

CURRICULUM VITAE: SHANE A. MCQUARRIE

Assistant Professor, Department of Mathematics, Brigham Young University

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EDUCATION

PhD Computational Science, Engineering, and Mathematics 2023

Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin
Data-driven parametric reduced-order models: Operator inference for reactive flow applications
Committee: Karen Willcox (Chair), Rachel Ward, Omar Ghattas, Robert Moser, Max Gunzburger

MS Computational Science, Engineering, and Mathematics 2020

Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin

MS Mathematics 2018

Department of Mathematics, Brigham Young University
Data assimilation in the Boussinesq approximation for mantle convection
Committee: Jared Whitehead (Chair), Emily Evans, Mark Allen

BS Mathematics (Applied and Computational Mathematics Emphasis) *magna cum laude* 2016

Department of Mathematics, Brigham Young University
Minors in Computer Science and Music

APPOINTMENTS

Assistant Professor 2025–present
Department of Mathematics, Brigham Young University

John von Neumann Postdoctoral Fellow in Computational Science 2023–2025
Department of Scientific Machine Learning, Sandia National Laboratories
Mentor: Bart van Bloemen Waanders

TEACHING (BYU)

Instructor

- Math 213: Elementary Linear Algebra Fall 2025
- Math 215: Computational Linear Algebra Fall 2025

Laboratory Instructor

- Math 405: Modeling with Uncertainty and Data 2 Laboratory Winter 2018
- Math 403: Modeling with Uncertainty and Data 1 Laboratory Fall 2017
- Math 323: Algorithm Design and Optimization 2 Laboratory Winter 2016
- Math 321: Algorithm Design and Optimization 1 Laboratory Fall 2015

Graduate Teaching Assistant

- Math 404: Modeling with Uncertainty and Data 2 Winter 2017
- Math 402: Modeling with Uncertainty and Data 1 Fall 2016

MENTORSHIP

CSEM Student Forum Organizer

2020–2023

Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin

Directed Reading Program Graduate Mentor

Department of Mathematics, The University of Texas at Austin. Mentored students:

- Angela Cao, *Titanic survival estimation via naïve Bayes and K-means in image clustering* 2020
- Ashwin Devaraj, *An introduction to complexity theory: P, NP, and reductions* Spring 2019
- Benjamin Maccini, *Matching networks for one-shot learning* Spring 2019
- Connor Brubaker, *An introduction to machine learning in practice* Fall 2018

PROFESSIONAL SERVICE

Conference Mini-symposia Organizer

- *Decision making for coupled systems.*
SIAM Conference on Computational Science and Engineering, Fort Worth, TX, 3–4 March 2025.
- *Data-driven and nonlinear model reduction methods for physical sciences and engineering.*
SIAM TX/LA Sectional, Houston, TX, 5 November 2022.

Journal Referee

- Journal of Scientific Computing
- SIAM Journal on Scientific Computing
- Journal of Mathematical Fluid Mechanics
- Journal of Computational Physics

AWARDS AND HONORS

SIAM SEAS Student Awards, First Place

2023

SIAM Southeastern Atlantic Section Annual Meeting

BGCE Student Paper Prize Winner

2023

ENB Elite Bavarian Graduate School of Computational Engineering
SIAM Conference on Computational Science and Engineering

BGCE Student Paper Prize Finalist

2021

ENB Elite Bavarian Graduate School of Computational Engineering
SIAM Conference on Computational Science and Engineering

CSEM Graduate Student Fellowship

2018

Oden Institute for Computational Engineering and Sciences

Thomas S. Monson Scholarship

2010

Brigham Young University

PUBLICATIONS

IN REVIEW

16. A. N. DIAZ, S. A. MCQUARRIE, J. T. TENCER, AND P. J. BLONIGAN, *Interpretable and flexible non-intrusive reduced-order models using reproducing kernel Hilbert spaces*, 2025, <https://arxiv.org/abs/2506.10224>
15. A. VIJAYWARGIYA, S. A. MCQUARRIE, AND A. GRUBER, *Tensor parametric Hamiltonian operator inference*, 2025, <https://arxiv.org/abs/2502.10888>

JOURNAL ARTICLES

14. S. A. MCQUARRIE, A. CHAUDHURI, K. E. WILLCOX, AND M. GUO, *Bayesian learning with Gaussian processes for low-dimensional representations of time-dependent nonlinear systems*, *Physica D: Nonlinear Phenomena*, 475 (2025), p. 134572, <https://doi.org/10.1016/j.physd.2025.134572>
13. S. A. MCQUARRIE, P. KHODABAKHSHI, AND K. E. WILLCOX, *Non-intrusive reduced-order models for parametric partial differential equations via data-driven operator inference*, *SIAM Journal on Scientific Computing*, 45 (2023), pp. A1917–a1946, <https://doi.org/10.1137/21m1452810>
12. M. GUO, S. A. MCQUARRIE, AND K. E. WILLCOX, *Bayesian operator inference for data-driven reduced-order modeling*, *Computer Methods in Applied Mechanics and Engineering*, 402 (2022), p. 115336, <https://doi.org/10.1016/j.cma.2022.115336>
11. B. PACHEV, J. P. WHITEHEAD, AND S. A. MCQUARRIE, *Concurrent multiparameter learning demonstrated on the Kuramoto–Sivashinsky equation*, *SIAM Journal on Scientific Computing*, 44 (2022), pp. A2974–a2990, <https://doi.org/10.1137/21m1426109>
10. S. A. MCQUARRIE, C. HUANG, AND K. E. WILLCOX, *Data-driven reduced-order models via regularised operator inference for a single-injector combustion process*, *Journal of the Royal Society of New Zealand*, 51 (2021), pp. 194–211, <https://doi.org/10.1080/03036758.2020.1863237>
9. A. FARHAT, N. E. GLATT-HOLTZ, V. R. MARTINEZ, S. A. MCQUARRIE, AND J. P. WHITEHEAD, *Data assimilation in large-Prandtl Rayleigh–Bénard convection from thermal measurements*, *SIAM Journal on Applied Dynamical Systems*, 19 (2020), pp. 510–540, <https://doi.org/10.1137/19m1248327>
8. P. BARTHOLOMEW, S. A. MCQUARRIE, J. S. PURCELL, AND K. WESER, *Volume and geometry of homogeneously adequate knots*, *Journal of Knot Theory and Its Ramifications*, 24 (2015), pp. 1550044, 29, <https://doi.org/10.1142/s0218216515500443>

CONFERENCE PROCEEDINGS

7. P. JAIN, S. A. MCQUARRIE, AND B. KRAMER, *Performance comparison of data-driven reduced models for a single-injector combustion process*, in *AIAA Propulsion and Energy Forum*, 2021, p. 3633, <https://doi.org/10.2514/6.2021-3633>
6. S. A. MCQUARRIE, J. HART, B. VAN BLOEMEN WAANDERS, AND K. WILLCOX, *Data-driven model reduction for physics-constrained optimization*, in *CSRI Summer Proceedings*, 2021, pp. 101–111, <https://www.sandia.gov/ccr/csri-summer-programs/2021-proceedings/>. SAND2022-0653R

SOFTWARE AND PROJECTS

5. **opinf**: Operator inference for non-intrusive model reduction in Python.
<https://willcox-research-group.github.io/rom-operator-inference-Python3>
4. Instructional Python labs for the *Foundation of Applied Mathematics* curriculum.
<https://github.com/Foundations-of-Applied-Mathematics/Labs>

OTHER PUBLICATIONS

3. S. A. MCQUARRIE, *Data-driven Parametric Reduced-Order Models: Operator Inference for Reactive Flow Applications*, PhD thesis, The University of Texas at Austin, 2023, <https://doi.org/10.26153/tsw/50172>
2. S. A. MCQUARRIE, *Data assimilation in the Boussinesq approximation for mantle convection*, master's thesis, Brigham Young University, 2018, <http://hdl.lib.byu.edu/1877/etd10228>
1. S. A. MCQUARRIE, A. X. GARCIA, AND J. E. SPOMER, *Information extraction and logical inference for derivative classifier assistance*, tech. report, Sandia National Laboratories, Albuquerque, NM, 2017

PRESENTATIONS

CONFERENCE PRESENTATIONS

27. *Data-driven reduced modeling in the time and frequency domains: Fundamentals, best practices, and implementation*. SIAM Conference on Computational Science and Engineering, Fort Worth, TX, 5 March 2025.
26. *Learning Bayesian reduced-order operators with Gaussian processes*. Model Reduction and Surrogate Modeling, San Diego, CA, 11 September 2024.
25. *Bayesian learning of reduced-order operators with Gaussian processes*. World Congress on Computational Mechanics, Vancouver, Canada, 24 July 2024.
24. *Bayesian learning of reduced-order operators with Gaussian processes*. European Congress on Computational Methods in Applied Sciences and Engineering, Lisbon, Portugal, 7 June 2024.
23. *Learning reduced operators with Gaussian processes*. SIAM TX/LA Sectional, Lafayette, LA, 4 November 2023.
22. *Non-intrusive parametric reduced-order modeling via operator inference*. SIAM SEAS Sectional, Blacksburg, VA, 25 March 2023.
21. *Operator inference for affine-parametric systems of partial differential equations*. SIAM Conference on Computational Science and Engineering, Amsterdam, The Netherlands, 28 February 2023.
20. *Learning physics-based reduced-order models from data: Operator inference for parametric partial differential equations*. Department of Mathematics Colloquium, Brigham Young University, Provo, UT, 29 November 2022.
19. *Bayesian operator inference for data-driven reduced-order modeling*. SIAM TX/LA Sectional, Houston, TX, 5 November 2022.
18. *Bayesian operator inference for data-driven reduced-order modeling*. American Mathematical Society

Western Sectional, Salt Lake City, UT, 22 October 2022.

17. *Non-Intrusive parametric reduced-order modeling via operator inference*. SIAM Conference on the Mathematics of Data Science, San Diego, CA, 28 September 2022.
16. *Non-intrusive parametric reduced-order modeling via operator inference*. U.S. National Congress on Theoretical and Applied Mechanics, Austin, TX, 22 June 2022.
15. *Non-intrusive parametric reduced-order modeling via operator inference*. SIAM Conference on Uncertainty Quantification, Atlanta, GA, 14 April 2022.
14. *Non-intrusive parametric reduced-order modeling via operator inference*. U.S. National Congress on Computational Mechanics, Virtual, 28 July 2021.
13. *Data-driven reduced-order models via regularized operator inference for a single-injector combustion process*. SIAM Conference on Control and Its Applications, Virtual, 21 July 2021.
12. *Data-driven reduced-order models via regularized operator inference*. SIAM Conference on Computational Science and Engineering, Virtual, 1 March 2021.

SEMINARS AND INVITED TALKS

11. *Data-driven reduced-order models for structured parametric PDEs*. Computational and Data-enabled Science Seminar, Department of Mathematics, Emory University, Atlanta, GA, 1 May 2025.
10. *Bayesian learning with Gaussian processes for low-dimensional representations of time-dependent nonlinear systems*. Applied Data Assimilation and Parameter Tracking Seminar, Online, 22 April 2024.
9. *Learning reduced-order models with uncertainty and structure*. Department of Mathematics Colloquium, Brigham Young University, Provo, UT, 14 November 2023.
8. *Non-intrusive parametric reduced-order modeling via operator inference*. Scientific Computing in Computer Science Colloquium, Technical University of Munich, Garching, Germany, 10 July 2023.
7. *Learning physics-based reduced-order models from data: Operator inference for parametric partial differential equations*. Department of Mathematics Colloquium, Brigham Young University, Provo, UT, 29 November 2022.
6. *An introduction to non-intrusive model reduction via operator inference*. CSEM Student Forum, Oden Institute for Computational Engineering and Sciences, Austin, TX, 2 October 2020.
5. *Data assimilation in the Boussinesq approximation for mantle convection*. Applied and Computational Mathematics Research Seminar, Tulane University, New Orleans, LA, 23 April 2017.

POSTERS

4. *Bayesian learning of operator inference reduced-order models*. Department of Energy Office of Science Advanced Scientific Computing Research Program Applied Mathematics and MMICCs Principal Investigators Meeting, Albuquerque, NM, 9 January 2024.
3. *Bayesian operator inference for data-driven reduced-order models*. Chesapeake Large Scale Analytics Conference, Annapolis, MD, 26 October 2022.
2. *RaISE: A framework to characterize surrogate models in scientific machine learning*. SIAM Conference on the Mathematics of Data Science, San Diego, CA, 28 September 2022.

1. *Data-driven reduced-order models via regularized operator inference for a single-injector combustion process*. Model Order Reduction Summer School (MORSS), École polytechnique fédérale de Lausanne (EPFL), Virtual, 8 September 2020.

MISCELLANEOUS

PROGRAMMING LANGUAGES

Strong: Python, bash / shell, git, L^AT_EX

Proficient: MATLAB, svn

Familiar: Julia, C++, C, Java, SQL, R

CERTIFICATIONS

Advanced Teaching Preparation Certificate	2022
Center for Teaching and Learning, The University of Texas at Austin	

Language Certificate: Spanish, Advanced Level	2014
American Council on the Teaching of Foreign Languages	