Sara Ichinaga

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EDUCATION

University of Washington, GPA 3.91/4.0. **Seattle, WA**
Ph.D. in Applied Mathematics Expected June 2026

University of Washington, GPA 3.87/4.0. **Seattle, WA**
M.S. in Applied Mathematics Sept 2021-Dec 2022

University of Washington, GPA 3.94/4.0, Magna Cum Laude. **Seattle, WA**
B.S. in Applied and Computational Mathematical Sciences, Minor in Dance Sept 2017-June 2021

RESEARCH EXPERIENCE

Graduate Researcher **Jan 2022-Present**
Department of Applied Mathematics, University of Washington **Seattle, WA**
Supervised by Dr. J. Nathan Kutz and Dr. Steven L. Brunton

- Studying, utilizing, and extending equation-free modeling techniques for analyzing real-world data sets. Areas of expertise include the dynamic mode decomposition (DMD), the sparse identification of nonlinear dynamics (SINDy), time-delay embeddings for partial measurement data, optimization techniques for sparse regression, and neural networks.
- Active developer and maintainer for PyDMD, an open-source Python package that implements various state-of-the-art DMD algorithms and tools for real-world data analysis. Code is available online at https://github.com/PyDMD/PyDMD.
- Assisted in the development of multi-resolution coherent spatiotemporal scale separation (mrCOSTS), a methodological extension of DMD capable of decomposing noisy, high-dimensional data sets that exhibit multi-scale dynamics.
- Developing sparse-mode DMD, a variant of DMD that generates sparse spatiotemporal modes when given time-varying snapshot data. This modification allows for de-noising and the extraction of spatially local features and their time dynamics.

Undergraduate Researcher **Feb 2019-Sept 2021**
Department of Biology, University of Washington **Seattle, WA**
Supervised by Dr. Bingni Brunton, Dr. Seth Hirsh, and Dr. Alice Schwarze

- Utilized the Hankel alternative view of Koopman (HAVOK) algorithm and its various parameter regimes in order to analyze chaotic dynamical systems and real-world data sets.
- Developed and analyzed modifications to HAVOK that improved the stability and accuracy of the algorithm.
- Used data-driven methods to infer networks of connectivity from videos of brain activity.
- Simulated spatiotemporal data for a variety of underlying network structures to investigate the accuracy and effectiveness of various data-driven network inference techniques.

PREPRINTS AND PUBLICATIONS

Sara M. Ichinaga, Francesco Andreuzzi, Nicola Demo, Marco Tezzele, Karl Lapo, Gianluigi Rozza, Steven L. Brunton, and J. Nathan Kutz. "PyDMD: A Python package for robust dynamic mode decomposition." ***JMLR.*** 2024. **25**(417):1-9. Available: http://jmlr.org/papers/v25/24-0739.html.

Karl Lapo, **Sara M. Ichinaga**, and J. Nathan Kutz. "A method for unsupervised learning of coherent spatiotemporal patterns in multi-scale data." ***PNAS.*** **In Press.** Preprint: https://arxiv.org/abs/2408.02396. (2024)

Alice C. Schwarze, **Sara M. Ichinaga**, and Bingni W. Brunton. "Network inference via process motifs for lagged correlation in linear stochastic processes." Preprint: https://arxiv.org/abs/2208.08871. (2022)

Seth M. Hirsh, **Sara M. Ichinaga**, Steven L. Brunton, J. Nathan Kutz, and Bingni W. Brunton. "Structured time-delay models for dynamical systems with connections to frenet-serret frame." ***Proceedings of the Royal Society A.*** 2021. **477**(2254): 20210097. Available: https://doi.org/10.1098/rspa.2021.0097.

CONFERENCES

Sara M. Ichinaga, Karl Lapo, J. Nathan Kutz, Steven L. Brunton, and Aleksandr Y. Aravkin. "Dynamic Mode Decomposition Variants and Extensions for Robust Data-Driven Modeling." To be presented at:

- SIAM Conference on Computational Science and Engineering 2025 (CSE25) (minisymposium talk)
- SIAM Conference on Applications of Dynamical Systems (DS25) (minisymposium talk)

Sara M. Ichinaga, Francesco Andreuzzi, Nicola Demo, Marco Tezzele, Karl Lapo, Gianluigi Rozza, Steven L. Brunton, and J. Nathan Kutz. "Extensions and Open-Source Algorithms for Data-Driven Modeling with Dynamic Mode Decomposition." Presented at:

- SIAM Conference on Uncertainty Quantification 2024 (UQ24) (minisymposium talk)
- SIAM Conference on Computational Science and Engineering 2023 (CSE23) (minisymposium talk)

TEACHING EXPERIENCE

Graduate Teaching Assistant **Sept 2024-Present**
Department of Applied Mathematics, University of Washington **Seattle, WA**
Supervised by Dr. Michelle Hickner, Dr. J. Nathan Kutz, and Dr. Steven L. Brunton

- Teaching assistant for ENGR 510 and ENGR 515, which are part of an introductory machine learning course series for engineering professionals.
- Lead office hour sessions, facilitate online student discussions, provide students with assignment feedback, conduct live code demonstrations for students, program and dispatch the code autograder, and assist with the development of homework assignments.

Mathematics Tutor **Sept 2021-June 2022**
Department of Mathematics, University of Washington **Seattle, WA**
Supervised by Dr. Matthew Conroy

- Tutored undergraduate students in various precalculus and introductory calculus topics.
- Provided one-on-one student assistance and facilitated critical student thinking and problem solving.

Graduate Teaching Assistant **Sept 2021-Dec 2021**
Department of Mathematics, University of Washington **Seattle, WA**
Supervised by Dr. Natalie Naehrig

- Instructed quiz sections for MATH 124, a differential calculus course.
- Aided student understanding of calculus concepts by facilitating group work, conducting guided classroom demonstrations, preparing review materials, and providing students with feedback.

TECHNICAL SKILLS

Programming Languages
Python (expert), MATLAB, Java, Bash, SQL, R

Technologies
Git/Github, Jupyter, LaTeX, Microsoft Azure

RELEVANT COURSEWORK

Applied Mathematics
- (AMATH 505) Introduction to Fluid Dynamics
- **(AMATH 515) Optimization: Fundamentals and Applications**
- (AMATH 561) Introduction to Probability and Random Processes
- (AMATH 563) Inferring Structure of Complex Systems
- (AMATH 567) Applied Complex Analysis
- (AMATH 568) Advanced Methods for Ordinary Differential Equations
- (AMATH 569) Advanced Methods for Partial Differential Equations
- (AMATH 575) Dynamical Systems
- **(AMATH 582) Computational Methods for Data Analysis**
- **(AMATH 584) Numerical Linear Algebra**
- (AMATH 585) Numerical Analysis of Boundary Value Problems
- (AMATH 586) Numerical Analysis of Time Dependent Problems

Computer Science
- (CSE 373) Data Structures and Algorithms
- (CSE 414) Database Systems
- (CSE 415) Artificial Intelligence
- (CSE 417) Algorithms and Computational Complexity
- **(CSE 546) Machine Learning**
- **(CSE 547) Machine Learning for Big Data**

COMMUNITY OUTREACH

Spectra: The Association for LGBT Mathematicians, Co-Chair **April 2024-Present**
Department of Applied Mathematics, University of Washington **Seattle, WA**

- Co-founder and outreach coordinator for the UW Mathematics and Applied Mathematics Spectra chapter.
- Organize and facilitate cross-departmental events aimed at fostering community amongst LGBTQIA+ mathematicians at UW.

Diversity, Equity, and Inclusion Committee Member **May 2022-Sept 2024**
Department of Applied Mathematics, University of Washington **Seattle, WA**

- Planned and facilitated departmental events and initiatives aimed at fostering diversity, equity, and inclusion.
- Organized, presented, and implemented strategies used to reform the undergraduate admissions process for improving diversity and accessibility.
- Former lead coordinator for the Women in Applied Mathematics Mentorship (WAMM) program, an outreach program that pairs undergraduate women with graduate mentors for a quarter of guided research exposure.

SCHOLARSHIPS, FELLOWSHIPS, AND GRANTS

- Weill Neurohub Undergraduate Research Fellowship 2020-2021
- Washington State Opportunity Scholarship 2017-2021
- Atsuhiko Tateuchi Memorial Scholarship 2017-2021
- Terry Scurry Scholarship of the University of Washington 2017
- Japanese American Citizens League Scholarship 2017
- Rotary Club of Federal Way Scholarship 2017