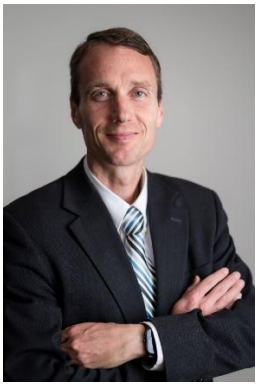
John D. Hedengren

Department of Chemical Engineering
Brigham Young University
330L EB
Provo, UT 84602
801-422-2590
john.hedengren@byu.edu



I am a Professor at Brigham Young University in the Chemical Engineering Department and lead the PRISM (Process Research and Intelligent System Modeling) group. I am a chemical engineer by training with a B.S. and M.S. degree from Brigham Young University, and a Ph.D. from the University of Texas at Austin. I consulted for many large petrochemical companies on automation solutions and then full-time for 5 years with ExxonMobil supporting advanced control and optimization solutions. I have experience with industrial control PLC and DCS systems including Honeywell TPS/TDC3000, Experion system, OPC, and Modbus. My area of expertise is in process dynamics, control, and optimization with applications in fiber optic monitoring, automation of oil and gas processes, unmanned aerial systems, systems biology, and grid-scale energy systems. In chemicals manufacturing, I have extensive experience in automation and modeling of the production of polymers such as polyethylene, polypropylene, butyl rubber, and polystyrene as well as specialty chemicals. Automation software (APMonitor / GEKKO) that I developed has been applied to over 100 industrial applications world-wide in refineries, chemical plants, and offshore oil platforms. I teach courses on computational methods, process dynamics and control, optimization, dynamic optimization, and fundamentals of chemical engineering. My online course material is viewed 5,000-8,000 times per day and there are 81,000 subscribers to the APMonitor YouTube channel. I teach a one-week short course on data science and optimization to industrial professionals. I have co-authored 70 journal publications, 40 peer-review conference publications, and 1 patent that span topics of oil production, drilling automation, smart grid optimization, unmanned aerial systems, and nonlinear predictive control. My publications have been cited 4027 times with a combined h-index of 34 and an i10-index of 86. My professional service includes appointments as a 2018-19 Distinguished Lecturer for the Society of Petroleum Engineers, IEEE CSS Education Technical Committee Chair, CACHE (Computer Aids for Chemical Engineering) 2023-2026 Trustee, BYU Chemical Engineering Graduate Committee Chair, American Automatic Control Council (A2C2) communications chair, BYU SPE Club Advisor, Adjunct Professor at the University of Utah, and member of the AIChE CAST (Computing and Systems Technology) executive committee.

RELATED EXPERIENCE

Brigham Young University, Provo, Utah — Aug 2011-Present
Professor in Chemical Engineering

Advanced Process Solutions, LLC — Jan 2007-April 2007, 2011-Present
Consult in machine learning, advanced control, cybersecurity, and optimization
Deploy software with leading companies in manufacturing, energy, and oil & gas
Teach ~6,000 students daily through online courses on AIChE Academy, APMonitor.com, and YouTube

University of Utah, Salt Lake City, Utah — Jan 2018-Present
Adjunct Professor in Chemical Engineering

ExxonMobil Chemical, Baytown, Texas — April 2007-Aug 2011
Supporting world-wide operations as a member of Central Engineering (2010)

Developed optimization software (APMonitor) used through-out the corporation
Coordinated funding, hiring, and work assignments for student Ph.D. interns

PAS, Inc., Advanced Process Control Development May 2005-Jan. 2007
Developed first principles models for homopolymer and impact polypropylene reactors
Conducted APC training seminars for internal and external clients
Commissioned 3 Unipol reactor APC applications as lead technical engineer

Advanced Process Control Research (UT Austin PhD) Sept. 2002-May 2005
Created an object oriented first principles modeling simulation environment
Developed methods to significantly reduce nonlinear MPC computational time
Explored large-scale model reduction
Developed real-time advanced control strategies of large-scale first principles models

ExxonMobil Chemical, Baytown, Texas April 2004-June 2004
Developed advanced process control for polymer production
Worked with plant operators and technical specialists to develop a model
Trained other engineers to use advanced control technology

Rocket Propellant Combustion Modeling (BYU MS) May 2001-Aug. 2002
Explored 'time to detonation' of a rocket motor in a pool fire
Improved speed of gaseous HMX reaction calculations by 10 times

CH2MHill Internship, Hanford, Washington June 2000-Aug. 2000
Determined pipe flushing requirements for radioactive waste
Worked on a team to maintain liquid pumping from radioactive waste tanks

BNFL Inc. Internship, Hanford, Washington June 1999-Aug. 1999
Performed design work for vitrification (molten glass encapsulation)
Analyzed corrosion for all major plant vessels handling radioactive sludge
Prepared reports for the US Department of Ecology and other clients

BYU DIPPR Thermophysical Properties Lab April 1999-June 1999
Predicted surface tensions for over 700 compounds
Verified predicted values with experimental data

EDUCATION

Ph.D., Chemical Engineering Aug 2002-May 2005
University of Texas at Austin, Summa Cum Laude
Advisor: Thomas F. Edgar
Dissertation: Real-Time Estimation and Control of Large-Scale Nonlinear DAE Systems

M.S., Chemical Engineering May 2001-Aug. 2002
Brigham Young University, Magna Cum Laude
Advisor: Merrill W. Beckstead
Thesis: Implementation of Automatically Simplified Chemical Kinetics through Intrinsic Low-Dimensional Manifolds for Gaseous HMX

B.S. Chemical Engineering Aug 1995-May 2001
Brigham Young University, Magna Cum Laude
Undergraduate Research: DIPPR (Oscarson, Rowley, Wilding), Catalysis Lab (Huber, Bartholomew, Hecker), Combustion Lab (Fletcher)

TEACHING

CH EN 263	Computational Tools
CH EN 273	Fundamentals of Chemical Engineering
CH EN 426	Machine Learning for Engineers
CH EN 436	Process Dynamics and Control
CH EN 475	Unit Operations Lab I
CH EN 477	Unit Operations Lab II
CH EN 691R/791R	Graduate Seminar
CH EN 536/593R/693R	Machine Learning and Dynamic Optimization
ME 575 / CE 575	Optimization Methods

ONLINE COURSES

AIChE Academy	Process Dynamics and Control
AIChE Academy	Introduction to Data Science with Python
AIChE Academy	Introduction to Python for Chemical Engineers
Begin Python	https://apmonitor.github.io/begin_python
Begin Matlab	https://apmonitor.github.io/begin_matlab
Begin Java	https://apmonitor.github.io/begin_java
Data Driven Engineering	https://apmonitor.com/dde
Dynamic Optimization	https://apmonitor.com/do
Design Optimization	https://apmonitor.com/me575
Machine Learning for Engineers	https://apmonitor.com/pds
Process Dynamics and Control	https://apmonitor.com/pdc

STUDENTS ADVISED

- Jose L. Mojica, M.S. 2013
  - Thesis: A Dynamic Optimization Framework with Model Predictive Control Elements for Long Term Planning of Capacity Investments in a District Energy System
- Ivan Y. Rojas, M.S., 2014
  - Topic: Optimized Photogrammetric Network Design with Flight Path Planner for UAV-based Terrain Surveillance
- Reza Asgharzadeh Shishavan, Ph.D., 2015
  - Topic: Nonlinear Estimation and Control with Application to Upstream Processes
- Sayed Mostafa Safdarnejad, Ph.D., 2016
  - Topic: Developing Modeling, Optimization, and Advanced Process Control Frameworks for Improving the Performance of Transient Energy-Intensive Applications
- Ammon Eaton, Ph.D., 2017
  - Topic: Multi-Fidelity Model Predictive Control of Upstream Energy Production Processes
- Logan Beal, Ph.D., 2018
  - Topic: Large-Scale Non-Linear Dynamic Optimization for Combining Applications of Optimal Scheduling and Control
- Brigham Hansen, M.S., 2018
  - Topic: Smart Technologies for Oil Production with Rod Pumping
- Trent Okeson, M.S., 2018
  - Topic: Camera View Planning for Structure from Motion: Achieving Targeted Inspection Through More Intelligent View Planning Methods
- R. Abraham Martin, Ph.D., 2018

    - Topic: Optimization-Based Spatial Positioning and Energy Management for Unmanned Aerial Vehicles
- Cody Simmons, M.S., 2019
    - Topic: Proactive Energy Optimization in Residential Buildings with Weather and Market Forecasts
- Nathaniel Gates, M.S., 2021
    - Topic: Combined Trajectory, Propulsion and Battery Mass Optimization for Solar-Regenerative High-Altitude Long-Endurance Aircraft
- Junho Park, Ph.D., 2022
    - Topic: Hybrid Machine Learning and Physics-Based Modeling Approaches for Process Control and Optimization
- Daniel Hill, Ph.D., 2023
    - Topic: Hybrid Nuclear Energy System Combined Dispatch and Design Optimization
- Samuel Arce Munoz, Ph.D., 2024
    - Topic: Transfer Learning for Model Predictive Control
- LaGrande Gunnell, Ph.D., 2025
    - Topic: Machine Learning under Uncertainty for Vitrification of Nuclear Waste
- Tanner Polley, Ph.D., in progress, estimated 2026
    - Topic: Physics-Informed Machine Learning and and Optimization of Carbon Capture
- Jonathan Pershing, M.S. in progress, estimated 2026
    - Topic: Pharmaceutical Advanced Process Control with Large-Language Models for Operational Design
- Erick Garcia Morado, Ph.D. in progress, estimated 2028
    - Topic: Physics-Informed Optimization under Uncertainty

PROFESSIONAL SERVICE AND MEMBERSHIPS

- AIChE CAST Division Executive Committee, Webinar Director, 2013-present
- AIChE UEFA Division Executive Committee, Webinar Director, 2014-2018
- AIChE Energy Editorship for Webinar Series, 2013-2019
- Associate Editor, MPDI Journal 'Processes', 2016-2020
- Committee Member, AACC Control Engineering Practice Award, 2016-2019
- Graduate Committee, Chemical Engineering, BYU, 2013-2020, Chair 2020-present
- Guest Editor, Control Engineering Practice, 2013
    - Special issue section on Advanced Process Control
- IEEE Control Systems Society, Associate Editor and Conference Editorial Board Member, 2012-2017
    - Conference on Decision and Control
    - American Control Conference
- IEEE Control Systems Society, Education Technical Committee Chair, 2021-present
- Public Relations Committee, Chemical Engineering, BYU, 2011-2013
- Reviewer: American Control Conference, Applied Energy, Applied Mathematical Modelling, Automatica, Conference on Decision and Control, Control Engineering Practice, DYCOPS (Dynamics and Control of Process Systems), Energy, Energy & Fuels, IFAC, International Federation of Automatic Control, Industrial and Engineering Chemistry Research, International Journal of Hydrogen Energy, International Journal of Robust and Nonlinear Control, Journal of Process Control, Journal of Thermal Science and Engineering Applications, PLOS One, Smart and Sustainable Manufacturing Systems, Springer Optimization Series
- Session Chair, AIChE Spring Meeting & Global Congress on Process Safety, Process Control and Optimization Developments, co-chair with Mark Darby, 2020-2021
- Society of Petroleum Engineers (SPE)
    - Distinguished lecturer (2018-2019)
    - Professional member and student club advisor (2012-present)

- Technical Steering Committee, Clear Gulf Joint Industry Project, 2013-Present
    - Participation from U.S. Congress, NASA, BYU, and oil companies

HONORS AND AWARDS

- Process Automation Hall of Fame, 2025
- John R. Ragazzini Education Award, American Automatic Control Council, 2024
- Society of Petroleum Engineers, Distinguished Lecturer, 2018-19
- Computing Practice Award, AIChE CAST Division, 2018
- BYU Chemical Engineering, Outstanding Faculty Award, 2016
- BYU Athletic Hall of Fame, 2015
- Himmelblau Award, AIChE CAST Division, 2014
- Thrust 2000 Fellowship Recipient, 2002-2004
- Memorial Scholar Athlete Award, 2001
- NCAA All-American in Cross-Country, 2000
- Kimball Scholar Athlete Award, 2000
- Verizon Academic All-American, 1st Team, 2000
- GTE Academic All-American, 2nd Team, 1999

TEXTBOOKS

1. Parkinson, A.R., Balling, R., **J.D. Hedengren**, Optimization Methods for Engineering Design, Second Edition, Brigham Young University, 2018. https://apmonitor.com/me575/index.php/Main/BookChapters

PEER REVIEWED JOURNAL PUBLICATIONS

1. Gunnell, L., Lu, X., Vienna, J.D., Kim, D-S, Riley, B.J., **Hedengren, J.D.**, Uncertainty propagation and sensitivity analysis for constrained optimization of nuclear waste vitrification, 2025, doi: 10.1111/jace.20446
2. Arce Munoz, S., **Hedengren, J.D.**, Transfer Learning for Thickener Control, Processes, Special Issue: Machine Learning Optimization of Chemical Processes, 2025, 13, 223, doi: 10.3390/pr13010223
3. Arce Munoz, S., Pershing, J., **Hedengren, J.D.**, Physics-Informed Transfer Learning for Process Control Applications, Industrial & Engineering Chemistry Research, 2024, doi: 10.1021/acs.iecr.4c02781
4. Chen, Y., Hill, D., Billings, B., **Hedengren, J.D.**, Powell, K.M., Hydrogen underground storage for grid electricity storage: An optimization study on techno-economic analysis, Energy Conversion and Management, Volume 322, 2024, 119115, ISSN 0196-8904, doi: 10.1016/j.enconman.2024.119115
5. Ho, A., Billings, B., **Hedengren, J.D.**, Powell, K.M., Flexible Nuclear Hybrid Systems for Load Following and Water Desalination, Renewable Energy Focus, Volume 51, October 2024, 1006412024, doi: 10.1016/j.ref.2024.100641
6. Larsen, A., Lee, R., Wilson, C., **Hedengren, J.D.**, Benson, F., Memmott, M., Multi-Objective Optimization of Molten Salt Microreactor Shielding Perturbations Employing Machine Learning, Nuclear Engineering and Design, Volume 426, September 2024, 113372, 2024.
7. Hill, D., Tito, S.R., Walmsley, M., **Hedengren, J.D.**, Techno-ecnonmic optimization of a hybrid energy system with limited grid connection in pursuit of net zero carbon emissions for New Zealand, e-Prime - Advances in Electrical Engineering, Electronics and Energy, 2024, 100564, ISSN 2772-6711, DOI: 10.1016/j.prime.2024.100564.
8. Wallace, J., Hill, D., Thurston, D., **Hedengren, J.D.**, Memmott, M., Model predictive control of a Lab-Scale thermal energy storage system in RELAP5-3D, Nuclear Engineering and Design, 2024, doi:10.1016/j.nucengdes.2024.112906
9. Wallace, J., **Hedengren, J.D.**, Powell, K.M., Memmott, M., Model predictive control of a grid-scale Thermal Energy Storage system in RELAP5-3D, Progress in Nuclear Energy, Volume 177, 2024, 105410, ISSN 0149-1970, doi: 10.1016/j.pnucene.2024.105410

10. Gunnell, L., Nicholson, B., **Hedengren, J.D.**, Equation-based and data-driven modeling: Open-source software current state and future directions, Computers & Chemical Engineering, 2024, 108521, ISSN 0098-1354, DOI: 10.1016/j.compchemeng.2023.108521.
11. Park, J., Babaei, M.R., Arce Munoz, S., Venkat, A.N., **Hedengren, J.D.**, Simultaneous Multistep Transformer Architecture for Model Predictive Control, Computers & Chemical Engineering, Volume 178, October 2023, 108396, DOI: 10.1016/j.compchemeng.2023.108396
12. Hill, D., McCrea, D., Ho, A., Memmott, M., Powell, K., **Hedengren, J.**, A Multi-Scale method for combined design and dispatch optimization of nuclear hybrid energy systems including storage, e-Prime - Advances in Electrical Engineering, Electronics and Energy, Volume 5, 2023, 100201, ISSN 2772-6711, DOI: 10.1016/j.prime.2023.100201
13. Babaei, M.R., Stone, R., Knotts, T.A., **Hedengren, J.D.**, Physics-Informed Neural Networks with Group Contribution Methods, Journal of Chemical Theory and Computation, American Chemical Society, 2023, DOI: 10.1021/acs.jctc.3c00195.
14. Rossiter, J.A., Cassandras, C.G., Hespanha, J., Dormido, S., Torre, L., Ranade, G., Visioli, A., **Hedengren, J.D.**, Murray, R.M., Antsaklis, P., Lamnabhi-Lagarrigue, F., Parisini, T., Control education for societal-scale challenges: A community roadmap, Annual Reviews in Control, 2023, ISSN 1367-5788, DOI: 10.1016/j.arcontrol.2023.03.007
15. Ho, A., Memmott, M., **Hedengren, J.D.**, Powell, K.M., Exploring the benefits of molten salt reactors: An analysis of flexibility and safety features using dynamic simulation, Digital Chemical Engineering, Volume 7, June 2023, 100091, ISSN 2772-5081, DOI: 10.1016/j.dche.2023.100091
16. Yao, J., Gao, T., **Hedengren, J.D.**, Powell, K.M., A Two-Level Optimization Framework for Battery Energy Storge Systems to Enhance Economics and Minimize Long-Term Capacity Fading, Journal of Energy Storage, Volume 63, July 2023, 106943, 2023, DOI: 10.1016/j.est.2023.106943
17. Munoz, S.A., Park, J., Stewart, C.M., Martin, A.M., **Hedengren, J.D.**, Deep Transfer Learning for Approximate Model Predictive Control, Processes 2023, 11, 197.
18. Gunnell, L., Manwaring, K., Lu, X., Reynolds, J., Vienna, J., **Hedengren, J.D.**, Machine Learning with Gradient-based Optimization of Nuclear Waste Vitrification with Uncertainties and Constraints, Processes, 10(11), 2365, Nov 2022, DOI: 10.3390/pr10112365.
19. Blackburn, L.D., Tuttle, J.F., Andersson, K., **Hedengren, J.D.**, Powell, K.M., Dynamic Machine Learning-based Optimization Algorithm to Improve Boiler Efficiency, Journal of Process Control, Volume 120, December 2022, Pages 129-149, 2022, DOI: 10.1016/j.jprocont.2022.11.002
20. Hill, D., Martin, A., Martin-Nelson, N., Granger, C., Memmott, M., Powell, K., **Hedengren, J.D.**, Techno-economic sensitivity analysis for combined design and operation of a small modular reactor hybrid energy system, International Journal of Thermofluids, Volume 16, 100191, November 2022, DOI: 10.1016/j.ijft.2022.100191
21. Ho, A., Hill, D., **Hedengren J.D.**, Powell, K.M., A nuclear-hydrogen hybrid energy system with large-scale storage: A study in optimal dispatch and economic performance in a real-world market, Journal of Energy Storage, March 2022.
22. Berrett, B.E., Vernon, C.A., Beckstrand, H., Pollei, M., Markert, K., **Hedengren, J.D.**, Franke, K.W., Large-Scale Reality Modeling of a University Campus Using Combined UAV and Terrestrial Photogrammetry for Historical Preservation and Practice Use, Drones, Special Issue on Geoinformatics for the Preservation and Valorization of Cultural Heritage, Nov 17, 2021, 5(4), 136. DOI: 10.3390/drones5040136.
23. Ho, A., Mohammadi, K., **Hedengren J.D.**, Memmott, M., Powell, K.M., Dynamic simulation of a novel nuclear hybrid energy system with large-scale hydrogen storage in an underground salt cavern, International Journal of Hydrogen Energy, 29 July 2021.
24. Moura Oliveira, P.B., **Hedengren, J.D.**, Pires, E.J.S, Swarm-Based design of Proportional Integral and Derivative Controllers using a Compromise Cost Function: An Arduino Temperature Laboratory Case Study, Special Issue: Algorithms for PID Controller, Algorithms, 13(12), 315, DOI: 10.3390/a13120315, 2020.
25. Hammond, J.E., Vernon, C.A., Okeson, T.J., Barrett, B.J., Arce, S., Newell, V., Janson, J., Franke, K.W., **Hedengren, J.D.** Survey of 8 UAV Set-Covering Algorithms for Terrain Photogrammetry, Remote Sensing, 2020, 12, 2285.

26. Arce, S., Vernon, C.A., Hammond, J., Newell, V., Janson, J., Franke, K.W., **Hedengren, J.D.** Automated 3D Reconstruction Using Optimized View-Planning Algorithms for Iterative Development of Structure-from-Motion Models, Remote Sensing, 2020, 12, 2169.
27. Park, J., Price, C., Pixton, D., Aghito, M., Nybø, R., Bjørkevoll, K., **Hedengren, J.D.**, Model predictive control and estimation of managed pressure drilling using a real-time high fidelity flow model, ISA Transactions, 105, pp. 256-268, Oct 2020, doi: 10.1016/j.isatra.2020.05.035
28. Park, J., Martin, R.A., Kelly, J.D., **Hedengren, J.D.**, Benchmark Temperature Microcontroller for Process Dynamics and Control, Computers & Chemical Engineering, Special Issue in Honor of Thomas F. Edgar, 135, 6 April 2020.
29. Simmons, C., Arment, J., Powell, K.M., **Hedengren, J.D.**, Proactive Energy Optimization in Residential Buildings with Weather and Market Forecasts, Processes, MDPI, 7 (12), 929, doi: 10.3390/pr7120929, 2019.
30. Hansen, B., Tolbert, B., Vernon, C., **Hedengren, J.D.**, Model Predictive Automatic Control of Sucker Rod Pump System with Simulation Case Study, Computers & Chemical Engineering, 121, pp. 263-284, 2019.
31. Blackburn, L., Young, A., Rogers, P., **Hedengren, J.D.**, Powell, K.M., Dynamic Optimization of a District Energy System with Storage Using a Novel Mixed-Integer Quadratic Programming Algorithm, Optimization and Engineering, 2019.
32. Freeman, M., Vernon, C., Berrett, B., Hastings, N., Derricott, J., Pace, J., Horne, B., Hammond, J., Janson, J., Chiabrando, F., **Hedengren, J.D.**, Franke, K., Sequential Earthquake Damage Assessment Incorporating Optimized sUAV Remote Sensing at Pescara del Tronto, Special Issue: Remote Sensing Applications for Earthquake and Tsunami Damage Assessment, Geosciences, 2019.
33. Okeson, T.J., Barrett, B.J., Arce, S., Vernon, C.A., Franke, K.W, **Hedengren, J.D.**, Achieving Tiered Model Quality in 3D Structure from Motion Models Using a Multi-Scale View-Planning Algorithm for Automated Targeted Inspection, Sensors, MDPI, 19 (12), 2703, doi: 10.3390/s19122703, 2019.
34. Martin, R.A., Gates, N., Ning, A., **Hedengren, J.D.**, Dynamic Optimization of High-Altitude Solar Aircraft Trajectories Under Station-Keeping Constraints, Journal of Guidance, Control, and Dynamics, 2018, doi: 10.2514/1.G003737.
35. Beal, L.D.R., Hill, D., Martin, R.A., and **Hedengren, J.D.**, GEKKO Optimization Suite, Processes, Volume 6, Number 8, 2018, doi: 10.3390/pr6080106.
36. Safdarnejad, S.M., **Hedengren, J.D.**, Powell, K.M., Performance Comparison of Low Temperature and Chemical Absorption Carbon Capture Processes in Response to Dynamic Electricity Demand and Price Profiles, Applied Energy, Volume 228, pp. 577-592, 2018, doi:10.1016/j.apenergy.2018.06.098.
37. Beal, L.D., Petersen, D., Grimsman, D., Warnick, S., **Hedengren, J.D.**, Integrated Scheduling and Control in Discrete-time with Dynamic Parameters and Constraints, Computers & Chemical Engineering, 115, pp. 361-376, 2018.
38. **Hedengren, J.D.**, Beal, L., Special Issue: Combined Scheduling and Control, Processes, 6(3), 24, doi: 10.3390/pr6030024, 2018.
39. Beal, L.D., Petersen D., Pila G., Davis, B., Warnick, S., and **Hedengren, J.D.**, Economic Benefit from Progressive Integration of Scheduling and Control for Continuous Chemical Processes, Processes, 5(4), 84, doi:10.3390/pr5040084, 2017.
40. Petersen, D., Beal, L.D., Prestwich D., Warnick, S., and **Hedengren, J. D.**, Combined Noncyclic Scheduling and Advanced Control for Continuous Chemical Processes, Processes, 2017, Processes, 5(4), 83, doi:10.3390/pr5040083, 2017.
41. Udy, J., Hansen, B., Maddux, S., Peterson, D., Heilner, S., Stevens, K., Lignell, D., **Hedengren, J.D.**, Review of Field Development Optimization of Waterflooding, EOR, and Well Placement Focusing on History Matching and Optimization Algorithms, Processes, 5(3), 34, 2017, doi:10.3390/pr5030034.
42. Taysom, S., **Hedengren, J.D.**, Sorensen, C., A Comparison of Model Predictive Control and PID Temperature Control in Friction Stir Welding, Journal of Manufacturing Processes, 29, pp. 232-241, 2017, doi: 10.1016/j.jmapro.2017.07.015.
43. Beal, L., Park, J., Petersen, D., Warnick, S., **Hedengren, J.D.**, Combined Model Predictive Control and Scheduling with Dominant Time Constant Compensation, Computers & Chemical Engineering, 104, pp. 271-282, 2017, doi: 10.1016/j.compchemeng.2017.04.024.

44. Martin, R.A., Blackburn, L., Pulsipher, J., Franke, K., **Hedengren, J.D.**, Potential Benefits of Combining Anomaly Detection with View Planning for UAV Infrastructure Modeling, Remote Sensing, 9(5), 434, 2017, doi:10.3390/rs9050434.
45. Mojica, J.L., Petersen, D.J., Hansen, B., Powell, K.M., **Hedengren, J.D.**, Optimal Combined Long-Term Facility Design and Short-Term Operational Strategy for CHP Capacity Investments, Energy, Vol 118, 1 January 2017, pp. 97–115.
46. **Hedengren, J.D.**, Eaton, A.N., Overview of Estimation Methods for Industrial Dynamic Systems, Optimization and Engineering, Springer, Vol 18 (1), 2017, pp. 155-178, DOI: 10.1007/s11081-015-9295-9.
47. Franke, K.W., Rollins, K.M. Ledezma, C., **Hedengren, J.D.**, Wolfe, D. Ruggles, S., Bender, C., Reimschiissel, B., Reconnaissance of Two Liquefaction Sites using Small Unmanned Aerial Vehicles and Structure from Motion Computer Vision Following the April 1, 2014 Chile Earthquake, Journal of Geotechnical and Geoenvironmental Engineering, Volume 143, Issue 5, May 2017, doi:10.1061/(ASCE)GT.1943-5606.0001647.
48. Eaton, A.N., Beal, L., Thorpe, S., Hubbell, C., **Hedengren, J.D.**, Nybø, R., Aghito, M., Real Time Model Identification Using Multi-Fidelity Models in Managed Pressure Drilling, Computers and Chemical Engineering, 2017, doi:10.1016/j.compchemeng.2016.11.008.
49. Powell, K.M., Kim, J.S., Kapoor, K., Mojica, J.L., **Hedengren, J.D.**, and Edgar, T.F., Thermal Energy Storage to Minimize Cost and Improve Efficiency of a Polygeneration District Energy System in a Real-time Electricity Market, Energy, 113, 52–63, 2016, doi:10.1016/j.energy.2016.07.009.
50. Ruggles, S., Clark, J., Franke, K.W., Wolfe, D., Reimschiissel, B., Martin, R.A., Okeson, T.J., **Hedengren, J.D.**, Comparison of SfM Computer Vision Point Clouds of a Landslide Derived from Multiple Small UAV Platforms and Sensors to a TLS based Model, Journal of Unmanned Vehicle Systems, 2016, doi:10.1139/juvs-2015-0043.
51. Taysom, S., **Hedengren, J.D.**, Sorensen, C., Dynamic Modeling of Friction Stir Welding for Model Predictive Control, Journal of Manufacturing Processes, 23, 165-174, 2016, doi:10.1016/j.jmapro.2016.06.004.
52. Safdarnejad, S.M., **Hedengren, J.D.**, Baxter, L.L, Dynamic Optimization of a Hybrid System of Energy-Storing Cryogenic Carbon Capture and a Baseline Power Generation Unit Applied Energy, Applied Energy Journal, 172 (15), 66–79, June 2016, doi:10.1016/j.apenergy.2016.03.074.
53. Powell, K. M., Eaton, A. N., **Hedengren, J. D.**, Edgar, T. F., A Continuous Formulation for Logical Decisions in Differential Algebraic Systems using Mathematical Programs of Complementarity Constraints, Processes, 2016, 4(1), 7; doi:10.3390/pr4010007.
54. Safdarnejad, S. M., Gallacher, J. R., **Hedengren, J. D.**, Dynamic Parameter Estimation and Optimization for Batch Distillation, Computers & Chemical Engineering, Vol. 86, pp. 18–32, 2016, DOI: 10.1016/j.compchemeng.2015.12.001.
55. Martin, R.A., Rojas, I., Franke, K.W., **Hedengren, J.D.**, Evolutionary View Planning for Optimized UAV Terrain Modeling in a Simulated Environment, Remote Sensing, 8(1), 26, 2016, DOI:10.3390/rs8010026.
56. Sun, L., Castagno, J., **Hedengren, J. D.**, and Beard, R. W., Parameter Estimation for Towed Cable Systems Using Moving Horizon Estimation, IEEE Transactions on Aerospace and Electronic Systems, Vol. 51, No. 2, April 2015.
57. Asgharzadeh Shishavan, R., Hubbell, C., Perez, H.D., **Hedengren, J.D.**, Pixton, D.S., and Pink, A.P., Multivariate Control for Managed Pressure Drilling Systems Using High Speed Telemetry, SPE Journal, SPE-170962, Published Online 7 Oct 2015, DOI: 10.2118/170962-PA.
58. Asgharzadeh Shishavan, R., Hubbell, C., Perez, H.D., **Hedengren, J.D.**, and Pixton, D.S., Combined Rate of Penetration and Pressure Regulation for Drilling Optimization Using High Speed Telemetry, SPE Drilling & Completion Journal, SPE-170275-PA, 30 (1), pp. 17-26, 5 March 2015.
59. Lewis, N.R., **Hedengren, J.D.**, Haseltine, E.L., Hybrid Dynamic Optimization Methods for Systems Biology with Efficient Sensitivities, Special Issue on Algorithms and Applications in Dynamic Optimization, Processes, 2015, 3(3), 701-729; DOI:10.3390/pr3030701.
60. Safdarnejad, S.M., **Hedengren, J.D.**, Lewis, N.R., Haseltine, E., Initialization Strategies for Optimization of Dynamic Systems, Computers and Chemical Engineering, 2015, Vol. 78, pp. 39-50, DOI: 10.1016/j.compchemeng.2015.04.016.

61. Safdarnejad, S.M., **Hedengren, J.D.**, Baxter, L.L, Plant-level Dynamic Optimization of Cryogenic Carbon Capture with Conventional and Renewable Power Sources, Applied Energy Journal, Vol. 149, pp. 354-366, 2015, DOI: 10.1016/j.apenergy.2015.03.100.
62. **Hedengren, J.D.**, Asgharzadeh Shishavan, R., Powell, K.M., and Edgar, T.F., Nonlinear Modeling, Estimation and Predictive Control in APMonitor, Computers and Chemical Engineering, Volume 70, pg. 133–148, 2014, DOI: 10.1016/j.compchemeng.2014.04.013.
63. Powell, K.M., **Hedengren, J.D.**, and Edgar, T.F., Dynamic Optimization of a Hybrid Solar Thermal and Fossil Fuel System, Solar Energy, DOI: 10.1016/j.solener.2014.07.004, Vol. 108, pp. 210–218, 2014.
64. Hallac, B., Keyvanloo, K., **Hedengren, J.D.**, Hecker, W.C., Argyle, M., An Optimized Simulation Model for Iron-Based Fischer-Tropsch Catalyst Design: Transfer Limitations as Functions of Operating and Design Conditions, Chemical Engineering Journal, Available online 8 November 2014, ISSN 1385-8947, http://dx.doi.org/10.1016/j.cej.2014.10.108, 2014.
65. Sun, L., **Hedengren, J.D.**, and Beard, R.W., Optimal Trajectory Generation using Model Predictive Control for Aerially Towed Cable Systems, Accepted to Journal of Guidance, Control, and Dynamics, Vol. 37, Issue 2, pp. 525-539, 2014.
66. Kelly, J. D. and **Hedengren, J.D.**, A Steady-State Detection (SSD) Algorithm to Detect Non-Stationary Drifts in Processes, Journal of Process Control, 23, 3, pp. 326–331, March 2013.
67. Spivey, B.J., **Hedengren, J.D.** and Edgar, T.F., Constrained Nonlinear Estimation for Industrial Process Fouling, Industrial & Engineering Chemistry Research, 49 (17), pp 7824–7831, DOI: 10.1021/ie9018116, 2010.
68. **Hedengren, J.D.** and Edgar, T.F., Approximate Nonlinear Model Predictive Control with In Situ Adaptive Tabulation, Computers and Chemical Engineering, Volume 32, pp. 706-714, 2008.
69. **Hedengren, J.D.** and Edgar, T.F., In Situ Adaptive Tabulation for Real-Time Control, Industrial & Engineering Chemistry Research, Ind. Eng. Chem. Res., Volume 44, Issue 8, pp. 2716 -2724, 2005.
70. **Hedengren, J.D.** and Edgar, T.F., Order Reduction of Large Scale DAE Models, Computers and Chemical Engineering, Volume 29, Issue 10, pp. 2069-2077, 2005.

PEER REVIEWED CONFERENCE PROCEEDINGS

1. Chen, Y., Hill, D., Billings, B., **Hedengren, J.D.**, Powell, K.M., Hydrogen Underground Storage for Grid Resilience: A Dynamic Simulation and Optimization Study, American Control Conference, Toronto, Canada, July 2024.
2. Gunnell, L., Perez, K.X., Castillo, I., Hoogerwerf, A.S., Peng, Y., **Hedengren, J.D.**, Detection of Valve Stiction in Industrial Control Loops through Continuous Wavelet Transformation with a CNN, American Control Conference, Toronto, Canada, July 2024.
3. **Hedengren, J.D.**, Brower, D.V., Kidder, K., Hillman, Z., Data-Driven TLP Tendon Loads from Internal Hull Fiber-Optic Sensors, ASME 42nd International Conference on Ocean, Offshore and Arctic Engineering, OMAE2023/103309, Melbourne, Australia, June 2023.
4. **Hedengren, J.D.**, Nicholson, B., Open-Source Modeling Platforms, Keynote Talk at FOCAPO / CPC 2023, San Antonio, TX, 8-12 January 2023.
5. **Hedengren, J.D.**, Brower, D.V., Kidder, K., Hillman, Z., Data-Driven TLP Tendon Loads from Internal Hull Fiber-Optic Sensors, ASME 42nd International Conference on Ocean, Offshore and Arctic Engineering, OMAE2023/103309, Melbourne, Australia, June 2023.
6. Rossiter, J.A., Visioli, A., Serbezov, A., **Hedengren, J.D.**, Douglas, B., Zakova, K., Open access resources to support learning of control engineering, 2022 European Control Conference (ECC), London, UK, July, 11-14, 2022.
7. Gates, N.S., Hill, D.C., Billings, B.W., Powell, K.M., **Hedengren, J.D.**, Benchmarks for Grid Energy Management with Python Gekko, 60th Conference on Decision and Control (CDC), Austin, TX, USA, December 13-15, 2021.
8. Wallace, J., Hill, D., Memmott, M., **Hedengren, J.**, Modeling and Optimizing Molten Salt Thermal Storage for Nuclear Power, Transactions of the 2020 Winter ANS (American Nuclear Society) Meeting, November 2020, Vol. 123, No. 1, pp. 144-145.

9. Moura Oliveira, P., **Hedengren, J.**, Boaventura, J., Bridging Theory to Practice: Feedforward and Cascade Control with TCLab Arduino Kit, 14th International Conference on Automatic Control and Soft Computing (CONTROLO), Bragança, Portugal, July 2020.
10. Moura Oliveira, P., **Hedengren, J.**, Rossiter, J.A., Introducing Digital Controllers to Undergraduate Students Using the TCLab Arduino Kit, 21st IFAC World Congress, Berlin, Germany, Volume 53, Issue 2, July 12-17, 2020, pp. 17524-17529.
11. Rossiter, J.A., Jones, B.L., Pope, S., **Hedengren, J.D.**, Evaluation and Demonstration of Take-Home Laboratory Kit, Invited Session: Demonstration and poster session, 12th IFAC Symposium on Advances in Control Education, July 7-9, 2019, 52 (9), pp. 56-61, Philadelphia, PA, USA.
12. Oliveira, P.M., **Hedengren, J.D.**, An APMonitor Temperature Lab PID Control Experiment for Undergraduate Students, 24th IEEE Conference on Emerging Technologies and Factory Automation (ETFA), Sep 10th - 13th, 2019, pp. 790-797, Zaragoza, Spain.
13. Pastusek, P., Payette, G., Shor, R., Cayeux, E., Aarsnes, U.J., **Hedengren, J.D.**, Menand, S., Macpherson, J., Gandikota, R., Behounek, M., Harmer, R., Detournay, E., Illerhaus, R., Liu, Y., Creating Open-Source Models, Test Cases, and Data for Oilfield Drilling Challenges, SPE/IADC Drilling Conference, The Hague, Netherlands, March 2019, SPE-194082-MS.
14. Tubbs, B., **Hedengren, J.D.**, Data-Driven Operations Management and Production Optimization, Operations: Case Studies and Best Practices, Canadian Institute Of Mining Metallurgy And Petroleum Conference Convention, CIM Convention, Montréal, CA, 2019.
15. Gates, N.S., Moore, K.R., Ning, A., **Hedengren, J.D.**, Combined Trajectory, Propulsion and Battery Mass Optimization for Solar-Regenerative High-Altitude Long Endurance Unmanned Aircraft, AIAA Science and Technology Forum (SciTech), 2019.
16. **Hedengren, J.D.**, Brower, D.V., Wilson J.C., High, G., Witherow, K., Distributed Fiber Optic Strain Monitoring During Deployment of A Deepwater Subsea Umbilical, Symposium 4 Pipelines, Risers, and Subsea Systems, ASME 38th International Conference on Ocean, Offshore and Arctic Engineering, OMAE2019/95558, Glasgow, Scotland, UK, June 2019.
17. Brower, D.V., Bentley, N.L., **Hedengren, J.D.**, Kipp, R.M., Le, S.Q., Seaman, C., Tang, H.H., Wilson, J.C., Full-Scale Testing of a Friction-Based, Post-Installable, Fiber-Optic Strain Sensor for Subsea Monitoring Systems, Topic: 4-6 Innovative Technologies for Deepwater Low-Cost Production, Symposium 4 Pipelines, Risers, and Subsea Systems, ASME 37th International Conference on Ocean, Offshore and Arctic Engineering, OMAE2018/77117, Madrid, Spain, June 2018.
18. **Hedengren, J.D.**, Brower, D.V., Wilson J.C., High, G., Witherow, K., New Flow Assurance System with High Speed Subsea Fiber Optic Monitoring Of Pressure And Temperature, Symposium 4 Pipelines, Risers, and Subsea Systems, ASME 37th International Conference on Ocean, Offshore and Arctic Engineering, OMAE2018/78079, Madrid, Spain, June 2018.
19. Martin, R.A., Heiner, B., **Hedengren, J.D.**, Targeted 3D Modeling from UAV Imagery, SPIE Defense + Security Symposium, Geospatial Informatics, and Motion Imagery Analytics VIII, 15 - 19 April 2018, Orlando, Florida.
20. Aghito, M., Bjørkevoll, K.S., Nybø, R., Eaton, A., **Hedengren, J.D.**, Automatic Model Calibration for Drilling Automation, SPE Bergen One Day Seminar, Bergen, Norway, 5 April 2017.
21. Beal, L., Clark, J., Anderson, M., Warnick, S., **Hedengren, J.D.**, Combined Scheduling and Control with Diurnal Constraints and Costs using a Discrete Time Formulation, FOCAPO / CPC 2017, Tuscon, AZ, Jan 2017.
22. Udy, J., Blackburn, L., **Hedengren, J.D.**, Darby, M., Reduced Order Modeling for Reservoir Injection Optimization and Forecasting, FOCAPO / CPC 2017, Tuscon, AZ, Jan 2017.
23. Franke, K., Nguyen, T., Shao, L., Bender, C., Wolfe, D., **Hedengren, J.D.**, Reimschiissel, B., The Use of Unmanned Aerial Vehicles (UAVs) and Structure from Motion (SfM) to Measure Volume Change at a Deep Dynamic Compaction Site, Geotechnical Frontiers, March 12-15, 2017, Orlando, Florida.
24. Park, J., Webber, T.R., Asgharzadeh Shishavan, R., **Hedengren, J.D.**, Improved Bottomhole Pressure Control with Wired Drillpipe and Physics-Based Models, SPE-184610-MS, SPE/IADC Drilling Conference and Exhibition, The Hague, The Netherlands, 14-16 March 2017.
25. Eaton, A., Beal, L., Thorpe, S.D., Janis, E.H., Hubbell, C., **Hedengren, J.D.**, Nybø, R., Aghito, M., Bjørkevoll, K., El Boubsi, R., Braaksma, J., and van Og, G., Ensemble Model Predictive Control for Robust Automated

Managed Pressure Drilling, SPE Annual Technical Conference and Exhibition (ATCE), SPE-174969-MS, Houston, TX: 28-30 Sept 2015.

26. Eaton, A., Safdarnejad, S.M., **Hedengren, J.D.**, Moffat, K., Hubbell, C., Brower, D.V., Brower, A.D., Post-Installed Fiber Optic Pressure Sensors on Subsea Production Risers for Severe Slugging Control, ASME 34th International Conference on Ocean, Offshore and Arctic Engineering, OMAE2014/42196, St. John's, Newfoundland, Canada, June 2015.
27. Palmer, L.M., Franke, K.W., Martin, R.A., Sines, B.E., Rollins, K.M., **Hedengren, J.D.**, Application and accuracy of structure from motion computer vision models with full-scale geotechnical field tests. Proceedings, 2015 International Foundation Congress and Equipment Expo, Paper 301, ASCE, Reston, VA, 2015.
28. Sugiura, J., Samuel, R., Oppelt, J., Ostermeyer, G.P., **Hedengren, J.D.**, and Pastusek, P., Drilling Modeling and Simulation: Current State and Future Goals, SPE IADC Drilling Conference and Exhibition, SPE-173045, 17-19 March 2015, UK, London.
29. Pixton, D., Asgharzadeh Shishavan, R., **Hedengren, J.D.**, Craig, A., Addressing UBO and MPD Challenges with Wired Drillpipe, SPE/IADC MPD & UBO Conference & Exhibition, Madrid, Spain: 8 - 9 Apr 2014.
30. Asgharzadeh Shishavan, R., Brower, D.V., **Hedengren, J.D.**, Brower, A.D., New Advances in Post-Installed Subsea Monitoring Systems for Structural and Flow Assurance Evaluation, OMAE2014/24300, San Francisco, CA, June 2014.
31. Brower, D., **Hedengren, J.D.**, Asgharzadeh Shishavan, R., and Brower, A., Advanced Deepwater Monitoring System, OMAE2013/10920, Nantes, France, June 2013, ISBN: 978-0-7918-5531-7.
32. Brower, D.V., Brower, A.D., **Hedengren, J.D.**, Asgharzadeh Shishavan, R., A Post-Installed Subsea Monitoring System for Structural and Flow Assurance Evaluation, Offshore Technology Conference, OTC 25368, Houston, TX, May 2014.
33. Jacobsen, L. T. and **Hedengren, J. D.**, Model Predictive Control with a Rigorous Model of a Solid Oxide Fuel Cell, American Control Conference (ACC), Washington, DC, pp. 3747–3752, 2013.
34. Powell, K. M., **Hedengren, J. D.**, and Edgar, T. F., Dynamic Optimization of a Solar Thermal Energy Storage System over a 24-Hour Period using Weather Forecasts, American Control Conference (ACC), Washington, DC, pp. 2952-2957, 2013.
35. Spivey, B.J., **Hedengren, J.D.**, and Edgar, T.F., Constrained Control and Optimization of Tubular Solid Oxide Fuel Cells for Extending Cell Lifetime, American Control Conference (ACC), Montréal, Canada, pp. 1356-1361, July 2012.
36. Brower, D., **Hedengren, J.D.**, Loegering, C., Brower, A., Witherow, K., and Winter, K., Fiber Optic Monitoring of Subsea Equipment, OMAE 2012, Rio de Janiero, Brazil, Volume 1: Offshore Technology, Number: 84143, pp. 769-776, June 2012.
37. **Hedengren, J.D.**, Allsford, K.V., and Ramlal, J., Moving Horizon Estimation and Control for an Industrial Gas Phase Polymerization Reactor, Proceedings of the American Control Conference (ACC), New York, NY, pp. 1353-1358, July 2007.
38. **Hedengren, J. D.** and Edgar, T. F., Moving Horizon Estimation - The Explicit Solution, Proceedings of the CPC-VII, Lake Louise, Alberta, Canada, 2006.
39. **Hedengren, J.D.** and Edgar, T.F., Order Reduction of Large Scale DAE Models, IFAC 16th World Congress, Prague, Czechoslovakia, July, 2005.
40. **Hedengren, J. D.** and Edgar, T. F., In Situ Adaptive Tabulation for Real-time Control, Proceedings of the American Control Conference (ACC), Boston, MA, pp. 2222-2227, July 2004.

PATENTS

1. Lawson, K. W., **Hedengren, J. D.**, Smith, L. C., Method for Controlling Bubble Formation in Polymerization Reactors, International Patent WO2012005740, Issued January 12, 2012, United States Patent Application 20130203946, Issued August 8, 2013.
2. Ross, K., **Hedengren, J.D.**, and Sorensen, C.A., Process Control of Plunge and Initial Traverse in Friction Stir Processing, Provisional Patent, filed with the U.S. Patent Office on March 2012.

INVITED PRESENTATIONS AND CONTRIBUTIONS

1. **Hedengren, J.D.**, Gunnell, L., GEKKO Optimization Suite for Control and Optimization, Tutorial Session: Tackling Control Problems with Open-Source Software in Julia and Python, American Control Conference, July 2024.
2. **Hedengren, J.D.**, Physics-Informed Deep Learning for Optimization and Control, Texas Tech University, Graduate Seminar, Mar 2024.
3. **Hedengren, J.D.**, Physics-Informed Deep Learning for Optimization and Control, Rowan University, Graduate Seminar, Mar 2024.
4. **Hedengren, J.D.**, Machine Learning for Engineers: MATLAB Curriculum Modules, MathWorks Technical Webinar, Mar 2024.
5. **Hedengren, J.D.**, Data-Driven Engineering and Process Control Education with Portable Labs, IFAC TC9.4 Control Education Webinar, Jan 2024.
6. **Hedengren, J.D.**, Generative AI for Process Systems Engineering, Advanced Process Monitoring Webinar Series and BYU Graduate Seminar, Nov 2024.
7. **Hedengren, J.D.**, Data-Driven Engineering Education with Hands-On Learning, Plenary Talk, Past and Future of Process/Product Analytics & Machine Learning, including Education and Workforce Development, FOPAM 2023, Foundations of Process/Product Analytics and Machine learning, University of California, Davis.
8. **Hedengren, J.D.**, Unlock Data to Optimize Industrial Processes, Energy Geoscience Institute (EGI), Invited Talk, University of Utah, Sept 2023.
9. **Hedengren, J.D.**, Learn Data-Driven Engineering with Interactive Modules, Industry 4.0 Topical Session, Analytics & AI, 2023 AIChE Spring Meeting, Houston, TX.
10. **Hedengren, J.D.**, Physics-Informed Deep Learning for Optimization and Control, Invited Presentation to Automated Systems & Soft Computing Lab (ASSCL), College of Computer and Information Sciences (CCIS), Prince Sultan University, Feb 2023.
11. **Hedengren, J.D.**, Nicholson, B., Open-Source Modeling Platforms, Keynote Talk at FOCAPO / CPC 2023, San Antonio, TX, 8-12 January 2023.
12. **Hedengren, J.D.**, Physics-Informed Machine Learning for Optimization and Control, Invited Presentation to DOW, May 2022.
13. **Hedengren, J.D.**, Gabbitas, M., and Van Katwyk, P., Data Science 3-Day Short Course, Delivered to Vermeer Corporation, Pella, IA in March 2022 and October 2022.
14. **Hedengren, J.D.**, Machine Learning and Dynamic Optimization Week-Long Short Course, Delivered to EDRC at Seoul National University, South Korea in Nov 2020, Jan 2021, and Dec 2021 with 30-70 participants.
15. **Hedengren, J.D.** and others, Panel Discussion: Machine Learning in the Oil and Gas Industry: Earth, Energy, and Environment (E3) Student Conference, Nov 2021.
16. Hammond, J., Hacioglu, A., **Hedengren, J.D.**, Teaching Hands-on Process Control Courses with Arduino Based TCLab, MATLAB and Simulink, AIChE Annual Meeting, Boston, MA, Nov 2021.
17. **Hedengren, J.D.**, Teaching Dynamics and Control with Arduino-based TCLab, Modeling, Estimation, and Control Conference, Austin, TX, Oct 2021.
18. **Hedengren, J.D.**, Machine Learning and Physics-Based Automation, Invited Webinar to University of Utah Chemical Engineering Graduate School Members, September 6, 2021.
19. Montalvo, C., Tekes, A. Douglas, B., **Hedengren, J.D.**, Feron, E., Kragelund, S., Horner, D., Kaminer, I., Egerstedt, M., More Material and More Immaterial, Innovative teaching strategies to make STEM courses more flexible in traditional and non-traditional settings, American Control Conference (ACC) Panel discussion, May 28, 2021.
20. **Hedengren, J.D.**, Machine Learning and Physics-Based Automation, Invited Webinar to IEEE Vancouver Joint Control, Robotics and Cybernetics Chapter, Feb 4, 2021.
21. **Hedengren, J.D.** and Balyadi, H., Podcast 8: Machine Learning Applications and Automation with Dr. John Hedengren and Hoss Belyadi, Jan 2021.

22. **Hedengren, J.D.**, Machine Learning and Physics-Based Automation for Oil and Gas, Invited Webinar to Saudi Aramco, Jan 2021.
23. **Hedengren, J.D.**, Teaching Dynamics and Control with Arduino-based TCLab, Invited Presentation at MathWorks Special Session, 59th Conference on Decision and Control, Jeju Island, Republic of Korea, Dec 14-18, 2020.
24. **Hedengren, J.D.**, Hybrid Machine Learning and Fundamental Modeling in the Oil and Gas Industry, Invited speaker at PAS Optics, Oct 2020.
25. **Hedengren, J.D.**, Hybrid Machine Learning and Fundamental Modeling in the Oil and Gas Industry, Invited webinar at the University of Wisconsin-Madison, Oct 2020.
26. **Hedengren, J.D.**, Machine Learning and Physics-Based Models for Drilling Automation, Webinar to the Society of Petroleum Engineers, May 2020.
27. **Hedengren, J.D.**, Drilling Automation and Downhole Monitoring with Physics-based Models. Society of Petroleum Engineers Distinguished Lecturer, Visits to: *(Jan 2018)* Salt Lake Section, Salt Lake City, Utah, (Sept 2018) Oklahoma City Section: Oklahoma City, Oklahoma, Southwest Oklahoma Section: Duncan, Oklahoma, Dallas Section: Dallas, Texas, Southwest Texas Section: Corpus Christi, Texas *(Feb 2019)* Bergen Section: Bergen, Norway, Copenhagen Section: Copenhagen, Denmark, German Section: Hanover, Germany, Ivano-Frankivsk Section: Ivano-Frankivsk, Ukraine, Timan-Pechora Section: Ukhta, Russia, Northwest Russia Section: St. Petersburg, Russia, Perm Section: Perm, Russia, Tyumen Section: Tyumen, Russia *(Apr 2019)* Vietnam Section: Ho Chi Minh City, Vietnam, Korea Section: Seoul, South Korea, Chengdu Study Group Section: Chengdu, China, Bangalore Section: Bangalore, India, Mumbai Section: Mumbai, India *(June 2019)* Hassi Messaoud Section: Hassi Messaoud, Algeria, Baghdad Section: Baghdad, Iraq, Basra Section: Basrah, Iraq, Erbil Section: Erbil, Iraq.
28. **Hedengren, J.D.**, Combined Scheduling and Control. Invited talk at the University of Wisconsin-Madison, Sept 2017.
29. Incorporating Dynamic Simulation into Chemical Engineering Curricula, **Hedengren, J.D.**, Badgwell, T.A., Grover, M., Braatz, R., ASEE Summer School for New Chemical Engineering Faculty, Raleigh, North Carolina, July 2017.
30. **Hedengren, J.D.**, Combined Scheduling, Design, and Control. Invited talk at Lund University, Lund, Sweden, Nov 2016.
31. **Hedengren, J.D.**, Ensemble Model Predictive Control for Robust Automated Managed Pressure Drilling, Invited talk at NTNU (Norwegian University of Science and Technology), Trondheim, Norway, Feb 2016.
32. **Hedengren, J.D.**, Combined Scheduling and Control, Invited talk at CMU (Carnegie Mellon University), Pittsburgh, PA, Oct 2015.
33. Mojica, J.L. and **Hedengren, J.D.**, APMonitor: Modeling Platform for Dynamic Optimization, Invited Session on Optimization Modeling Languages and Software at APMOD 2014, 11th International Conference on Applied Mathematical Optimization and Modelling, 9-11 April 2014, Warwick Business School, Coventry, UK.
34. **Hedengren, J.D.**, Dynamic Data Reconciliation and Optimization, Invited talk at University of Utah, Salt Lake City, UT, Oct 2013.
35. **Hedengren, J.D.**, Dynamic Data Reconciliation and Optimization, Invited Lecture at the University of Utah, Graduate Seminar, 30 Oct 2013.
36. **Hedengren, J.D.**, Dynamic Optimization Across Disciplines, Invited Lecture at Oklahoma State University, Graduate Seminar, 17 Sept 2013.
37. Mojica, J.L., Greenquist, I., **Hedengren, J.D.**, Dynamic Optimization: Energy System Planning Under Uncertainty, INEST Nuclear Hybrid Energy Systems CORE Workshop, Idaho Falls, ID, July 2013.
38. Greenquist, I., **Hedengren, J.D.**, Opportunities for Hybrid Nuclear System Integration in the Petrochemical Industry, INEST Nuclear Hybrid Energy Systems CORE Workshop, Idaho Falls, ID, July 2013.
39. **Hedengren, J.D.**, Monitoring Energy Infrastructure, Invited Session, Clear Gulf Joint Industry Project Review Meeting, Johnson Space Center, Houston, TX, April 2013.
40. **Hedengren, J.D.**, APMonitor Modeling Language for Mixed-Integer Differential Algebraic Systems, Computing Society Sponsored Session on Optimization Modeling Software: Design and Applications, INFORMS Annual Meeting, Phoenix, AZ, Oct 2012.

41. **Hedengren, J. D.**, A Nonlinear Model Library for Dynamics and Control, Computer Aids for Chemical Engineering (CACHE) News, Invited Feature Article, Summer 2008.
42. Invited Contributor to: Beucher, O. and M. Weeks, Introduction to MATLAB & SIMULINK: A Project Approach, 3rd Edition, Infinity Science Press, 2008.

CONFERENCE PAPERS AND PRESENTATIONS

1. **Hedengren, J.D.**, Park, J., Perez, K., Generative AI for Process Systems Engineering: Potential Applications and Pitfalls, Emerging Technologies in Data Analytics, 2024 AIChE Spring Meeting, New Orleans, LA.
2. **Hedengren, J.D.**, Fry, A., Perez, K., Hacioglu, A., Wang, J., Loftin, J., Machine Learning for Engineering course in MATLAB and Python, Education Division, 2023 AIChE Annual Meeting, Orlando, FL.
3. Babaei, M.R., Park, J., Venkat, A., **Hedengren, J.D.**, Framework for Hybrid Machine Learning with Open-Source Python Seeq Sysid Package, 2023 AIChE Spring Meeting, Houston, TX.
4. Babaei, M.R., Mtetwa, F., Stone, R., Knotts, T.A., **Hedengren, J.D.**, Physics-Informed Deep Learning for Prediction of Thermophysical Properties: Normal Boiling Point, 2023 AIChE Spring Meeting, Houston, TX.
5. VanKeersblick, L., Clark, M., Hunter, I., **Hedengren, J.D.**, Joint Angle Calculations Using Motion Capture and Deep Learning Pose Estimation for Safety Applications, Poster Session: Industry 4.0/Analytics & AI, 2023 AIChE Spring Meeting, Houston, TX.
6. Knotts, T., **Hedengren, J.D.**, Babaei, M.R., Physics-Informed Deep Learning for Prediction of Thermophysical Properties: The Parachor Method for Surface Tension, AIChE Annual Meeting, Phoenix, AZ, Nov 13-18, 2022.
7. Yao, J., Gao, T., **Hedengren, J.D.**, Powell, K., Two-Level Optimization Framework with Consideration of Economic Benefits and Long-Term Capacity Fading for Battery Energy Storage Systems, AIChE Annual Meeting, Phoenix, AZ, Nov 13-18, 2022.
8. Ho, A., Mohammadi, K., Memmott, M., **Hedengren, J.D.**, Powell, K., Dynamic Modeling and Simulation of a Novel Nuclear-Hydrogen Hybrid Energy System with Large-Scale Storage in an Underground Salt Cavern, AIChE Annual Meeting, Phoenix, AZ, Nov 13-18, 2022.
9. Ho, A., Hill, D., **Hedengren, J.D.**, Powell, K., An Optimal Dispatch and Economic Performance Study of a Nuclear-Hydrogen Hybrid Energy System with Large-Scale Storage in Underground Salt Cavern, AIChE Annual Meeting, Phoenix, AZ, Nov 13-18, 2022.
10. Ho, A., Mohammadi, K., Memmott, M., **Hedengren, J.D.**, Powell, K., Dynamic Modeling and Simulation of a Novel Nuclear-Hydrogen Hybrid Energy System with Large-Scale Storage in an Underground Salt Cavern, AIChE Annual Meeting, Phoenix, AZ, Nov 13-18, 2022.
11. Serbezov, A., Zakova, K., Visioli, A., Rossiter, J.A., Douglas, B., **Hedengren, J.D.**, Open access resources to support the first course in feedback, dynamics and control, Advanced in Control Education (ACE2022), Hamburg, Germany, 24-27 July 2022.
12. Rossiter, J.A., Visioli, A., Serbezov, A., **Hedengren, J.D.**, Douglas, B., Zakova, K., Open access resources to support learning of control engineering, 2022 European Control Conference (ECC), London, UK, July, 11-14, 2022.
13. Granger, C., Martin, A., Hill, D., Wallace, J., Memmott, M., **Hedengren, J.D.**, Optimal Dispatch with MPC Using Lab Scale Arduino Hardware, Process Modeling and Simulation IV, 2022 AIChE Spring Meeting, San Antonio, TX, April 2022.
14. Park, J., Lyman, J., Darby, M., Lima, L., Nelson, C., and **Hedengren, J.D.**, Hybrid Machine Learning and Fundamental Modeling for Real-Time Optimization of a Fluidized Bed Roaster, 2020 Spring Meeting & 16th Global Congress on Process Safety, AIChE, Houston, TX, 29 March-2 April, 2020.
15. Park, J., Lyman, J., Darby, M., Lima, L., Nelson, C., and **Hedengren, J.D.**, Hybrid Machine Learning and Fundamental Modeling for Real-Time Optimization of a Fluidized Bed Roaster, 2020 Spring Meeting & 16th Global Congress on Process Safety, AIChE, Houston, TX, 29 March-2 April, 2020.
16. **Hedengren, J.D.**, Martin, R.A., Kantor, J.C., Reuel, N., Temperature Control Lab for Dynamics and Control, AIChE Annual Meeting, Orlando, FL, Nov 2019.

17. Park, J., Hansen, B., Gates, N., Darby, M., **Hedengren, J.D.**, Use of Nonlinear and Machine Learning Techniques for Improved APC Modeling, AIChE Spring Meeting, New Orleans, LA, April 2019. Abstract
18. Park, J., Patterson, C., Kelly, J., **Hedengren, J.D.**, Closed-Loop PID Re-Tuning in a Digital Twin By Re-Playing Past Setpoint and Load Disturbance Data, AIChE Spring Meeting, New Orleans, LA, April 2019.
19. Blackburn, L., **Hedengren, J.D.**, Powell, K.M., Real-time Optimization of Chillers with Thermal Energy Storage and Variable Electricity Rates, Smart City & Sustainable Communities, INFORMS 2018 Annual Meeting, Phoenix, AZ, USA, Nov. 4-7, 2018.
20. Okeson, T., Barrett, B., Blackburn, L., **Hedengren, J.D.**, Franke, K., Optimized Infrastructure Monitoring: 3D Modeling in Complex Environments, Center for Unmanned Aircraft Systems (C-UAS), Atlanta, GA, 8 Feb 2017.
21. Eaton, A.N., Park, J., Thorpe, S., Webber, T., Safdarnejad, S.M., **Hedengren, J.D.**, High-Speed Data and High-Fidelity Models: Opportunities and Challenges in Well Manufacturing, AIChE Spring Meeting, Houston, TX, April 2016.
22. Safdarnejad, S.M., Richards, J., Griffiths, J., **Hedengren, J.D.**, Baxter, L.L., Increased Stability of a Power Grid by Energy Storage of Cryogenic Carbon Capture, AIChE Spring Meeting, Houston, TX, April 2016.
23. Nikbakhsh, S., **Hedengren, J.D.**, Darby, M., Udy, J., Constrained Model Identification Using Open-Equation Nonlinear Optimization, AIChE Spring Meeting, Houston, TX, April 2016.
24. Martin, R.M., Hall, A., Brinton, C., Franke, K., and **Hedengren, J.D.**, Privacy Aware Mission Planning and Video Masking for UAV Systems, UMS-01, Unmanned Systems: Mission Management and Planning Technologies, Jan 4, 2016, AIAA Infotech at Aerospace, AIAA Science and Technology Forum and Exposition 2016, San Diego, California, USA, 4-8 Jan 2016.
25. Safdarnejad, S.M., **Hedengren, J.D.**, Baxter, L.L., Dynamic Optimization of the Hybrid System of a Baseline Power Generation Unit and Cryogenic Carbon Capture, Western Section of the Combustion Institute, Fall 2015 Meeting, Provo, UT, October 5-6, 2015.
26. Eaton, A.N., Beal, L., Janis, E., Hubbell, C., **Hedengren, J.D.**, Nybø, R., Aghito, M., Bjørkevoll, K., Addressing Control Challenges of Discontinuous Processes with Multi-Fidelity Model Predictive Control, Modeling, Control and Optimization of Energy Systems II, AIChE Annual Meeting, Salt Lake City, UT, Nov 2015.
27. Park, J., Safdarnejad, M., Asgharzadeh Shishavan, R., **Hedengren, J.D.**, Rastegar, R., Snell, A., Nonlinear Model Predictive Control of Managed Pressure Drilling Based on Hammerstein-Wiener Piecewise Linear Models, AIChE Annual Meeting, Salt Lake City, UT, Nov 2015.
28. Safdarnejad, M., Gallacher, J., **Hedengren, J.D.**, Baxter, L.B., A New Framework for Dynamic Parameter Estimation and Optimization of Batch Distillation Columns, AIChE Annual Meeting, Salt Lake City, UT, Nov 2015.
29. Safdarnejad, M., **Hedengren, J.D.**, Baxter, L.B., Reduction in Cycling of the Boilers By Using Large-Scale Energy Storage of Cryogenic Carbon Capture, AIChE Annual Meeting, Salt Lake City, UT, Nov 2015.
30. Franke, K, **Hedengren, J.D.** and Farrell, R., UAS-Based Infrastructure Monitoring, Center for Unmanned Aircraft Systems (C-UAS), Arlington, VA, Feb 2015.
31. Asgharzadeh Shishavan, R. and **Hedengren, J.D.**, Improved Estimator Insensitivity to Outliers, Measurement Drift, and Noise, AIChE Spring Meeting, New Orleans, LA, April 2014.
32. Asgharzadeh Shishavan, R., Memmott, J.A., **Hedengren, J.D.**, and Pixton, D., Pressure Regulation and Kick Attenuation with Wired Pipe Technology in Managed Pressure Drilling, AIChE Spring Meeting, New Orleans, LA, April 2014.
33. Brower, D., Brower, A., Memmott, J.A., Asgharzadeh Shishavan, R., and **Hedengren, J.D.**, Advanced Monitoring Systems on Existing Deepwater Infrastructure for Intelli-Field Advances, AIChE Spring Meeting, New Orleans, LA, April 2014.
34. Mojica, J.L., Chen, M., Petersen, D., **Hedengren, J.D.**, Planning of Capacity Investments using a Model Predictive Control Approach, INFORMS Annual Meeting, Minneapolis, MN, Oct 2013.
35. **Hedengren, J.D.**, Mojica, J.L., Lewis, A.D. and Nikbakhsh, S., MINLP with Combined Interior Point and Active Set Methods, INFORMS Annual Meeting, Minneapolis, MN, Oct 2013.
36. **Hedengren, J.D.** and Franke, K., Infrastructure Monitoring: Displacement Detection with Optical Sensors, Center for Unmanned Aircraft Systems (C-UAS), Snowbird, UT, Aug 2013.
37. Martin, R.A., Pulsipher, J., Lund, C., Clark, J., **Hedengren, J.D.**, and Franke, K., UAV-Based Infrastructure Monitoring, Poster Session: Center for Unmanned Aircraft Systems (C-UAS), Snowbird, UT, Aug 2013.

38. **Hedengren, J.D.**, Mojica, J.L., Asgharzadeh Shishavan, R., Safdarnejad, S.M., Recent Advances in the Application of MIDAE Systems, AIChE National Meeting, San Francisco, CA, Nov 2013.
39. Mojica, J.L., **Hedengren, J.D.**, A Model Predictive Control Approach for Long Term Planning of Capacity Investments in a District Heating System, AIChE National Meeting, San Francisco, CA, Nov 2013.
40. Abbott, C.S., Haseltine, E.L., Martin, R.A., and **Hedengren, J.D.**, New Capabilities for Large-Scale Models in Computational Biology, Computing and Systems Technology Division, AIChE National Meeting, Pittsburgh, PA, Oct 2012.
41. Asgharzadeh Shishavan, R. and **Hedengren, J.D.**, Nonlinear Model Predictive Control of a Thermal Oxidizer System, Computing and Systems Technology Division, AIChE National Meeting, Pittsburgh, PA, Oct 2012.
42. Powell, K.M., **Hedengren, J.D.**, and Edgar, T.F., Dynamic Optimization of Solar Thermal Systems with Storage, Computing and Systems Technology Division, AIChE National Meeting, Pittsburgh, PA, Oct 2012.
43. **Hedengren, J.D.**, Mojica, J.L., Cole, W., Edgar, T.F., APOPT: MINLP Solver for Differential Algebraic Systems with Benchmark Testing, INFORMS Annual Meeting, Phoenix, AZ, Oct 2012.
44. Liang Sun, **Hedengren, J.D.**, Beard, R.W., Real-time Moving Horizon Estimation for an Unmanned Aerial System, OPTEC Workshop on Moving Horizon Estimation and System Identification, Leuven, Belgium, Aug 2012.
45. **Hedengren, J.D.**, A Simulation Platform to Enhance Engineering Laboratory Experiences, ASEE: American Society for Engineering Education, Summer School, Orono, Maine, July 2012.
46. Jensen, K.R. and **Hedengren, J.D.**, Improved Load Following of a Boiler with Advanced Process Control, AIChE Spring Meeting, Houston, TX, April 2012.
47. **Hedengren, J.D.**, Brower, D., and Mojica, J., Advanced Process Monitoring of Flow Assurance with Fiber Optics, AIChE Spring Meeting, Houston, TX, April 2012.
48. Soderstrom, T.A., Zhang, Y., and **Hedengren, J.D.**, Advanced Process Control in ExxonMobil Chemical Company: Successes and Challenges, CAST Division, AIChE National Meeting, Salt Lake City, UT, Nov 2010.
49. Spivey, B.J., **Hedengren, J.D.**, and Edgar, T.F., Monitoring of Process Fouling Using First-Principles Modeling and Moving Horizon Estimation, Proc. Applications of Computer Algebra (ACA) Conference, Montréal, Canada, 2009.
50. Spivey, B.J., **Hedengren, J.D.**, and Edgar, T.F., Monitoring of Process Fouling Using First-Principles Modeling and Moving Horizon Estimation, Proc. Texas, Wisconsin, California Control Consortium (TWCCC), Austin, TX, February 2009.
51. Ramlal, J., Naidoo, V., Allsford, K.V., and **Hedengren, J.D.**, Moving Horizon Estimation for an Industrial Gas Phase Polymerization Reactor, Proc. IFAC Symposium on Nonlinear Control Systems Design (NOLCOS), Pretoria, South Africa, 2007.
52. **Hedengren, J.D.** and Edgar, T.F., Order Reduction of a Large-Scale Index-2 DAE Model, Computing and Systems Technology Division, AIChE National Meeting, Cincinnati, OH, Nov 2005.
53. **Hedengren, J. D.** and Edgar, T. F., Efficient Moving Horizon Estimation of DAE Systems, Texas-Wisconsin Modeling and Control Consortium (TWMCC), Austin, TX, Feb 2005.
54. **Hedengren, J. D.** and Edgar, T. F., Adaptive DAE Model Reduction, Texas-Wisconsin Modeling and Control Consortium (TWMCC), Madison, WI, Sept 2004.
55. **Hedengren, J. D.** and Edgar, T. F., Order Reduction of Large Scale DAE Models, Computing and Systems Technology Division, AIChE National Meeting, Austin, TX, Nov 2004.
56. **Hedengren, J. D.** and Edgar, T. F., Dependency Analysis for DAE to ODE Conversion and Model Reduction, Texas-Wisconsin Modeling and Control Consortium (TWMCC), Austin, TX, Feb 2004.
57. **Hedengren, J. D.**, In Situ Adaptive Tabulation for Real-time Control, Admission to Candidacy, 9 Dec. 2003 - Himmelblau Library (CPE 4.446).
58. **Hedengren, J. D.** and Edgar, T. F., In Situ Adaptive Tabulation for Nonlinear MPC, Poster Session: Systems and Process Control, AIChE National Meeting, San Francisco, CA, Nov 2003.
59. **Hedengren, J. D.** and Edgar, T. F., In Situ Adaptive Tabulation for Nonlinear MPC, Texas-Wisconsin Modeling and Control Consortium (TWMCC), Madison, WI, Sept 2003.
60. **Hedengren, J. D.**, Beckstead, M. W., and Spinti, J., Implementation of Automatically Simplified Chemical Kinetics through Intrinsic Low-Dimensional Manifolds for Gaseous HMX, Joint Army-Navy-NASA-Air Force (JANNAF) 20th Propulsion Systems Hazards Subcommittee (PSHS), 38th JANNAF Combustion Subcommittee Meeting, and 2nd Modeling and Simulation Subcommittee Meeting, Destin, FL, Apr 2002.