Boris Krämer

Associate Professor
Department of Mechanical and Aerospace Engineering
University of California San Diego
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RESEARCH INTERESTS

- Reduced-order modeling of high-dimensional complex systems
- Structure-preserving scientific machine learning
- Optimal control in high dimensions
- Multifidelity uncertainty quantification
- Design under uncertainty
- Applications: Digital twins, combustion, space weather, soft robotics, metal additive manufacturing, aircraft design optimization, semiconductor manufacturing, radiation hardened electronics, metamaterials.

EMPLOYMENT

Associate Professor (tenured)   (July 2025–present)
Department of Mechanical and Aerospace Engineering
University of California San Diego, La Jolla, CA

Assistant Professor (tenure-track)   (Sep. 2019–June 2025)
Department of Mechanical and Aerospace Engineering
University of California San Diego, La Jolla, CA

Postdoctoral Research Associate   (Sep. 2015–Aug. 2019)
Department of Aeronautics & Astronautics, and Aerospace Computational Design Lab (ACDL)
Massachusetts Institute of Technology, Cambridge, MA
Advisor: Karen E. Willcox

Research Internship   (Sep. 2014–Apr. 2015)
Mechatronics and Multimedia Group
Mitsubishi Electric Research Laboratory, Cambridge, MA

EDUCATION

Ph.D. in Mathematics   (Aug. 2015)
Thesis: *Model and Data Reduction for Control, Identification and Compressed Sensing* (Advisor: John Burns)
Department of Mathematics and Interdisciplinary Center for Applied Mathematics (ICAM)
Virginia Tech, Blacksburg, VA

M.Sc. in Mathematics   (Aug. 2011)
Thesis: *Model reduction of the coupled Burgers' equation in conservation form* (Advisor: John Burns)
Department of Mathematics and Interdisciplinary Center for Applied Mathematics (ICAM)
Virginia Tech, Blacksburg, VA

Cand. Dipl. Math. Tech (Pre-Diploma in Techno-Mathematics)   (Jul. 2009)
Department of Mathematics
Karlsruhe Institute of Technology (KIT), Germany

PREPRINTS

* denotes supervised student or Postdoc

7. B. Kramer, S. Gugercin, J. Borggaard, *Nonlinear Balanced Truncation: Part 2-Model Reduction on Manifolds*, arXiv:2302.02036.

6. H. Kim*, B. Kramer, *Physically consistent predictive reduced-order modeling by enhancing Operator Inference with state constraints*, arXiv:2502.03672.

5. B. Kramer and G. Pogudin, *Discovering polynomial and quadratic structure in nonlinear ordinary differential equations*, arXiv:2502.10005

4. H. Sharma*, J.D. Draxl-Giannoni*, B. Kramer, *Nonlinear energy-preserving model reduction with lifting transformations that quadratize the energy*, arXiv:2503.02273.

3. S. Kang*, H. Kim*, H., B. Kramer, *Parametric Operator Inference to simulate the purging process in semiconductor manufacturing*, arXiv:2504.03990.

2. H. Sharma*, J.D. Draxl-Giannoni*, B. Kramer, *Structure-preserving Lift & Learn: Scientific machine learning for nonlinear conservative partial differential equations*, arXiv:2507.00301

1. S.P.C. van Schie, B. Kramer, J.T. Hwang, *Weighted proper orthogonal decomposition for high-dimensional optimization*, arXiv:2508.09084

JOURNAL PUBLICATIONS

* denotes supervised graduate student or Postdoc

49. N. Linden-Santangeli*, J. Zhang, B. Kramer, P. Rangamani, *Systems modeling and uncertainty quantification of AMP-activated protein kinase signaling*, npj Systems Biology and Applications, 2025 (to appear).

48. Y. Guo*, B. Kramer, *Risk-based design optimization for powder bed fusion metal additive manufacturing*, Structural & Multidisciplinary Optimization, 68, 179 (2025). https://doi.org/10.1007/s00158-025-04120-w

47. O. Issan*, O. Koshkarov, F. D. Halpern, G.L. Delzanno, B. Kramer, *Conservative data-driven model order reduction of a fluid-kinetic spectral solver.* Physics of Plasmas, 32, 083907, 2025. https://doi.org/10.1063/5.0275478

46. N. Linden-Santangeli*, J. Zhang, B. Kramer, P. Rangamani, *Increasing certainty in systems biology models using Bayesian multimodel inference*, Nature Communications 16, pp. 7416, 2025. https://doi.org/10.1038/s41467-025-62415-4

45. N. Corbin*, A. Sarkar, J.M.A. Scherpen, B. Kramer, *Scalable computation of input-normal/output-diagonal balanced realization for control-affine polynomial systems*, Systems & Control Letters 204, 106178, 2025. https://doi.org/10.1016/j.sysconle.2025.106178

44. Y. Geng, L. Ju, B. Kramer, Z. Wang, *Data-driven reduced-order models for port-Hamiltonian systems with operator inference*, Computer Methods in Applied Mechanics and Engineering, 442, 118042, 2025. https://doi.org/10.1016/j.cma.2025.118042

43. Y. Guo*, D. Lee* , B. Kramer, *Robust design optimization with limited data for char combustion*, Structural & Multidisciplinary Optimization 68:59, 2025. https://doi.org/10.1007/s00158-025-03988-y

42. O. Issan*, O. Koshkarov, F. D. Halpern, B. Kramer, G.L. Delzanno, *Conservative closures of the Vlasov-Poisson equations discretized with a symmetrically weighted Hermite spectral expansion in velocity* Journal of Computational Physics, Vol. 524, 113741. https://doi.org/10.1016/j.jcp.2025.113741

41. N. Corbin*, and B. Kramer, *Scalable computation of $\mathcal{H}_\infty$ energy functions for polynomial control-affine systems*, IEEE Transactions of Automatic Control, 70:5, pp. 3088-3100, 2025. https://doi.org/10.1109/TAC.2024.3494472

40. N. Galioto, H. Sharma*, B. Kramer, A.A. Gorodetsky, *Bayesian identification of nonseparable Hamiltonians with multiplicative noise using deep learning and reduced-order modeling*, Computer Methods in Applied Mechanics and Engineering, 430, 117194, 2024. https://doi.org/10.1016/j.cma.2024.117194

39. O. Issan*, O. Koshkarov, F.D. Halpern, B. Kramer, G.L. Delzanno, *Anti-symmetric and positivity preserving formulation of a spectral method for Vlasov-Poisson equations.* Journal of Computational Physics, 514, 113263, 2024. https://doi.org/10.1016/j.jcp.2024.113263

38. R. Han, B. Kramer, D. Lee*, A. Narayan, Y. Xu, *An approximate control variates approach to multifidelity distribution estimation*, SIAM/ASA Journal on Uncertainty Quantification 12 (4), 1349-1388, 2024. https://doi.org/10.1137/23M1584307

37. D. Lee*, E. Lavichant* and B. Kramer, *Global sensitivity analysis with limited data via sparsity-promoting D-MORPH regression: Application to char combustion*, Journal of Computational Physics, Vol. 511, 113116, 2024. https://doi.org/10.1016/j.jcp.2024.113116

36. Y. Geng, J. Singh, L. Ju, B. Kramer, Z. Wang, *Gradient preserving operator inference: data-driven reduced-order models for equations with gradient structure*, Computer Methods in Applied Mechanics and Engineering, Vol. 427, 117033, 2024. https://doi.org/10.1016/j.cma.2024.117033

35. B. Kramer, S. Gugercin, J. Borggaard, L. Balicki, *Scalable computation of energy functions for nonlinear balanced truncation*, Computer Methods in Applied Mechanics and Engineering, Vol. 427, 117011, 2024. https://doi.org/10.1016/j.cma.2024.117011

34. H. Sharma*, B. Kramer, *Preserving Lagrangian structure in data-driven reduced-order modeling of large-scale mechanical systems*, Physica D: Nonlinear Phenomena, Vol 462, 134128, 2024. https://doi.org/10.1016/j.physd.2024.134128

33. H. Sharma*, D. Najera-Flores, M. Todd, B. Kramer, *Lagrangian operator inference enhanced with structure-preserving machine learning for nonintrusive model reduction of mechanical system*, Computer Methods in Applied Mechanics and Engineering, Vol. 423, 116865, 2024. https://doi.org/10.1016/j.cma.2024.116865

32. B. Kramer, B. Peherstorfer, K. Willcox, *Learning nonlinear reduced models from data with Operator Inference*, Annual Review of Fluid Mechanics 56:1, 521-548, 2024. https://doi.org/10.1146/annurev-fluid-121021-025220

31. A. Bychkov, O. Issan*, G. Pogudin, B. Kramer, *Exact and optimal quadratization of nonlinear finite-dimensional non-autonomous dynamical systems*, SIAM Journal of Applied Dynamical Systems, 23(1), 982-1016, 2024. https://doi.org/10.1137/23M1561129

30. O. Issan*, P. Riley, E. Camporeale, B. Kramer, *Bayesian inference and global sensitivity analysis for ambient solar wind prediction*, Space Weather 21(9), 2023. https://doi.org/10.1029/2023SW003555

29. H. Sharma*, H. Mu, P. Buchfink, R. Geelen, S. Glas, B. Kramer, *Symplectic model reduction of Hamiltonian systems using data-driven quadratic manifolds*, Computer Methods in Applied Mechanics and Engineering, 417, 116402, 2023. https://doi.org/10.1016/j.cma.2023.116402

28. J. Reiner, N. Linden*, R. Vaziri, N. Zobeiry, B. Kramer, *Bayesian parameter estimation for the inclusion of uncertainty in progressive damage simulation of composites*, Composite Structures, 321, p.117257, 2023. https://doi.org/10.1016/j.compstruct.2023.117257

27. D. Lee*, B. Kramer, *Multifidelity conditional value-at-risk estimation by dimensionally decomposed generalized polynomial chaos-Kriging*, Reliability Engineering & System Safety, 235, p.109208, 2023. https://doi.org/10.1016/j.ress.2023.109208

26. D. Lee*, B. Kramer, *Bi-fidelity conditional-value-at-risk estimation by dimensionally decomposed generalized polynomial chaos expansion.* Structural & Multidisciplinary Optimization, 66(2), 33, 2023. https://doi.org/10.1007/s00158-022-03477-6

25. N. Sawant, B. Kramer, B. Peherstorfer, *Physics-informed regularization and structure preservation for learning stable reduced models from data with operator inference.* Computer Methods in Applied Mechanics and Engineering, 401. p.115836, 2023. https://doi.org/10.1016/j.cma.2022.115836

24. N. Linden*, B. Kramer, P. Rangamani, *Bayesian parameter estimation for dynamical models in systems biology.* PLOS Computational Biology 18(10):e1010651, 2022. https://doi.org/10.1371/journal.pcbi.1010651

23. O. Issan*, B. Kramer, *Predicting solar wind streams from the inner-Heliosphere to Earth via shifted operator inference.* Journal of Computational Physics, 473, 111689, 2022. https://doi.org/10.1016/j.jcp.2022.111689

22. B. Kramer, *Learning state variables for physical systems.* Nature Computational Science 2, 414–415 (2022). https://doi.org/10.1038/s43588-022-00283-4 (News & Views Article)

21. H. Sharma*, Z. Wang, B. Kramer, *Hamiltonian operator inference: physics-preserving learning of reduced-order models for Hamiltonian systems*, Physica D: Nonlinear Phenomena, 431, 133122, 2022. https://doi.org/10.1016/j.physd.2021.133122.

20. A. Chaudhuri, B. Kramer, M. Norton, J.O. Royset, K. Willcox, *Certifiable risk-based engineering design optimization*, AIAA Journal, 60:2, 551-565, 2022, https://doi.org/10.2514/1.J060539

19. B. Kramer and K. Willcox. *Balanced truncation model reduction for lifted nonlinear systems.* In: Realization and Model Reduction of Dynamical Systems: A Festschrift in Honor of the 70th Birthday of Thanos Antoulas, Springer, pp. 157-174, 2022. https://doi.org/10.1007/978-3-030-95157-3_9

18. B. Kramer, *Stability domains for quadratic-bilinear reduced-order models.* SIAM J. Appl. Dyn. Syst., 20(2), 981–996, 2021 https://doi.org/10.1137/20M1364849

17. Y. Huang*, B. Kramer *Balanced reduced-order models for iterative nonlinear control of large-scale systems.* IEEE Control Systems Letters, Vol. 5, No. 5, 1699-1704, Nov. 2021, https://doi.org/10.1109/LCSYS.2020.3042835

16. P. Benner, P. Goyal, B. Kramer, B. Peherstorfer, K. Willcox. *Operator inference for non-intrusive model reduction of systems with non-polynomial nonlinear terms.* Comput. Methods Appl. Mech. Engrg. 372, p. 113433, 2020. https://doi.org/10.1016/j.cma.2020.113433

15. R. Swischuk, B. Kramer, C. Huang, and K. Willcox. *Learning physics-based reduced-order models for a single-injector combustion process.* AIAA Journal, 58:6, 2658–2672, 2020 https://doi.org/10.2514/1.J058943.

14. M. Heinkenschloss, B. Kramer, T. Takhtaganov. *Adaptive reduced-order model construction for conditional value-at-risk estimation.* SIAM/ASA J. Uncertainty Quantification, 8(2), 668–692, 2020. https://doi.org/10.1137/19M1257433.

13. E. Qian, B. Kramer, B. Peherstorfer, K. Willcox. *Lift & Learn: Physics-informed machine learning for large-scale nonlinear dynamical systems.* Physica D: Nonlinear Phenomena, Volume 406, p. 132401, 2020. https://doi.org/10.1016/j.physd.2020.132401 and http://arxiv.org/abs/1912.08177.

12. A. Chaudhuri, B. Kramer and K. Willcox. *Information reuse for importance sampling in reliability-based design optimization.* Reliability Engineering & System Safety, Volume 201, p. 106853, 2020. https://doi.org/10.1016/j.ress.2020.106853. [**This work was mentioned in the AIAA Aerospace America Magazine read article**]

11. B. Kramer and K. Willcox. *Nonlinear model order reduction via lifting transformations and proper orthogonal decomposition.* AIAA Journal, 57:6, 2297–2307, 2019. https://doi.org/10.2514/1.J057791.

10. B. Kramer, B. Peherstorfer, A. Marques, U. Villa, K. Willcox. *Multifidelity probability estimation via fusion of estimators.* Journal of Computational Physics, 392: 385–402, 2019. https://doi.org/10.1016/j.jcp.2019.04.071; arxiv.org/abs/1905.02679

9. M. Heinkenschloss, B. Kramer, T. Takhtaganov, K. Willcox. *Conditional-Value-at-Risk estimation via Reduced-Order Models.* SIAM/ASA J. Uncertainty Quantification, 6(4), 1395–1423, 2018. https://doi.org/10.1137/17M1160069. [**top-20 downloaded SIAM JUQ paper over past 12 month, as of 08/21/2019**]

8. B. Peherstorfer, B. Kramer and K. Willcox. *Multifidelity preconditioning of the cross-entropy method for rare event simulation and failure probability estimation.* SIAM/ASA J. Uncertainty Quantification, 6(2), 737–761, 2018. https://doi.org/10.1137/17M1122992. [**top-20 downloaded SIAM JUQ paper over past 12 month, as of 06/19/2019**]

7. B. Kramer and A. Gorodetsky. *System identification via CUR-factored Hankel approximation.* SIAM J. Scientific Computing 40(2), pp. 848–866, 2018. https://doi.org/10.1137/17M1137632.

6. B. Kramer, B. Peherstorfer and K. Willcox. *Feedback control for systems with uncertain parameters using online-adaptive reduced models.* SIAM J. Appl. Dyn. Syst., 16(3), pp. 1563–1586, 2017. https:

//doi.org/10.1137/16M1088958.

5. B. Kramer, P. Grover, P. Boufounos, M. Benosman, S. Nabi. *Sparse sensing and DMD based identification of flow regimes and bifurcations in complex flows.* SIAM J. Appl. Dyn. Syst., 16(2), pp. 1164–1196, 2017. https://doi.org/10.1137/15M104565X.

4. M. Benosman, J. Borggaard, O. San and B. Kramer. *Learning-based Robust Stabilization for Reduced-Order Models of 2D and 3D Boussinesq Equations.* Applied Mathematical Modelling, Vol. 49, pp. 162–181, 2017. https://doi.org/10.1016/j.apm.2017.04.032.

3. B. Peherstorfer, B. Kramer and K. Willcox. *Combining multiple surrogate models to accelerate failure probability estimation with expensive high-fidelity models.* Journal of Computational Physics, 341:61-75, 2017. https://doi.org/10.1016/j.jcp.2017.04.012.

2. B. Kramer and J.R. Singler. *A POD projection method for large-scale algebraic Riccati equations.* Numerical Algebra, Control and Optimization, 6(4), pp. 413–435, 2016. https://doi.org/10.3934/naco.2016018.

1. B. Kramer and S. Gugercin. *Tangential interpolation-based eigensystem realization algorithm for MIMO systems.* Mathematical and Computer Modelling of Dynamical Systems, 22(4), pp. 282–306, 2016. https://doi.org/10.1080/13873954.2016.1198389.

REFEREED CONFERENCE PROCEEDINGS

* denotes supervised graduate student or Postdoc

15. N. Corbin*, B. Kramer, *Computing solutions to the polynomial-polynomial regulator problem*, 63rd IEEE Conference on Decision and Control (CDC), Milan, Italy, 2024, pp. 2689-2696, https://doi.org/10.1109/CDC56724.2024.10885897.

14. H. Sharma*, I. Adibnazari, J. Cervera Torralba, M.T. Tolley, B. Kramer, *Data-driven Model Reduction for Soft Robots via Lagrangian Operator Inference*, 26th International Symposium on Mathematical Theory of Networks and Systems (MTNS), appeared online at IFAC-PapersOnLine, Volume 58, Issue 17, pp. 91-96, 2024. https://doi.org/10.1016/j.ifacol.2024.10.119

13. H. Sharma*, I. Adibnazari, J. Cervera Torralba, M.T. Tolley, B. Kramer, *Preserving Lagrangian structure in data-driven reduced-order modeling or soft robots*, 20th Robotics Science and Systems (RSS) conference, Delft, July 2024.

12. N. Corbin*, B. Kramer, *Scalable Computation of H-infinity Energy Functions for Polynomial Drift Nonlinear Systems*, 2024 American Control Conference (ACC), pp. 2506-2511, 2024. https://doi.org/10.23919/ACC60939.2024.10644363

11. I. Adibnazari, H. Sharma*, J. Cervera Torralba, M.T. Tolley, B. Kramer, *Full-Body Optimal Control of a Swimming Soft Robot Enabled by Data-Driven Model Reduction*, 2023 Southern California Robotics (SCR) Symposium, September 14-15, 2023. (not refereed)

10. H. Sharma*, N. Galioto, A. Gorodetsky, B. Kramer, *Bayesian identification of nonseparable Hamiltonian systems using stochastic dynamic models*, 61st IEEE Conference on Decision and Control (CDC), Cancun, Mexico, 2022, pp. 6742-6749. https://doi.org/10.1109/CDC51059.2022.9992571

9. P. Jain*, S. A. McQuarrie, B. Kramer, *Performance comparison of data-driven reduced models for a single-injector combustion process.* AIAA Propulsion and Energy 2021 Forum, August 2021. https://doi.org/10.2514/6.2021-3633

8. A. Chaudhuri, B. Kramer, M. Norton. *Risk-based design optimization via probability of failure, conditional value-at-risk, and buffered probability of failure* AIAA SciTech 2020 Forum, January 2020. https://doi.org/10.2514/6.2020-2130.

7. R. Swischuk, B. Kramer, C. Huang, and K. Willcox. *Learning physics-based reduced-order models for a single-injector combustion process.* AIAA SciTech 2020 Forum, January 2020. https://doi.org/10.2514/6.2020-1411.

6. E. Qian, B. Kramer, A. N. Marques, K. E. Willcox. *Transform & Learn: A data-driven approach to nonlinear model reduction.* AIAA Aviation 2019 Forum, June 2019. https://doi.org/10.2514/6.2019-3707.

5. B. Kramer. *Solving algebraic Riccati equations via proper orthogonal decomposition.* 19th IFAC World

Congress, 2014. pp. 7767–7772. https://doi.org/10.3182/20140824-6-ZA-1003.02477. [Acceptance Rate 76%].

4. J.A. Burns and B. Kramer. *Full flux models for optimization and control of heat exchangers.* American Control Conference, 2015, pp. 577–582. https://doi.org/10.1109/ACC.2015.7170797. [Acceptance Rate 63%].

3. M. Benosman, B. Kramer, P. Grover, P. Boufounos. *Learning-based reduced-order model stabilization for partial differential equations: Application to the coupled Burgers' equation.* American Control Conference, 2016, pp. 1673–1678. https://doi.org/10.1109/ACC.2016.7525157. [Acceptance Rate 68%].

2. B. Kramer. *Model reduction for control of a multiphysics system: Coupled Burgers' equation.* American Control Conference, 2016, pp. 6146–6151. https://doi.org/10.1109/ACC.2016.7526635. [Acceptance Rate 68%].

1. M. Benosman, J. Borggaard and B. Kramer. *Robust POD model stabilization for the 3D Boussinesq equations based on Lyapunov theory and extremum seeking.* American Control Conference, 2017, pp. 1827–1832. https://doi.org/10.23919/ACC.2017.7963218. [Acceptance Rate 66%].

PATENTS

2. M. Benosman, P. Boufounos, B. Kramer, P. Grover, *System and Method for Controlling Operations of Air-Conditioning System.* US Patent 9976765B2, Filed Mar 6, 2015, granted May 22, 2018.

1. P. Boufounos, P. Grover, B. Kramer, M. Benosman, *System and Method for Controlling Operations of Air-Conditioning System.* US Patent 10145576B2, Filed May 18, 2015, granted December 4, 2018.

THESIS

1. B. Kramer, Model and Data Reduction for Control, Identification and Compressed Sensing. Ph.D. thesis, August 2015. Available at http://hdl.handle.net/10919/75179.

2. B. Kramer, Model Reduction of the Coupled Burgers Equation in Conservation Form. M.Sc. thesis, August 2011. Available at http://hdl.handle.net/10919/34791.

MEDIA COVERAGE & POPULAR WORKS

1. Speeding up Solar Wind Forecasts with Reduced-order Modeling, O. Issan, B. Kramer, Society of Industrial and Applied Mathematics (SIAM) Blog Post, 10 May 2023.

2. Identifiability and Sensitivity Analysis for Bayesian Parameter Estimation in Systems Biology, N. Linden, P. Rangamani, B. Kramer, Society of Industrial and Applied Mathematics (SIAM) Blog Post, 14 March 2023.

3. The Electoral Count Act is actually and engineering problem, B. Kramer, C. Truax, J. Carreon, The BULWARK, 27 September 2022

4. Solar storms can wreak havoc. We need better space weather forecasts. Science News, February 27, 2021. I was interviewed for this article, which also mentions our NSF grant 2028125.

5. Progress toward the 2030 vision of CFD (AIAA Aerospace America Magazine, 12/2020). This article mentions [12].

6. Mathematician, Engineer receive Newton Award for Transformative Ideas during COVID-19 Pandemic (UCSD News, 07/21/2020)

7. A Faster Way to Design Rockets: Scientific Machine Learning (Tech Briefs, 04/16/2020) This article mentions our work [13,15].

8. Scientific machine learning paves way for rapid rocket engine design (Science Daily, 04/16/2020). This article mentions our work [13,15].

9. Researchers advance probabilistic analysis for greater efficiency and safety (AIAA Aerospace America Magazine, 12/2019). This article mentions [12].

AWARDS and RECOGNITIONS

- **Invitee: National Academy of Engineering Future of Engineering workshop**, 2024.
- **Promotion to AIAA Senior Member**, 2022
- **NSF CAREER Award**, 2022.
- **DoD Newton Award 2020**, (13 out of 548 applicants were awarded)
- **SIAM Certificate of Recognition** for exceptional service to the Virginia Tech SIAM chapter, 2014.
- **Hatcher Foundation Fellowship** for summer term funding, Virginia Tech, 2011–2015.

FUNDING

14. **Department of Energy (DOE)**, Co-PI, *Center for Advancing the Radiation Resilience of Electronics*, NNSA PSAAP IV Program, 09/2025-09/2030.
13. **Department of Energy (DOE)**, Co-PI, *Center for Simulation & Design of Heterogeneous Architectures for Performance and Energy Absorption*, NNSA PSAAP IV Program, 09/2025-09/2030
12. **Defense Advanced Research Projects Agency (DARPA)**, Co-PI, *STORMLAP: Strong Turbulence and Rogue-Wave Modeling using Machine-Learning Assisted Predictions*, 03/2025-03/2026.
11. **Defense Advanced Research Projects Agency (DARPA)**, Co-PI, *Predictive Real-Time Intelligence for Metallic Endurance (PRIME)*, 02/2025-02/2027.
10. **Air Force Office of Scientific Research (AFOSR)**, Co-PI, *MURI: Mathematics of Digital Twins*, Co-PI, 09/2024-10/2029.
9. **Air Force Research Laboratory (AFRL)**, Co-PI, *ACCORD: AFRL–UCSD Collaborative Center for Optimal Risk-quantified and Robust Design of Aerospace Vehicles*, 12/08/2023-09/07/2029.
8. **Office of Naval Research**, Lead-PI, *Nonlinear Data-driven and Structure-Preserving Hamiltonian Model Reduction*, 08/01/2022–07/31/2025.
7. **National Science Foundation (NSF)**, Single PI, *CAREER: Goal-oriented Variable Transformations for Efficient Reduced-order and Data-driven Modeling*, 05/01/2022–04/30/2027.
6. **National Science Foundation (NSF)**, Co-PI, *Collaborative Research: Nonlinear Balancing: Reduced Models and Control*, 01/01/2022–12/31/2024.
5. **Korea Institute for Advancement of Technology & Korea Electronics Technology Institute**, Single PI, *Prediction, Damage Analysis and Risk Assessment for a Gas Power Plant via Fast and Accurate Reduced Models*, 12/01/2021–11/30/2024.
4. **Defense Advanced Research Projects Agency (DARPA)**, Single-PI, *Multifidelity Risk Assessment of High-Performance Systems*, 08/20/2021–08/19/2022.
3. **National Science Foundation (NSF)**, Co-PI, *SWQU: Composable Next Generation Software Framework for Space Weather Data Assimilation and Uncertainty Quantification*, 09/01/2020–08/31/2023.
2. **Department of Defense**, Newton Award for Transformative Ideas during the COVID-19 Pandemic, *Geometric Structure-Preserving Model Reduction for Large-Scale Interconnected Systems: Part II*, 08/17/2020–02/16/2021.
1. **National Science Foundation (NSF)**, Co-PI, *SBIR Phase I: Human-Centered, Augmented Intelligence Software for Water and Wastewater*, via Confluency LLC, Chicago, 07/01/2020–06/30/2021.

STUDENTS AND POSTDOCS

Postdocs

3. Dr. Yulin Guo, 01/2024-present
2. Dr. Dongjin Lee, 01/2022–08/2023 (now: Assistant Professor at Hanyang University, Korea)
1. Dr. Harsh Sharma, 08/2020–07/2025 (now: Assistant Professor, University of Wisconsin-Madison, US)

PhD Students

10. Shelby Pullen, 09/2025 - present
9. Justin Burzachiello, 01/2025 - present
8. Albani Olivieri, 09/2024 - present
7. Jaime Landeros, 09/2024 - present
6. Steven Nguyen, 09/2023 - present (co-advised with Prof. Jorge Cortes)

5. Dylan Hirsch, 09/2023 - present (co-advised with Prof. Sylvia Herbert)
4. Hyeonghun Kim, 09/2022-present
3. Nick Corbin, 09/2021-present
2. Opal Issan, 08/2021-present
1. Nate Linden-Santangeli, 09/2020-06/2025 (co-advised with Prof. Padmini Rangamani)

Master's students

4. Elle Lavichant (MAE), 09/2024 - 08/2025.
3. Liezl Maree (ECE), 2021. (Position after graduation: General Atomics.)
2. Parikshit Jain (MAE), 2021. (Position after graduation: NOVA Ltd.)
1. Yizhe Huang (CSE), 2020. Thesis: Model Reduction and Iterative LQR for Control of High-Dimensional Nonlinear Systems. (Position after graduation: PhD student at UT Austin.)

Undergraduate students

12. Rachel McClow (MAE), 07–09/2025
11. Anique Dittrich (MAE), 05–09/2024
10. Juan Diego Draxl-Giannoni (MAE & Physics), 09/2023–08/2024
9. Elle Lavichant (MAE), 06/2023–08/2024
8. Emily Deboer (MAE), 06–09/2023
7. Jason Stanley (CS), 10/2022–05/2023
6. Luis Angel Rojas Mercado (ENLACE student from Mexico), 06–08/2022
5. Alberto Javier Ojeda Gutiérrez (ENLACE student from Mexico), 06–08/2022
4. Hannah Haider (MAE), 06–08/2023
3. Antoinette Gautier (MAE), 06–09/2022
2. Brenden Volker (MAE), 04–08/2021
1. Justin Burzachiello (UC STARS student from UC Riverside), 06–08/2021

TEACHING & MENTORING

University of California San Diego, Department of Mechanical and Aerospace Engineering
- MAE 274: Model Reduction (PhD level), Spring 2020 (virtual), Spring 2022, Winter 2025, [new course]
- MAE 279: Uncertainty Quantification (PhD level), Spring 2021 (virtual), Spring 2023, [new course]
- MAE 280A: Linear Systems (PhD level), Fall 2025
- MAE 290A: Numerical Methods for Linear Algebra (PhD level), Fall 2020 (virtual), Fall 2021 & 2022
- MAE 143A: Signals & Systems (3rd-year UG), Winter 2020, Winter 2021 (virtual), Winter 2022 (hybrid), Fall 2022, Winter 2024, Winter 2025.
- MAE 143B: Linear Control (undergraduate): Spring 2025

Virginia Tech, Department of Mathematics
- MATH 2214: Introduction to Differential Equations, Spring 2014 (primary instructor)
- MATH 1205: Calculus I—Differential Calculus, Fall 2013 (primary instructor)
- MATH 1224: Vector Geometry, Spring 2012 (recitation leader)

Virginia Tech, Graduate-Undergraduate Mentoring Program
- Introduced undergraduate students to life in graduate school through regular meetings and shadowing
- Helped with and discussed academic career choices and raised interest in graduate school

University of California San Diego: Academic Community for Engineering Success (ACES)
- As an ACES mentor, I support students from economically and educationally underserved backgrounds, and we focus on enhancing student success in their chosen engineering major through admission to the Summer Engineering Institute, faculty mentorship, a collaborative peer support community, and additional academic enrichment.

Society for Industrial and Applied Mathematics (SIAM) Mentor-Protégé Program
- Mentored CSE students as part of Broader Engagement Program at SIAM CSE 2017, 2019, 2021
- Held one-on-one discussions about career opportunities and graduate school

University of California San Diego: ENLACE bi-national summer research program
- Goal: to encourage the participation of high school and university students in research in the sciences and engineering, while promoting cross-border friendships between Latin America and the United States.
- Supervised two students in my research lab in summer 2022.

University of California San Diego: PATHways to STEM (PATHS)
- Goal: to foster excellence in Science, Technology, Engineering, and Mathematics (STEM) through Enhanced Access and Mentorship
- Mentoring an Aerospace Engineering student, 2023-present

INVITED TALKS

Invited Keynotes
2. *Keynote speaker*: 9th Thermal and Fluids Engineering Conference of the American Society of Thermal and Fluids Engineers (ASTFE), Corvallis, Oregon, April 21-24, 2024.
1. *Semi-plenary speaker*: Model Reduction and Surrogate Modeling (MORE), Berlin, Sept. 2022.

Invited Panel Discussions
2. SIAM Conference on Computational Science and Engineering ($\approx$2,000 participants), Panel on "Future Directions in Computational Science and Engineering", March 2025.
1. American Nuclear Society Winter Meeting, Panel "Contemporary Reduced-Order Modeling Applications in Nuclear Science and Engineering", November 2020.

Invited Talks in Industry
5. ASML San Diego, March 24, 2022.
4. ASML San Diego, October 6, 2020.
3. Boeing Commercial Airplanes (Optimization Technical Excellence Center), virtual, August 17, 2020.
2. Hughes Research Lab (HRL), Malibu, CA, virtual, July 21, 2020.
1. Boeing Commercial Airplanes (Applied Mathematics Group), virtual, July 7, 2020.

Invited Talks at National Laboratories
3. Lawrence Livermore National Laboratories, Data-driven Physical Simulation (DDPS) Webinar (virtual), January 26, 2024.
2. Sandia National Laboratories, Uncertainty Quantification talk series (virtual), November 15, 2021.
1. Sandia National Laboratories, Livermore, CA, March 15, 2017.

Invited Seminar Talks
30. University of Washington, Data-driven Science and Engineering Seminar, November 11, 2025.
29. Karlsruhe Institute of Technology (KIT), CRC Seminar in Wave Phenomena, July 4, 2024.
28. University of Stuttgart, Institute of Engineering and Computational Mechanics Seminar, July 2, 2024.
27. Technical University of Darmstadt, Institute for Nano- and Microfluidics Seminar, July 1, 2024.
26. Louisiana State University, Control and Optimization Seminar, April 1, 2024.
25. Courant Institute of Mathematical Sciences, NYU, Computational Mathematics and Scientific Computing Seminar, September 15, 2023.
24. University of Michigan, Space Weather Simulation Summer (SWSS) school, Lecturer, Aug 2, 2023.
23. Georgia Tech, School of Aerospace Engineering Seminar Series, March 30, 2023.
22. Oregon State University, School of Nuclear Science & Engineering Seminar Series, February 1, 2023.
21. Ecole Polytechnique, Computer Science Laboratory, Paris, December 11-15, 2022.
20. University of Stuttgart (Germany), SimTech Seminar on Model Reduction and Data Techniques for Surrogate Modeling, December 08, 2022.
19. Virginia Tech, Mathematics Colloquium, October 14, 2022.
18. Stanford University, Fluid Mechanics seminar series, January 18, 2022.
17. University of Konstanz, Numerical Optimization seminar (virtual), Germany, January 11, 2022.
16. New York University, Kolchin Seminar in Differential Algebra, November 16, 2018.
15. MIT, Aerospace Computational Design Lab seminar, Cambridge, MA, November 9, 2018.
14. University of Washington, Department of Mechanical Engineering Colloquium, Seattle, WA, November 6, 2018.

13. Tufts University, Computational and Applied Math Seminar, Boston, MA, April 23, 2018.
12. MIT, Aerospace Computational Design Lab seminar, Cambridge, MA, March 2, 2018.
11. Dartmouth College, Department of Mathematics, Hanover, NH, February 3, 2018.
10. Johannes Gutenberg Universität Mainz, Department of Mathematics, Germany, November 21, 2017.
 9. MIT, Aerospace Computational Design Lab seminar, Cambridge, MA, May 12, 2017.
 8. Cornell University, Sibley School of Mechanical and Aerospace Engineering, April 18, 2017.
 7. Virginia Tech, Department of Mathematics Colloquium, Blacksburg, VA, March 17, 2017.
 6. University of Massachusetts Dartmouth, Computational Science Seminar, February 15, 2017.
 5. MIT, Aerospace Computational Design Lab seminar, Cambridge, MA, February 19, 2016.
 4. University of Konstanz, Germany, Department of Mathematics, July 13, 2015.
 3. Rice University, Department of Computational and Applied Mathematics (SIAM student seminar), Houston, March 12, 2014
 2. University of Missouri Science & Technology, Department of Mathematics, Rolla, January 15, 2014.
 1. Fraunhofer ITWM, Kaiserslautern, Germany, October 24, 2011.

Invited Conference Talks

67. *Nonlinear control and balanced truncation model reduction for high-dimensional systems*, workshop "Mathematical and Computational Foundations of Digital Twins", Centre International de Rencontres Mathématiques (CIRM), Luminy, France, August 11-15, 2025.
66. *Towards controllable and observable reduced-order models for digital twins*, SIAM Annual Meeting (AN25), Montreal, Canada, July 28-August 1, 2025.
65. *Data-driven reduced-order models for control of soft robots*, SIAM Conference on Control and Its Applications (CT25), Montreal, Canada, July 28-30, 2025.
64. *The polynomial-polynomial regulator for high dimensional nonlinear control*, 16th Viennese Conference on Optimal Control and Dynamic Games. Vienna, Austria, July 15-18, 2025.
63. *Optimization under uncertainty for efficient laser powder-bed fusion manufacturing*, 6th International Conference on Uncertainty Quantification in Computational Science and Engineering (UNCECOMP), Rhodes, Greece, June 15-18, 2025.
62. *Nonlinear balanced truncation model reduction in high dimensions*, SIAM Conference on Computational Science and Engineering, March 3-7, 2025.
61. *Structure-Preserving Learning of High-Dimensional Lagrangian and Hamiltonian Systems*, ICERM workshop Computational Learning for Model Reduction, January 6-10, 2025.
60. Nonlinear balanced truncation, Mini-Workshop on Data-driven Modeling, Analysis, and Control of Dynamical Systems at the Mathematisches Forschungsinstitut Oberwolfach, December 8-13, 2024.
59. *Discovering Quadratic Representations of PDEs*, AAAI Fall Symposium on Integrated Approaches to Computational Scientific Discovery (Arlington, VA), November 7-9, 2024.
58. *Scalable computations for nonlinear balanced truncation model reduction*, 60th Annual Allerton Conference on Communication, Control, and Computing, University of Illinois at Urbana-Champaign, September 25-27, 2024.
57. *Structure-preserving learning of high-dimensional Lagrangian systems*, 2nd International AMS-UMI Joint Meeting, Universita degli Studi di Palermo, 25 July 2024.
56. *Multifidelity risk assessment for nonlinear systems under high-dimensional dependent random variables*, SIAM Conference on Uncertainty Quantification, Trieste, Italy, 29 February 2024.
55. *Symplectic model reduction of Hamiltonian systems using data-driven quadratic manifolds*, 10th International Congress on Industrial and Applied Mathematics, Tokyo, JP, August 25, 2023.
54. *Scalable computations for nonlinear balanced truncation model reduction*, SIAM Conference on Control and Its Applications, Philadelphia, PA, 24-26 July 2023.
53. *Learning exact and optimal quadratic forms for nonlinear non-autonomous ODEs*, AAAI Spring Symposium on Computational Approaches to Scientific Discovery, 28 March 2023.
52. *Predicting Solar Wind Streams from the Inner-Heliosphere to Earth via Shifted Operator Inference*, SIAM Conference on Computational Science and Engineering, Feb 26-Mar 3, 2023.
51. *Nonlinear balanced truncation model reduction for control*, Isaac Newton Institute for Mathematical Sciences Programme on: The mathematical and statistical foundation of future data-driven engineering, Cambride, UK, February 22, 2023.
50. *Hamiltonian Operator Inference: Physics-preserving learning of reduced-order models for Hamiltonian systems*, SIAM Conference on Methods of Data Science, San Diego, CA, September 26-30, 2022.

49. *Hamiltonian Operator Inference: Physics-preserving learning of reduced-order models for Hamiltonian systems*, 15th World Congress on Computational Mechanics (WCCM), Yokohama, JP (virtual), July 31-August 5, 2022.

48. *Learning low-dimensional dynamical systems operators for advection-dominated solar wind models*, Solar Heliospheric and INterplanetary Environment (SHINE) conference, Honolulu, Hawaii, June 27 - July 1, 2022.

47. *Learning low-dimensional dynamical systems operators for advection-dominated solar wind models* Geospace Environment Modeling, Honolulu, Hawaii, June 19-26, 2022

46. *Learning reduced-order models via structure-preserving operator inference*, ICAM Conference on Applied and Computational Mathematics, Blacksburg, Virginia, June 1–3, 2022

45. *Shifted operator inference for data-driven modeling of solar winds*, SIAM Conference on Uncertainty Quantification, Atlanta, April 12-15, 2022

44. *Computing stability radii for data-driven nonlinear models.* IACM Conference on Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering, & Technology [link], September 26–29, 2021, San Diego, CA.

43. *Performance comparison of data-driven reduced models for a single-injector combustion process.* AIAA Propulsion and Energy Forum (virtual), August 9–11, 2021.

42. *Balanced truncation model reduction via nonlinear energy functions.* SIAM Conference on Control and Its Applications (virtual), July 19-21, 2021.

41. *Adaptive Reduced-Order Model Construction for Conditional Value-at-Risk Estimation.* 4th International Conference on Uncertainty Quantification in Computational Sciences and Engineering (UNCECOMP21), virtual, June 28–30, 2021.

40. *Balanced reduced-order models for iterative nonlinear control of large-scale systems.* American Control Conference (virtual), May 25–28, 2021.

39. *Stability domains for quadratic-bilinear systems.* SIAM conference on Computational Science and Engineering (virtual), March 1–5, 2021.

38. *Learning physics-based reduced-order models for combustion applications.* Center for Extreme Events Research (CEER) virtual research summit, San Diego, November 20, 2020.

37. *Operator inference for non-polynomial systems and control applications.* ICERM Workshop on Mathematics of Reduced Order Models, Brown University, RI, Feb 17–21, 2020.

36. *LQR control for systems with uncertain parameters via online-adaptive reduced models.* Workshop on Feedback Control, Johann-Radon Institute for Computational and Applied Mathematics (RICAM), JKU Linz, Austria, November 29, 2019.

35. *Reduced-order models for risk measure estimation in robust design.* ENUMATH 2019, Egmond aan Zee, Netherlands, October 3, 2019.

34. *Lifting transformations and model reduction.* ENUMATH 2019, Egmond aan Zee, Netherlands, September 30, 2019.

33. *Multifidelity estimation of risk measures in robust design.* 15th U.S. National Congress on Computational Mechanics, Austin, TX, July 30, 2019.

32. *Conditional-Value-at-Risk estimation via reduced-order models.* East Coast Optimization Meeting (ECOM) 2019; George Mason University, April 4, 2019.

31. *Lifting nonlinear systems: More structure, more opportunities for ROM?* SIAM conference on Computational Science and Engineering; Spokane, February 26, 2019.

30. *Stabilization of reduced-order flow models through learning-based closure modeling.* World Congress of Computational Mechanics (WCCM), New York City, July 27, 2018.

29. *Lifting nonlinear systems: More structure, more opportunities for ROM?* Data to Decisions: Computational Methods for Design of Next-Generation Engineered Systems Workshop, Singapore, May 31, 2018.

28. *Conditional-value-at-risk estimation with reduced-order models.* MoRePaS IV conference (Model Reduction of Paramatrized Systems); Nantes, France, April 10, 2018.

27. *Conditional-value-at-risk estimation with reduced-order models.* Isaac Newton Workshop on Reducing Dimensions and Cost for UQ in Complex Systems; Cambridge, UK, March 7, 2018.

26. *Data-driven reduced-order models for control of PDEs with uncertain parameters.* SIAM conference on Control and Its Applications; Pittsburgh, July 10, 2017.

25. *Stabilization of reduced-order flow models through learning-based closure modeling.* Conference on Clas-

       sical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation; Virginia Tech, Blacksburg, June 25, 2017.

24. *Data-driven model reduction via CUR-factored Hankel approximation.* SIAM conference on Optimization; Vancouver, Canada, May 23, 2017.

23. *Multifidelity failure probability estimation in combustion modeling.* 16th International Conference on Numerical Combustion; Orlando, April 3, 2017.

22. *Multifidelity computation of failure probabilities for systems with uncertain parameters.* SIAM conference on Computational Science and Engineering; Atlanta, March 2, 2017.

21. *Data-driven modeling for control of systems with time-varying and uncertain parameters.* Workshop on Data-Driven Methods for Reduced-Order Modeling and Stochastic Partial Differential Equations; Banff International Research Station, Canada, January 29–February 3, 2017.

20. *Reduced-order models from data: Eigensystem realization algorithm and CUR-factorization.* Conference on Recent Developments in Numerical Methods for Model Reduction; Paris, France, November 9, 2016.

19. *Control for systems with uncertain parameters through reduced-order models.* SIAM Annual Meeting; Boston, July 15, 2016.

18. *Model reduction for control of a multiphysics system: coupled Burgers' equation.* American Control Conference; Boston, July 8, 2016.

17. *Control for systems with uncertain parameters through data-driven models.* Workshop on Data to Decisions in Aerospace Engineering; University of Auckland, New Zealand, April 19, 2016.

16. *System identification and model reduction for MIMO systems via the Eigensystem Realization Algorithm.* Data-driven model order reduction and machine learning conference, Stuttgart, Germany, March 31, 2016.

15. *Detection of parameter-dependent regimes in complex flows via compressed sensing and dynamic mode decomposition.* Model Reduction of Parametrized Systems (MoRePaS); Trieste, Italy, Oct. 13–16, 2015.

14. *On POD and Krylov methods for solution of algebraic Riccati equations.* SIAM Control and its Applications; Paris, July 8–10, 2015.

13. *Full flux models for optimization and control of heat exchangers.* American Control Conference; Chicago, July 1–3, 2015.

12. *Tangential interpolation framework for MIMO eigensystem realization* (Poster). SIAM Computational Science and Engineering; Salt Lake City, March 14–18, 2015.

11. *Solving algebraic Riccati equations via proper orthogonal decomposition.* IFAC World Congress; Cape Town, August 24–29, 2014.

10. *A Proper orthogonal decomposition based method for solving algebraic Riccati equations.* SIAM Annual Meeting; Chicago, July 7–11, 2014.

9. *Tangential interpolation for data-driven model reduction by the eigensystem realization algorithm.* VT SIAM Student Conference; Virginia Tech, March 8, 2014.

8. *Convergence of low-order Riccati solutions.* 3rd International Summer School on Numerical Linear Algebra; Shanghai, August 2, 2013.

7. *Parameter sensitivity of POD-based reduced-order controllers.* SIAM Southeastern Atlantic Section Meeting; University of Tennessee, March 23–24, 2013.

6. *LQR optimal control for a thermal-fluid dynamics* (Poster). SIAM Computational Science and Engineering; Boston, February 25–March 1, 2013.

5. *Optimal and suboptimal LQR control for a coupled Burgers' equation.* Southeastern Atlantic Regional Conference on Differential Equations; Wake Forest University, October 19–20, 2012.

4. *Control of a coupled Burgers' equation using POD* (Poster). Workshop on Adaptivity and Model Order Reduction in PDE Constrained Optimization; Hamburg, July 23–27, 2012.

3. *POD study for a coupled Burgers' equation* (Poster). SIAM Annual Meeting; Minneapolis, July 9–13, 2012.

2. *A POD manual for a coupled Burgers' equation.* SIAM Student Conference (Johnfest); Virginia Tech, March 3, 2012.

1. *POD-based model reduction.* SIAM Student Chapter at Virginia Tech; February 14, 2012.

WORKSHOPS & COLLABORATIVE VISITS

20. Department of Mathematics, Virginia Tech, Prof. Jeff Borggaard, June 23 - 26, 2025.

19. Mathematisches Forschungsinstitut Oberwolfach, Mini-Workshop Data-driven Modeling, Analysis, and Control of Dynamical Systems, December 8-13, 2024.
18. Department of Mathematics, Virginia Tech, Prof. Jeff Borggaard and Serkan Gugercin, June 28 - July 31, 2023.
17. Isaac Newton Institute semester program on "The mathematical and statistical foundation of future data-driven engineering", invited participant and speaker, February 5 – 26, 2023.
16. Ecole Polytechnique, Computer Science Laboratory, Paris, Prof. Gleb Pogudin, December 11-15, 2022
15. ICERM Spring 2020 Reunion Event, Brown University, May 23 - June 10, 2022.
14. Oden Institute for Computational Engineering and Sciences, University of Texas at Austin, Prof. Karen Willcox, July 25–August 1, 2019.
13. Oden Institute for Computational Engineering and Sciences, University of Texas at Austin, Prof. Karen Willcox, March 4–8, 2019.
12. Department of Computational and Applied Mathematics (CAAM), Rice University, Houston, Prof. Matthias Heinkenschloss, October 9–13, 2017.
11. Department of Aerospace Engineering at the University of Michigan, Prof. Karthik Duraisamy, March 30–31, 2017.
10. Department of Computational and Applied Mathematics (CAAM), Rice University, Houston, Prof. Matthias Heinkenschloss, January 16–20, 2017.
9. Institute for Computational Engineering and Sciences, University of Texas at Austin, Prof. Karen Willcox August 2–5, 2016.
8. Rocky Mountain Summer Workshop on Uncertainty Quantification, CU Denver, July 15–17, 2015.
7. IMA Special Workshop: Careers and Opportunities in Industry for Mathematical Scientists, Minneapolis, April 7–9, 2014.
6. Department of Computational and Applied Mathematics (CAAM) at Rice University, Houston, March 10–12, 2014.
5. University of Missouri Science & Technology, Prof. John Singler, January 9–16, 2014.
4. Science in Finance Workshop, D-fine GmbH, Kronberg, Germany, November 13–15, 2013.
3. SIAM Gene Golub Summer School on Matrix Functions and Matrix Equations, Shanghai, July 22–August 9, 2013.
2. Workshop on Adaptivity and Model Order Reduction in PDE Constrained Optimization, Hamburg, July 23–27, 2012.
1. Workshop on Future Directions in Applied Mathematics, Raleigh, March 10–11, 2011.

PROFESSIONAL SOCIETIES

- Society for Industrial and Applied Mathematics (SIAM), Member, 2011–present
- American Institute of Aeronautics and Astronautics (AIAA), Senior Member, 2019–present
- German Academic International Network (GAIN), 2014–present
- American Mathematical Society (AMS), 2010-2015
- Deutscher Hochschul Verband (DHV), 2017-2020

PROFESSIONAL SERVICE

Editorial Service
- Structural and Multidisciplinary Optimization, Guest Editor, 2025
- Advances in Computational Mathematics, Guest Editor, 2025
- SIAM Journal on Uncertainty Quantification, Associate Editor, Jan 2023-present
- American Control Conference, Guest Editor, 2016-17

Professional Committees
- AIAA Committee on Non-Deterministic Approaches (NDA), Member 2021-present. Education subcommittee chair, 2021-2022
- AIAA Committee on Multidisciplinary Design Optimization, Member, 2021

Journal Paper Referee   ACM Transaction on Mathematical Software (TOMS); AIAA Journal; Automatica; Advances in Computational Mathematics (ACOM); Computer Methods in Applied Mechanics and Engineering (CMAME); Entropy; Fluids; International Journal for Numerical Methods in Engineering (IJNME); International Journal of Computer Mathematics; IEEE Transactions of Automatic Control (TAC); IEEE Control Systems Letters (L-CSS); Journal of Computational Physics (JCP); Journal of Computational Dynamics (JCD); Journal of Nonlinear Science; Mathematical Methods in the Applied Sciences; Mathematics; Mathematics of Control, Signals, and Systems (MCSS); Mechanical Systems and Signal Processing; Nature Communications; Nature Computational Science; Nonlinear Dynamics (NoDy); Numerical Methods in Biomedical Engineering; Numerical Mathematics Theory, Methods, and Applications; Physica D: Nonlinear Phenomena; Proceedings of the Royal Society A; Proceedings of the National Academy of Sciences (PNAS), Reliability Analysis & System Safety (RESS); SIAM Journal on Matrix Analysis and Applications (SIMAX); SIAM Journal on Numerical Analysis (SINUM); SIAM Journal on Scientific Computing (SISC); SIAM Journal on Uncertainty Quantification (SIAM-JUQ); SIAM Journal on Methods for Data Science (SIMODS); Structural and Multidisciplinary Optimization (SMO); Space Weather; Systems & Control Letters (SCL); The Aeronautical Journal

Conference Paper Referee
- AIAA SciTech Forum 2022, 2023, 2024, 2025, 2026 (paper reviewer; student paper competition reviewer)
- American Control Conference (ACC): 2015, 2016, 2017, 2018, 2022, 2025
- Model Order Reduction and Surrogate Modeling (MORE) abstract reviewer, 2024
- Conference on Decision and Control (CDC): 2016, 2017, 2018, 2022
- International Symposium on Mathematical Theory of Networks and Systems, 2022
- European Control Conference (ECC): 2016

Conference Organization
10. Organizing committee (Local Arrangements Chair), 2026 IEEE Conference on Decision and Control (CDC), Hawaii, December 15-19, 2026.
9. Program committee, SIAM Conference on Control and Its Applications (SIAM CT), Montreal, Canada, July 28-30, 2025.
8. Organizing committee, SIAM Conference on Computational Science and Engineering, Fort Worth, TX, March 2-7, 2025.
7. Co-organizer, "Advances in Digital Twins" workshop at Stanford University, February 24-25, 2025.
6. Main local organizer. "Model Reduction and Surrogate Modeling (MORE) 2024", San Diego, CA, Sept 9-13, 2022.
5. Organizer, Southern California Applied Mathematics Symposium, April 2024, UCSD.
4. Co-organizer, "Conference and Workshop: Nonlinear model reduction for control", Blacksburg, VA, May 22- 26, 2023.
3. Organizing committee, SIAM Conference on Control and Its Applications (SIAM CT), July 24-26, 2023.
2. Scientific committee, Model Reduction and Surrogate Modeling (MORE) 2022, Berlin, Germany [link]
1. Local organizing committee, IACM Conference on *Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering,* & Technology [link], September 26–29, 2021, San Diego, CA.

Minisymposia Organization at Major Conferences
19. SIAM Computational Science and Engineering, Forth Worth, TX, March 3-7, 2025; *Mathematics of Digital Twins*, Co-organized with Prof. Dongbin Xiu (Ohio State) and Prof. Daniel Tartakovsky (Stanford)
18. SIAM Computational Science and Engineering, Forth Worth, TX, March 3-7, 2025; *Structure-preserving Model Order Reduction for Large-scale Systems*, Co-organized with Prof. Cecilia Pagliantini (Pisa) and Anthony Gruber (Sandia National Laboratories)
17. Unione Matematica Italiana – American Mathematical Society Joint Meeting, Palermo, Italy, July 23-26, 2024, *Exploiting low-rank structures for the solution of PDEs*. Co-organized with Professor Alessandro Alla (Sapienza Universita di Roma)
16. SIAM Conference on Uncertainty Quantification, Trieste, Italy, February 27-March 1, 2024, *Mitigating parametric and model uncertainty in systems biology*. Co-organized with PhD student Nate Linden, Prof. Padmini Rangamani, and Prof. Daniele Schiavazzi (Purdue)
15. 10th International Congress on Industrial and Applied Mathematics (ICIAM), August 20-25, 2023, Tokyo, Japan, *Space Weather: Modeling, Surrogates and Uncertainty Quantification.* Co-organized with

Professor Enrico Camporeale (CU Boulder and NOAA)

14. 10th International Congress on Industrial and Applied Mathematics (ICIAM), August 20-25, 2023, Tokyo, Japan, *Learning dynamical systems by preserving symmetries, energies, and variational principles.* Co-organized with Professor Yuto Miyatake (Osaka University)

13. SIAM Conference on Control and Its Applications, July 26-28, Philadelphia, PA, *Nonlinear model reduction for control applications.* Co-organized with Professors Serkan Gugercin and Jeff Borggaard (Virginia Tech)

12. SIAM Computational Science and Engineering, Amsterdam, The Netherlands, February 26 – March 3, 2023, *Exact polynomialization and Quadratization of nonlinear dynamics.* Co-organized with Professor Gleb Pogudin (Ecole Polytechnique, Paris)

11. SIAM Computational Science and Engineering, Amsterdam, The Netherlands, February 26 – March 3, 2023, *Structure-preserving model reduction for Lagrangian and Hamiltonian systems.* Co-organized with Professor Silke Glas (University of Twente) and Dr. Harsh Sharma (UCSD)

10. SIAM Methods of Data Science (MDS),San Diego, CA, Sept 26-30, 2022, *Learning dynamical systems by preserving symmetries, energies, and variational principles*, Co-organized with Professor Christine Allen-Blanchette (Princeton)

9. 15th World Congress on Computational Mechanics (WCCM), (virtual), July 31 - August 5, 2022. *Structure-preserving model reduction for nonlinear systems.* Co-organized with Prof. Yuto Miyatake.

8. SIAM Conference on Uncertainty Quantification, hybrid, *Uncertainty quantification and data assimilation for space weather applications.* Co-organized with Professor Rebecca Morrison (CU Boulder).

7. IACM Conference on *Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering*, & Technology [link], September 26–29, 2021, San Diego, CA. Organizing a MS on *Data-driven reduced-order methods for system control* with Wayne Uy and Benjamin Peherstorfer (NYU Courant Institute). I am also on the local organizing committee.

6. SIAM Conference on Control and Its Applications (CT21), virtual, *Model Reduction for Control of High-Dimensional Nonlinear Systems.* Co-organized with Profs. Serkan Gugercin and Jeff Borggaard (Virginia Tech).

5. SIAM Conference on Computational Science and Engineering (CSE21), virtual, *Structure-preserving model reduction for large-scale systems.* Co-organized with Prof. Volker Mehrmann (TU Berlin).

4. SIAM Conference on Computational Science and Engineering (CSE19), Spokane, WA. *Data-augmented reduced-order modeling: operator learning and closure/error modeling.* Co-organized with Dr. Kevin Carlberg (Sandia National Labs).

3. 16th International Conference on Numerical Combustion, Orlando, FL. *Uncertainty quantification and model inadequacy in combustion simulations.* Co-organized with Dr. Todd Oliver (ICES, UT Austin).

2. SIAM Conference on Computational Science and Engineering (CSE17), Atlanta, GA. *Model Order Reduction: Perspectives from Junior Researchers.* Co-organized with Dr. Alessandro Alla (FSU).

1. SIAM Annual Meeting (AN16), Boston, MA. *Data-based methods towards optimal control of complex systems.* Co-organized with Dr. Joshua Proctor (Institute for Disease Modeling).

SIAM Student Chapter at Virginia Tech President, 2013–2014 and VP for Research, 2012–2013
- Initiated new activities: First poster session and first industrial conference
- Organized biweekly talks with invited faculty and graduate student speakers
- Assisted in planning student conference at VT with 20 speakers and posters

OUTREACH

Science Fairs: Partnering with UCSD Center for Research on Education, Assessment and Teaching Excellence (CREATE)
- UC San Diego CREATE is a university-housed research center committed to supporting K-20 education among all San Diego students and teachers.
- We designed, organized, and hosted science booth offerings at the themed "Space Research at UCSDttogether with the MAE undergraduate clubs RPL, SEDS at the following venues:
    8. Barrio Logan Science and Art Expo, April 16, 2022.
    7. San Diego Air & Space Museum's 17th Annual Space Day, May 21, 2022.

6. Southeast San Diego Science & Art Expo, August 13, 2022.
5. Comienza con un Sueno/It Begins with a Dream, UCSD Campus, March 4, 2023.
4. Barrio Logan Science and Art Expo, April 15, 2023.
3. Southeast San Diego Science & Art Expo, August 12, 2023.
2. Barrio Logan Science and Art Expo, April 12, 2024.
1. Barrio Logan Science and Art Expo, April 14, 2025.

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