SAMUEL LOOMIS

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EDUCATION

PhD University of California, Davis, Physics — In Progress
Advisor: James P. Crutchfield

MS University of California, Davis, Physics — June 2018
Advisor: James P. Crutchfield

BS North Carolina State University, Physics & Mathematics — May 2016
Graduated Summa Cum Laude

HONORS AND AWARDS

NSF GRFP Honorable Mention 2018

Sigma Xi 2018

Phi Kappa Phi 2015

Our Three Winner's Scholarship 2015
The Our Three Winner's Scholarship is given to students who demonstrate a commitment to volunteerism by performing meaningful community service without compensation.

Provost's Professional Experience Program Research Assistanceship 2015

Caldwell Fellows 2013
One of 25 fellows selected from a class of over 4,000 based on leadership potential, academic excellence, and commitment to service.

RESEARCH EXPERIENCE

Complexity Sciences Center, UC Davis — 2017 to Present
Graduate Student Researcher
Advisor: James Crutchfield

- Developing new fundamental theorems on the memory and energy efficiency of quantum computers in the task of simulating time-series data *(5 publications, dissertation in progress)*.
- Forged new interdisciplinary connections by applying tools from statistical mechanics to probe data and models of ecologic-economic problems, such as the economic geography of carbon emissions *(1 publication)*.

- Extending and formalizing the use of reproducing kernel Hilbert spaces for discovering structure in time-series data *(1 publication)*.

Center for Quantum Mathematics and Physics, UC Davis 2016 to 2017
Graduate Student Researcher
Advisor: Steve Carlip

- Studied the asymptotic behavior of non-manifold-like networks in the causal set approach to quantum gravity *(1 publication).*

GR Group, NCSU 2013 to 2016
Undergraduate Research Assistant
Advisor: David Brown

- Using the DeWitt elastic medium model to derive equations of motion for elastic bodies in general relativity *(1 publication).*
- Programming and analyzing FORTRAN simulations of Cauchy horizons in black hole formation.

Joint Institute for Computational Sciences, ORNL/UT Knoxville 2013 to 2016
Research Intern
Advisors: Kwai Wong, John Drake, Joshua Fu

- As part of the CSURE REU program.
- Wrote FORTRAN code to solve multi-dimensional partial differential equations using the Spectral Element Method. Applied the code to study chemical transport models.

TEACHING EXPERIENCE

UC Davis Intermittently 2016 to Present
Teaching Assistant, Physics

- Led Discussion Lab meetings for Physics 7A,B,C (introductory physics for biological sciences); Discussion Labs integrate model-based reasoning and interactive learning to allow students to make sense of physical phenomena.
- Led Discussion and Lab meetings for Physics 9A,B,C (introductory physics for physical sciences/engineering). Discussion meetings involve small-group collaboration for solving problems sandwiched by large-group discussion of the relevant concepts and solutions. Lab meetings involve small-group collaboration to complete physical experiments and collect & analyze data.

PUBLICATIONS

Journal Publications

Loomis, S. P., Crutchfield, J. P. "*Thermodynamically-efficient local computation and the inefficiency of quantum memory compression*," Phys. Rev. Research **2**, 023039. 2020.

Loomis, S. P., Crutchfield, J. P. "*Thermal efficiency of quantum memory compression*," Phys. Rev. Lett. **125**, 020601. 2020.

Loomis, S. P., Mahoney, J. R., Aghamohammadi, C., Crutchfield, J. P. "*Optimizing quantum models of classical channels: The reverse Holevo problem*," J. Stat. Phys **181**, 1966–1985. 2020.

Loomis, S. P., Crutchfield, J. P. "*Strong and weak optimizations in classical and quantum models of stochastic processes*," J. Stat. Phys **176**, 1317–1342. 2019.

Aghamohammadi, C., Loomis, S. P., Mahoney, J. R., Crutchfield, J. P. "*Extreme quantum memory advantage for rare-event sampling*," Phys. Rev. X **8**, 011025. 2018.

Loomis, S. P., Carlip, S. "*Suppression of non-manifold-like sets in the causal set path integral*," Class. Quantum Grav. **35** 024002. 2017.

Loomis, S. P., Brown, J. D. "*Continuous body dynamics and the Mathisson-Papapetrou-Dixon equations*," Phys. Rev. D **95**, 044025. 2017.

Journal Papers in Review

Loomis, S. P., Crutchfield, J. P. "*Topology, convergence, and reconstruction of predictive states*," Submitted to: Physica D. *arXiv:2109.09203 [cond-mat.stat-mech]*

Loomis, S. P., Cooper, M., Crutchfield, J. P. "Nonequilibrium thermodynamics in measuring carbon footprints," Submitted to: Physica A. *arXiv:2106.03948 [cond-mat.stat-mech]*

PRESENTATIONS

Paper Presentation, "*Thermodynamically-efficient local computation and the inefficiency of quantum memory compression*," Workshop on Agency at the Interface of Quantum and Complexity Science, Singapore 2020.

Paper Presentation, "*Thermal efficiency of quantum memory compression*," Information Engines at the Frontiers of Nanoscale Thermodynamics, Telluride 2019.

Paper Presentation, "*Suppression of non-manifold-like sets in the causal set path integral*," Pacific Coast Gravity Meeting, Santa Barbara 2017.

PROFESSIONAL AFFILIATIONS

Graduate Organization of Physics Students, 2018-2019
Founding Member, Community Representative
GradOPS serves as a voice for the graduate students to the Physics faculty and staff. It seeks to better the department by seeking out graduate student involvement and building

community. As community representative I spearheaded organizing community events and built partnerships with local service organizations.

College of Science Ambassadors, 2014-2016
Ambassador
Ambassador representing the college to prospective students and visitors.

COMMUNITY SERVICE

Yolo Inferfaith Immigration Network, 2018-2020
Board Member, Fundraising Dinner Coordinator
YIIN (the Yolo Interfaith Immigration Network) is a group of people serving and advocating for immigrants in Yolo County. As a board member, I took part in decisions about undertaking and managing new projects. As Fundraising Dinner Coordinator I led a team to plan and execute YIIN's annual spring fundraiser in 2019.

SATELLITE Camp, 2013-2015
Counselor
Each summer supervised and mentored high school sophomores for a week of science education and college preparation on NCSU campus.

COMPUTER SKILLS

Fluent: Python, FORTRAN

Experience: R, C#, Java, C++, Julia

OTHER

History enthusiast
Ukulele player
Amateur mead-maker
Owner of a cat-like dachshund & step-dad to a desert pony