Adrienne M. Propp

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Education

Stanford University — Stanford, CA
Ph.D. Candidate in Computational and Mathematical Engineering — 2021–Present
Advisor: Daniel Tartakovsky; expected Spring/Summer 2027.

University of Oxford — Oxford, UK
M.Sc. in Mathematical Modelling and Scientific Computing — 2018
Advisor: Ricardo Ruiz-Baier. Thesis: "Simulating 3D Orthotropic Cardiac Electromechanics Incorporating Stress-Assisted Diffusion."

Harvard University — Cambridge, MA
B.A. in Applied Mathematics, *magna cum laude* with highest honors — 2017
Advisor: Steven C. Wofsy. Thesis: "MethaneSat: Detecting Methane Emissions in the Barnett Shale Region."

Research Interests

I develop mathematically structured, data- and compute-efficient ML methods for scientific applications, with an emphasis on surrogate modeling, graph-based learning, transfer learning, uncertainty quantification, and reliable generalization from sparse data.

Research Experience

Stanford University — 2021–Present
Ph.D. Candidate

- Develop data- and compute-efficient scientific machine-learning surrogate models that exploit mathematical structure to improve accuracy, stability, and generalization.
- Designed a probabilistic framework for learning on graphs, grounded in optimal recovery and kernel theory, that learns accurately from sparse observations while rigorously quantifying uncertainty.
- Developed domain-decomposition and transfer-learning strategies to improve scalability, training efficiency, and out-of-distribution generalization for graph neural network surrogates of physical systems.
- Proved costless model-selection guarantees for contextual bandits through reinforcement learning.

Google X, the Moonshot Factory — Summer–Fall 2026
AI & Earth Sciences Resident

- Research and develop self-supervised learning methods and foundation models across computer vision, remote sensing, map matching, graph algorithms, and inverse problems.
- Contribute to agentic AI workstreams and workflows for multi-stage research and development.

Sandia National Laboratories — Summer 2025
Graduate Intern, Computer Science Research Institute

- Developed a scalable, physics-inspired GNN surrogate for high-resolution ice-sheet dynamics on unstructured meshes, combining parallel domain decomposition and transfer learning to accelerate training and improve full-field velocity prediction and generalization in data-limited regimes.

Apple, Exploratory Design Group — Summer 2024
ML Research & Mathematical Sciences Intern

- Developed scientific machine-learning approaches for exploration of an emerging technology in a severely data-limited regime, emphasizing sample efficiency, stable training, and reliable evaluation.

Harvard University, Wofsy Lab — Jan. 2016–Sep. 2017
Research Assistant, Department of Earth & Planetary Sciences

- Developed an inverse-modeling framework to assess how well MethaneSat could constrain methane emissions.
- The resulting work was cited by NASA and contributed to funding for the MethaneSat project, launched in 2024.

SLAC National Accelerator Laboratory, Glenzer Lab — Summer 2015
SULI Intern

- Engineered piezoelectric breakup of a cryogenic hydrogen microjet and operated Thomson parabola diagnostics for laser-plasma experiments at LLNL's Jupiter Laser Facility.

Applied Research and Policy

RAND Corporation Jan. 2019–Sep. 2021

Technical Analyst

- Developed large-scale Markov chain Monte Carlo and agent-based models to quantify the financial effects of U.S. health-care reform proposals; results informed federal and state policy briefs.
- Designed a multimodal modeling framework to advise Virginia Governor Ralph Northam's response to COVID-19.
- Developed a framework to help policymakers assess risks from adversarial machine-learning techniques.
- Managed an international OECD research study on effective global teaching practices.

Publications and Preprints

Submitted manuscripts

1. **Propp, A.**[*], Perego, M., Howard, A., Gruber, A., Stinis, P., Cyr, E., and Tartakovsky, D. (2026). "Domain-Decomposed Graph Neural Network Surrogate Modeling for Ice Sheets." Submitted. arXiv:2512.01888.
2. Zhang, H., **Propp, A.**, Kinch, B., Owhadi, H., and Trask, N. (2026). "Structure-Preserving Neural Surrogates with Tractable Uncertainty Quantification." Submitted. arXiv:2606.11650.

Peer-reviewed publications

3. **Propp, A.**[*], Actor, J., Walker, E., Owhadi, H., Trask, N., and Tartakovsky, D. (2025). "Discovery of Probabilistic Dirichlet-to-Neumann Maps on Graphs." *SIAM Journal on Scientific Computing*. doi:10.1137/25M1765201.
4. **Propp, A.**[*], Vardavas, R., Price, C., and Kapinos, K. (2025). "LHIEM: The Longitudinal Health, Income, and Employment Model." *Journal of Artificial Societies and Social Simulation*. jasss.org/28/2/1.html.
5. **Propp, A.**[*] and Tartakovsky, D. (2025). "Transfer Learning on Multi-Dimensional Data: A Novel Approach to Neural Network-Based Surrogate Modeling." *Journal of Machine Learning for Modeling and Computing*. DOI.
6. Krishnamurthy, S. K.[*], **Propp, A.**[*], and Athey, S. (2024). "Towards Costless Model Selection in Contextual Bandits: A Bias-Variance Perspective." In *Proceedings of the 27th International Conference on Artificial Intelligence and Statistics (AISTATS)*. proceedings.mlr.press/v238/kumar-krishnamurthy24a.html.
7. **Propp, A.**[*], Gizzi, A., Levrero-Florencio, F., and Ruiz-Baier, R. (2019). "An Orthotropic Electro-Viscoelastic Model for the Heart with Stress-Assisted Diffusion." *Biomechanics and Modeling in Mechanobiology*. doi:10.1007/s10237-019-01237-y.
8. Gauthier, M.[*] et al. [including **Propp, A.**] (2016). "High Intensity Laser-Accelerated Ion Beam Produced from Cryogenic Micro-Jet Target." *Review of Scientific Instruments*. doi:10.1063/1.4961270.
9. Chen, S. N.[*] et al. [including **Propp, A.**] (2016). "Absolute Dosimetric Characterization of Gafchromic EBT3 and HDv2 Films Using Commercial Flat-Bed Scanners and Evaluation of the Scanner Response Function Variability." *Review of Scientific Instruments*. doi:10.1063/1.4954921.

[*]*First or co-first author.*

Teaching and Mentoring

Stanford ICME Sep. 2024

Organizer and Coordinator, ICME Refresher Courses

- Organized and coordinated a multi-day program for incoming graduate students covering probability and statistics, ODEs and PDEs, applied calculus, linear algebra, and scientific computing and programming.

Harvard University Spring 2015–Fall 2016

Teaching Fellow, Department of Applied Mathematics

- AM 105: Ordinary and Partial Differential Equations (Spring 2015; Fall 2016).
- AM 21a: Multivariable Calculus (Fall 2015).
- Twice awarded the Certificate of Distinction in Teaching for AM 105, based on student evaluations.

Harvard University Fall 2014–Spring 2017

Peer Tutor in Mathematics

- Tutored fellow undergraduates in mathematics.

For Love of Children (FLOC), Washington, DC Jan. 2019–Mar. 2020
Volunteer Mathematics Tutor
- Provided individualized mathematics tutoring to children through a nonprofit academic-support program.

Selected Presentations

- **Propp, A.**, Actor, J., Walker, E., Owhadi, H., Tartakovsky, D., and Trask, N. "Learning Dirichlet-to-Neumann Maps on Graphs with Gaussian Processes." SIAM Mathematics of Data Science, 2024. *(Poster).*
- **Propp, A.**, Howard, A., Perego, M., Heinlein, A., Tartakovsky, D., and Stinis, P. "Graph Neural Operators for Quantification of Geometric Uncertainty." WCCM/PANACM, 2024. *(Invited talk).*
- **Propp, A.**, Actor, J., Walker, E., Owhadi, H., Tartakovsky, D., and Trask, N. "Discovery of Dirichlet-to-Neumann Maps on Graphs via Gaussian Processes." Scientific Machine Learning: Emerging Topics, 2024. *(Contributed talk).*
- **Propp, A.** and Tartakovsky, D. "Transfer Learning for Surrogate Models of PDEs." Mathematical and Scientific Machine Learning, ICERM, 2023. *(Invited talk).*
- **Propp, A.**, Price, C., Vardavas, R., and Kapinos, K. "Dynamic Microsimulation Modeling for Healthcare Expenditures." American Society of Health Economists Conference, 2021. *(Contributed talk).*
- Gizzi, A., **Propp, A.**, and Ruiz-Baier, R. "Mixed Formulations for Stress-Assisted Diffusion Problems in Cardiac Biomechanics." ICNumACA, 2018.
- **Propp, A.** et al. "MethaneSat: Detecting Methane Emissions in the Barnett Shale Region." American Geophysical Union Fall Meeting, 2017. *(Contributed talk).*
- **Propp, A.** et al. "Development of and Laser-Driven Proton Acceleration from a Cryogenic Hydrogen Microjet." 3rd High-Power Laser Workshop, SLAC National Accelerator Laboratory, 2015. *(Poster).*

Honors and Awards

- SIAM Student Travel Award, Society for Industrial and Applied Mathematics — Sep. 2026
- Community Impact Award, Stanford Alumni Association — Apr. 2026
- ICME Student Leadership Award, Stanford University (only two-time recipient) — May 2023; May 2026
- Stanford Graduate Fellowship — Sep. 2021
- Enhancing Diversity in Graduate Education Fellowship, Stanford University — Sep. 2021
- RAND Corporation Spotlight Award (recognized for outstanding contributions to two distinct projects) — Apr. 2020
- Distinction on M.Sc. dissertation, Oxford Mathematical Institute — Sep. 2018
- *Magna cum laude*, Harvard University — May 2017
- Certificate of Distinction in Teaching (AM 105), Harvard University (two-time recipient) — May 2016; Dec. 2016
- Harvard College Scholar — May 2014
- "Hanging Jig," U.S. Patent D679,613 S — Apr. 2013

Academic Service

- **Reviewer:** *Journal of Artificial Societies and Social Simulation*; *Neural Networks*; *International Journal for Uncertainty Quantification*; *SIAM Journal on Scientific Computing*
- **Admissions committee:** Student member, Stanford ICME Ph.D. Admissions Committee (2025–2026 admissions cycle)
- **Peer mentor:** Stanford EDGE Program; Stanford ICME Buddy Program
- **Board member:** Stanford Women in Mathematics, Statistics, and Computational Engineering
- **Member:** ICME Student Action Group