

Samuel Rudy

Ph.D. Candidate in Applied Mathematics
University of Washington

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Research Interests

- Machine learning for system identification and forecasting.
- Filtering high dimensional nonlinear dynamics.
- Deep learning.

Education

University of Washington	Seattle, WA
M.S. in Applied Mathematics	2015
Ph.D. in Applied Mathematics	Expected 06/2019
Advisors: J. Nathan Kutz and Steven Brunton	

Washington University in St. Louis	St. Louis, MO
B.A. in Mathematics (Summa Cum Laude), second major in Physics	2014
Thesis: An Alternative Graph Theoretic Proof of the Amitsur-Levitski Identity	

Affiliations

Research Assistant	Dept. of Applied Mathematics, UW	2016-
Instructor	Dept. of Applied Mathematics, UW	2018
Teaching Assistant	Dept. of Applied Mathematics, UW	2018
Data Science Intern	HERE Technologies	2017
Teaching Assistant	Dept. of Mathematics, UW	2014-2016

Awards and Honors

1. NSF GRFP Honorable Mention (2016)
2. University of Washington Top Scholars Fellowship (2015)
3. Sigma Pi Sigma Physics Honor Society (2014)
4. Phi Beta Kappa (2014)
5. Washington University Ross Middlemiss Awards in Mathematics (2014)
6. Budapest Semesters in Mathematics High Honors (2013).

Journal Publications

1. **Samuel H. Rudy**, Steven L. Brunton, and J. Nathan Kutz. Smoothing and parameter estimation by soft-adherence to governing equations. *arXiv preprint*, 2018 (Preprint submitted to *Journal of Computational Physics* special issue VSI: Machine Learning)
2. **Samuel H. Rudy**, J. Nathan Kutz, and Steven L. Brunton. Deep learning of dynamics and signal-noise decomposition with time-stepping constraints. *arXiv preprint arXiv:1808.02578*, 2018 (Under review at *Journal of Computational Physics*)
3. **Samuel H. Rudy**, Alessandro Alla, Steven L. Brunton, and J. Nathan Kutz. Data-driven identification of parametric partial differential equations. *arXiv preprint arXiv:1806.00732*, 2018. (Under review at *SIAM Journal on Applied Dynamical Systems*)

4. **Samuel H. Rudy**, Steven L. Brunton, Joshua L. Proctor, and J. Nathan Kutz. Data-driven discovery of partial differential equations. *Science Advances*, 3(4):e1602614, 2017.
5. **Samuel H. Rudy**, Pedro D. Maia, J. Nathan Kutz. Cognitive and behavioral deficits arising from neurodegeneration and traumatic brain injury: a model for the underlying role of focal axonal swellings in neuronal networks with plasticity. *Journal of Systems and Integrative Neuroscience*. 2016.

Conference Proceedings

1. J. Nathan Kutz, **Samuel H. Rudy**, Alessandro Alla, and Steven L. Brunton. Data-driven discovery of governing physical laws and their parametric dependencies in engineering, physics and biology. *In CAMSAP*, pages 1–5, 2017.

Teaching

- Instructor, UW, Applied Math 383, *Introduction to Continuous Mathematical Modeling*, Summer 2018.
- Teaching Assistant, UW
 1. Math 111, *Algebra with Applications*, Fall 2016
 2. Math 125, *Calculus with Analytic Geometry II*, Fall 2014
 3. Math 126, *Calculus with Analytic Geometry III*, Winter 2015, Fall 2015
 4. Applied Math 563, *Inferring Structure of Complex Systems*, Spring 2018
- Grader, Washington University, Math 310, *Foundations for Higher Mathematics*, Fall 2013

Service

- Reviewer for *Journal of Computational Physics*, *SIAM Journal on Applied Mathematics*, and *Mathematical Geosciences*.
- Session chair and Co-organizer for “Physics Motivated Problems in Machine Learning” minisymposium at 2019 SIAM Conference on Computational Science and Engineering.
- Homework Help Volunteer at Seattle Public Libraries, 2015-Current. Mentoring for 1.5 hours per week during the school year at Douglas Truth Public Library with significant experience working with students from immigrant and ESL population.

Invited Talks

1. “Recent Topics in System Identification” at SIAM Conference on Control and Its Applications 2019 (Chengdu China, Planned June 2019)
2. “Extreme Events in Dynamical Systems” at SIAM Conference on Applications of Dynamical Systems 2019 (Snowbird UT, Planned May 2019)
3. “Physics Motivated Problems in Machine Learning” at SIAM Conference on Computational Science and Engineering 2019 (Spokane WA, Planned February 2019)
4. “Machine Learning and Data Science Approaches in Ocean Acoustics” at 176th meeting of the Acoustical Society of America (Victoria BC, November 2018)
5. MIT Aerospace Computational Design Lab Seminar (Cambridge MA, November 2018)
6. Brown University Division of Applied Mathematics. CRUNCH Group. (Providence RI, October 2018)
7. UC Berkeley/LBNL Applied Mathematics Seminar (Berkeley CA, October 2018)
8. Banff workshop on Data-driven methods for reduced-order modeling and stochastic PDEs (Banff Canada, January 2017)

9. “An Alternative Graph Theoretic Proof of the Amitsur-Levitski Identity”, Undergraduate Honors Thesis Presentation at Washington University in St. Louis (St. Louis MO, April 2014)

Contributed Talks

1. “Nonlinear Dynamics: Model Reduction” at 71st Annual Meeting of the APS Division of Fluid Dynamics (Atlanta GA, November 2018)
2. “Nonlinear Dynamics: Topology and Theoretical” at 69th Annual Meeting of the APS Division of Fluid Dynamics (Portland OR, November 2016)

Contributed Posters

1. Symposium on Machine Learning for Dynamical Systems, Imperial College London (London UK, Planned February 2019)

Open-source Software

1. PDE-FIND [<https://github.com/snagcliffs/PDE-FIND>]
2. parametric-discovery [<https://github.com/snagcliffs/parametric-discovery>]
3. RKNN [<https://github.com/snagcliffs/RKNN>]
4. SmoothingParamEst [<https://github.com/snagcliffs/SmoothingParamEst>]