrics using active deep learning methods. *AIChE Enterprise and Infrastructure Resilience Workshop*, 2020.
23. J.A. Paulson, K. Shao, and A. Mesbah. Robust data-driven design of generic control structures with probabilistic guarantees using Gaussian process emulators. *AIChE Annual Meeting*, 2021. Abstract 176h.
24. D. Krishnamoorthy, A. Mesbah, and J.A. Paulson. Deep learning-based approximate economic model predictive control with offset-free asymptotic performance guarantees using a modifier-adaptation scheme. *AIChE Annual Meeting*, 2021. Abstract 644c.
25. J. O’Leary, J.A. Paulson, and A. Mesbah. Physics-constrained deep learning of unmodeled physics in systems governed by stochastic differential equations. *AIChE Annual Meeting*, 2021. Abstract 182d.
26. U. Shah, J.A. Paulson, and B.R. Bakshi. Enabling real-time synergies in techno-ecological systems using adaptive nonlinear model predictive control. *AIChE Annual Meeting*, 2021. Abstract 434b.
27. F. Sorourifar, N. Choksi, and J.A. Paulson. Integrated design and model predictive control of multiscale systems using a multi-fidelity Bayesian optimization approach. *AIChE Annual Meeting*, 2021. Abstract 485a.
28. C. Lu and J.A. Paulson. A novel constrained Bayesian optimization method for computationally expensive grey-box models with composite objective and constraint functions. *AIChE Annual Meeting*, 2021. Abstract 558a.

29. A. Kudva, F. Sorourifar, and J.A. Paulson. Constrained robust Bayesian optimization of expensive black-box functions under uncertainty. *AIChE Annual Meeting*, 2022. Abstract 483c.
30. F. Sorourifar and J.A. Paulson. Continuous multi-fidelity Bayesian optimization for efficient integrated process design and advanced control. *AIChE Annual Meeting*, 2022. Abstract 433h.
31. G. Makrygiorgos, J.A. Paulson, and A. Mesbah. Data-efficient automated tuning of generic control structures using adversarially robust Bayesian optimization. *AIChE Annual Meeting*, 2022. Abstract 624d.
32. K. Chan, J.A. Paulson, and A. Mesbah. End-to-end design and implementation of robust MPC on resource-limited hardware using multi-objective Bayesian optimization and deep learning. *AIChE Annual Meeting*, 2022. Abstract 434a
33. C. Lu and J.A. Paulson. Exact penalty Bayesian optimization: No-regret data-driven optimization with unknown equality and inequality constraints. *AIChE Annual Meeting*, 2022. Abstract 10d.
34. C. Lu and J.A. Paulson. Exploiting grey-box hybrid models in constrained Bayesian optimization using a smoothed sample average approximation. *AIChE Annual Meeting*, 2022. Abstract 234f.
35. J.A Paulson, A. Bonzanini, G. Makrygiorgos, and A. Mesbah. Active deep learning for scalable approximation of reachable and invariant sets for mixed-integer nonlinear systems. *AIChE Annual Meeting*, 2022. Abstract 12a.
36. J.A. Paulson, G. Makrygiorgos, and A. Mesbah. Data-efficient globally optimal policy-based reinforcement learning via gradient-accelerated Bayesian optimization. *AIChE Annual Meeting*, 2022. Abstract 235f.
37. J. Missik, G. Bohrer, M. Scyphers, J.A. Paulson, M. Silva, A. Matheny, and A.M. Restrepo. Examining species-specific hydraulic traits using multi-scale measurements and the hydrodynamic canopy transpiration model FETCH3.14. Submitted to *American Geophysical Union Fall Meeting*, 2022.
38. M. Silva, J. Missik, T. Yazbeck, G. Bohrer, and J.A. Paulson. Making Bayesian optimization accessible: Using Bayesian Optimization for Anything (BOA) to minimize canopy resistance in an LES model. Submitted to *American Geophysical Union Fall Meeting*, 2022.
39. J. Missik, G. Bohrer, M. Scyphers, J.A. Paulson, Y. Mau, M. Silva, A.M. Matheny, and A.M.R. Acevedo. Influence of species-specific hydraulic traits on stress response: Insights from the hydrodynamic canopy transpiration model FETCH3.14. Submitted to *AMS 35th Conference on Agricultural and Forest Meteorology/14th Fire and Forest Meteorology Symposium/Sixth Conference on Biogeosciences*, 2023.
40. M. Schyphers, J. Missik, G. Bohrer, and J.A. Paulson. Bayesian Optimization for Anything (BOA), a language-agnostic hyperparameter tuning parameter package to ease model optimization. Submitted to *AMS 35th Conference on Agricultural and Forest Meteorology/14th Fire and Forest Meteorology Symposium/Sixth Conference on Biogeosciences*, 2023.
41. Y. Lu, J.A. Paulson, Q. Zhang. A Bayesian optimization framework for solving generic inverse optimization problems. Submitted to *AIChE Annual Meeting*, 2023.
42. F. Sorourifar, M. Muthyala, and J.A. Paulson. A compressed sensing framework for learning interpretable molecular property models from limited data: Application to discovery of sustainable battery materials. Submitted to *AIChE Annual Meeting*, 2023.
43. C. Lu and J.A. Paulson. Constrained Bayesian optimization for expensive noisy hybrid models using differentiable quantile function approximations. Submitted to *AIChE Annual Meeting*, 2023.

44. A. Kudva, W. Tang, and J.A. Paulson. Efficient flexibility analysis of computationally expensive black-box simulators using quantile-based Bayesian optimization. Submitted to *AICHE Annual Meeting*, 2023.
45. F. Sorourifar, T. Banker, and J.A. Paulson. High-dimensional Bayesian optimization of molecular properties using quantitative structure-property relationships on sparse axis-aligned subspaces. Submitted to *AICHE Annual Meeting*, 2023.
46. G. Makrygiorgos, J.A. Paulson, and A. Mesbah. Necessary optimality-constrained Bayesian optimization (NOBO) for efficiently learning complex control policies from closed-loop data. Submitted to *AICHE Annual Meeting*, 2023.
47. F. Sorourifar, D. Chamaki, N. Tubman, J.A. Paulson, and D.E. Bernal Neira. The quantum Gaussian process: Specialized gaussian process modifications for efficient quantum-classical optimization. Submitted to *AICHE Annual Meeting*, 2023.
48. K.J. Chan, J.A. Paulson, and A. Mesbah. Towards personalized cold plasma treatments using safe explorative Bayesian optimization. Submitted to *AICHE Annual Meeting*, 2023.

F. Selected Software

1. J.A. Paulson and A. Mesbah. The non-smooth polynomial chaos expansion (nsPCE) toolbox. University of California, Berkeley, July 17, 2019. <https://github.com/joelpaulson/nsPCE>
2. J.A. Paulson and A. Mesbah. Data-driven scenario optimization for automated controller tuning with probabilistic performance guarantees. The Ohio State University, November 22, 2020. https://github.com/joelpaulson/LCSS_DataDrivenScenarioOptimization
3. J.A. Paulson and C. Lu. The COBALT Algorithm for Constrained Grey-box Optimization of Computationally Expensive Models. The Ohio State University, May 10, 2021. <https://github.com/joelpaulson/COBALT>

III. RESIDENT INSTRUCTION

A.1. Supervision of Graduate Students

1. Naitik Alkesh Choksi, 2019-2021 (Graduated with M.S. in July 2021).
2. Utkarsh Shah, 2019-2022 (Graduated with Ph.D. in Jan. 2022, Co-advised with Bhavik Bakshi)
3. Cong Wen (Kevin) Lu, 2019-date
4. Farshud Sorouifar, 2020-date (Recipient of NSF Graduate Research Fellowship)
5. Akshay Kudva, 2020-date
6. Ting-Yeh Chen, 2021-date
7. Joe Flory, 2021-date
8. Madeline Scyphers, 2021-date (Co-advised with Gil Bohrer)
9. Jonathan (Wei-Ting) Tang, 2022-date
10. Madhav Muthyala, 2022-date
11. Kevin Donnelly, 20203-date (Co-advised with Bhavik Bakshi)

A.2. Supervision of Undergraduate Research Students

1. Marcello Velotta, 2020
2. Jonas Woelk, 2022
3. Tommy Banker, 2022-date

4. Matt Robinson, 2022-date
5. Chati Pranav, 2022-date
6. Dominic Cirillo, 2022-date
7. Brayden Gibbs, 2023-date

B.1. Service of Ph.D. & M.S. Examination Committees

- Kaarina Lokko (Chemistry)
- Tong Zhao (Mechanical Engineering)
- Eric Falascino (Chemical and Biomolecular Engineering)
- Vyom Thakker (Chemical and Biomolecular Engineering)
- Michael Charles (Chemical and Biomolecular Engineering)
- Jonathan Hightower (Chemical and Biomolecular Engineering)
- Yazeed Aleissa (Chemical and Biomolecular Engineering)
- Kevin Do (Chemical and Biomolecular Engineering)
- Vivek Vattiyam (Chemical and Biomolecular Engineering)
- Joseph Kolb (Chemical and Biomolecular Engineering)
- Yi-Chen Huang (Chemical and Biomolecular Engineering)
- Long Wang (Mechanical and Aerospace Engineering)
- Ying Xue (Chemical and Biomolecular Engineering)
- Hamza Anwar (Electrical and Computer Engineering)
- Dongjoon Kim (Chemical and Biomolecular Engineering)
- Yuanhao Zhang (Chemical and Biomolecular Engineering)
- Xinyu Zhen (Chemical and Biomolecular Engineering)
- Amrita Sen (Chemical and Biomolecular Engineering)
- Weiyao Zhang (Chemistry)
- Sunghoon Kim (Chemical and Biomolecular Engineering)
- Farshid Nazemi (Chemical and Biomolecular Engineering)
- Xinyu Zhen (Chemical and Biomolecular Engineering)

B.2. External Examiner on Ph.D. Theses

- Eric Bradford, Department of Engineering and Cybernetics, Norwegian University of Science and Technology, 2020

C. Courses Taught (with recent instructor scores received by students)

1. Chemical Process Dynamics and Control (CBE 4624), Fall 2019, 4.76/5.00
2. Chemical Process Dynamics and Control (CBE 4624), Fall 2021, 4.88/5.00
3. Chemical and Biomolecular Engineering Process and Product Design Principles I (CBE 4670), Spring 2022, 4.90/5.00
4. Chemical Process Dynamics and Control (CBE 4624), Fall 2022, 4.88/5.00
5. Computational Methods for Chemical Engineering (CBE 5194), Spring 2023
6. Chemical Process Dynamics and Control (CBE 4624), Fall 2023
7. Neural Networks and Deep Learning (online OSU CPDA program), Spring 2020, Fall 2021, Spring 2022, Fall 2022, Spring 2023
 - a. **Overview:** I developed this course to introduce students from a diverse set of backgrounds to cutting-edge deep learning technology, with a particular emphasis on how to use open-source packages in Python to efficiently build complex data-driven models

- b. **Quote(s) from Student Evaluation:** (i) “By far the best course out of this OSU certificate and the only one that really pushed me to my limits”; (ii) “There are a lot of AI courses out there, and I’ve taken a bunch of them, but very few with the quality material and knowledge reviewed during this course.”

IV. SERVICE (PUBLIC, PROFESSIONAL, AND UNIVERSITY)

A. Service to Disciplinary and Professional Societies

1. American Institute of Chemical Engineers (AIChE)

- Member, 2009-date
- Computing & Systems Technology (CAST) Division, 2011-date
- Chair for Session on Modeling, Control, and Optimization of Manufacturing Systems, Fall Annual Meeting, 2019 and 2020
- Chair for Session on Big Data and Applications in Advanced Modeling and Manufacturing, Fall Annual Meeting, 2020
- CAST graduate student poster judge, 2020
- Chair for Session on Advances in Process Control I and II, Fall Annual Meeting, 2021
- Chair for Session on Applied Artificial Intelligence, Big Data, and Data Analytics Methods for Next-Gen Manufacturing Efficiency, Fall Annual Meeting, 2021 and 2022
- Co-chair for Session on Predictive Control and Optimization, Fall Annual Meeting, 2021
- Co-chair for Session on Advances in Computational Methods and Numerical Analysis, Fall Annual Meeting, 2021
- Undergraduate student poster judge for AIChE North Central Regional Conference, 2021
- Chair for Session on Advances in Computational Methods and Numerical Analysis I & II, Fall Annual Meeting, 2022
- Chair for Session on Innovations in Concept-to-Manufacturing and Distribution, Fall Annual Meeting, 2022
- Co-chair for Session on Data-Driven Dynamic Modeling, Estimation and Control III, Fall Annual Meeting, 2022
- Program Coordinator – Applied Mathematics and Numerical Analysis (Area 10d), CAST Division – AIChE, 2024
- CAST student poster judge for Interactive Session: Systems and Process Control, 2022
- Chair for Invited Tutorial Session on Approaches in Data Analytics I & II, Spring Meeting, 2023

2. Control Societies

- Member, IEEE Control Systems Society (CSS), 2014-date
- Member, IEEE CSS Technical Committee on Process Control, 2020-date
- Member, IEEE CSS Technical Committee on Robust and Complex Systems, 2021-date
- Member, IFAC Technical Committee on Chemical Process Control, 2018-date
- Member, IFAC Technical Committee on Control Design, 2020-date
- Member, IFAC Technical Committee on Distributed Parameter Systems, 2020-date
- Associate Editor for American Control Conference (ACC), 2020, 2021, 2022, 2023
- Associate Editor for European Control Conference (ECC), 2021, 2022, 2023
- Associate Editor for Chemical Process Control Division of IFAC World Congress, 2023
- Lead Organizer of an Invited Session, “Recent Advances in Model Predictive Control for Uncertain Systems”, American Control Conference (ACC), 2021
- Member, International Programme Committee (IPC) for 13th DYCOPS-CAB, 2022

- Liaison for Early Career Researchers, IEEE CSS TC on Process Control, 2022-date
 - Organized and founded the “Process Control, Optimization, and Data Analytics Young Researcher Online Seminar Series,” whose goal is to provide a platform for early-career researchers to share their work with the process control community.
- Member, International Programme Committee (IPC) for 7th International Symposium on Advanced Control of Industrial Processes (AdCONIP), 2022
- Chair for Session on Advances in Process Control I, DYCOPS-CAB, 2022
- Chair for Session on Data-Driven Control, FOCAPO/CPC, 2023
- Poster judge for interactive session, FOCAPO/CPC, 2023

3. Journal Reviewer for

ACS Sensors; AIChE Journal; Automatica; Advanced Control for Applications; Annual Reviews in Control; Canadian Journal of Chemical Engineering; Chemical Engineering Science; Carbon; Computers & Chemical Engineering; Electronics; Entropy; European Journal of Control; IEEE Control Systems Letters; IEEE Control Systems Magazine; IEEE Transactions on Automatic Control; IEEE Transactions on Systems, Man, and Cybernetics; IEEE Transactions on Systems Technology; Industrial & Engineering Chemistry Research; International Journal of Robust and Nonlinear Control; Journal of Guidance, Control, and Dynamics; Journal of Mechanical Design; Journal of Process Control; Mathematics; Optimal Control, Applications, and Methods; Processes; Systems & Control Letters

4. Conference/Proceedings Reviewer for

AIChE; American Control Conference; Dynamics and Control of Process Systems including Biosystems Symposium; European Control Conference; IEEE Conference on Decision and Control; IFAC ADCHEM; IFAC NMPC Conference; IFAC Symposium on Control, Optimization, and Automation in Mining, Mineral, and Metal Processing; IFAC World Congress

5. Miscellaneous

Tau Beta Pi (TBP), Engineering Honors Society, 2010-date; Member, Practice school recruitment panel, MIT, 2014; Hosted Research 101 Session, DOW-MIT ACCESS program, MIT, 2015; Captain, Chemical Engineering Intramural Basketball Team, 2013-2016

B. University/Campus Service

1. The Ohio State University:

Campus: Judge, Undergraduate Research Forum for Engineering & Architecture Presentation Competition (2021);

Chemical and Biomolecular Engineering: AIChE Student Chapter Committee (2019-2020); Participated in Graduate Recruiting (2020); Coffee with a Prof. Event Panel Speaker (December, 2020, April 2021, September 2021); Communications Committee (2020, 2021, 2022); Curriculum Committee (2020, 2021); Poster judge for Graduate Research Symposium (GRS) (2019, 2020, 2021); Member of NOBCCHE (National Organization for the Professional Advancement of Black Chemists and Chemical Engineers) Recruitment Team (2020); Member OSU CBE graduate recruitment team at AIChE (2020); Guest speaker, CBE Graduate Communications course (2021); Member, CBE Curriculum Revision Working Group (2021); Reviewer, Admit to CBE Major Essays (May, 2021); Graduate Studies Committee (2021, 2022); Student and Post-doc Award Committee (2021, 2022); Distance Learning Committee (2021); Host of CBE Academic Session for Graduate Engineering Open House (2022)

V. SPONSORED RESEARCH GRANTS

A. Federal Research Grants

- Principal Investigator, Feb. 2023 – Jan. 2027, CAREER: Advancing Efficient Global Optimization of Extremely Expensive Functions under Uncertainty using Structure-Exploiting Bayesian Methods, Sponsor: National Science Foundation (\$517,535)
- Co-Principal Investigator, Sep. 2020 – Aug. 2024, EFRI DChem: One-step conversion of CH₄ and CO₂ to liquid fuels with the use of a multi-functional pseudo catalytic system, Sponsor: National Science Foundation (\$2,000,000)
- Co-Principal Investigator, Jan. 2021 – Dec. 2022, NSF2026: EAGER: Spatio-temporal design of techno-ecological synergies for a world without waste and resilient landscapes, Sponsor: National Science Foundation (\$299,943)
- Co-Principal Investigator, Sep. 2021 – Aug. 2024, Engineering principles for sustainable organic electrode materials, Sponsor: National Science Foundation (\$437,330)

B. Seed Grants

- Co-Principal Investigator, Sep. 2021 – Aug. 2024, Accelerated discovery of long-life organic electrode materials for sustainable energy storage with active machine learning, Sponsor: OSU Sustainability Research Seed Grant Program (\$34,300)

C. Industrial Grants, Gifts, and Contracts

- Principal Investigator, Bayesian optimization with local search constraints for HVAC systems, Sponsor: Mitsubishi Electric Research Laboratories (\$10,000)