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Nicolas H. Christianson

RESEARCH INTERESTS

Online algorithms/optimization; robust and reliable machine learning; power grid; electricity markets; algorithms for decarbonization; sustainable datacenters

EDUCATION

California Institute of Technology, *Ph.D. in Computing and Mathematical Sciences* 2020–25 (expected)
Supported by NSF Graduate Research Fellowship, 2021–present
Resnick Sustainability Institute Scholar, 2023–present
Advisors: Adam Wierman and Steven Low

Harvard College, *A.B. summa cum laude in Applied Mathematics* 2016–20
Honors: Phi Beta Kappa Junior 24, Detur Book Prize, John Harvard Scholar. *GPA*: 3.976/4.0.

PAPERS

*equal contribution

C. Yeh, V. Li, R. Datta, J. Arroyo, **N. Christianson**, C. Zhang, Y. Chen, M. Hosseini, A. Golmohammadi, Y. Shi, Y. Yue, A. Wierman. "SustainGym: Reinforcement Learning Environments for Sustainable Energy Systems." *NeurIPS Datasets and Benchmarks Track*, 2023.

A. Lechowicz, **N. Christianson**, J. Zuo, N. Bashir, M. Hajiesmaili, A. Wierman, P. Shenoy. "The Online Pause and Resume Problem: Optimal Algorithms and an Application to Carbon-Aware Load Shifting." *Proceedings of the ACM on Measurement and Analysis of Computing Systems*, accepted. (link)

L. Werner*, **N. Christianson***, A. Zocca, A. Wierman, S. Low. "Pricing Uncertainty in Stochastic Multi-Stage Electricity Markets." *Conference on Decision and Control (CDC),* 2023.

N. Christianson, J. Shen, A. Wierman. "Optimal robustness-consistency tradeoffs for learning-augmented metrical task systems." *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2023. (link)

D. Rutten, **N. Christianson**, D. Mukherjee, A. Wierman. "Smoothed Online Optimization with Unreliable Predictions." *Proceedings of the ACM on Measurement and Analysis of Computing Systems*, 7.1 (2023): 1-36. (link)

C. Yeh, **N. Christianson**, S. Low, A. Wierman, Y. Yue. "Decision-aware uncertainty-calibrated deep learning for robust energy system operation." Proposal, *ICLR Workshop on Tackling Climate Change with Machine Learning*, 2023.

N. Christianson, C. Yeh, T. Li, M. Hosseini, M. Torabi Rad, A. Golmohammadi, A. Wierman. "Robustifying machine-learned algorithms for efficient grid operation." Under review at *Environmental Data* Science; preliminary version at *NeurIPS Workshop on Tackling Climate Change with Machine Learning*, 2022. (link)

N. Christianson*, L. Werner*, A. Wierman, S. Low. "Dispatch-aware planning for feasible power system operation." *Electric Power Systems Research* 212 (2022): 108597. (link)

N. Christianson, T. Handina, A. Wierman. "Chasing convex bodies and functions with black-box advice." *Conference on Learning Theory*. PMLR, 2022. (link)

W. Qian, C.W. Lynn, A.A. Klishin, J. Stiso, **N.H. Christianson**, D.S. Bassett. "Optimizing the human learnability of abstract network representations." *Proceedings of the National Academy of Sciences* 119.35 (2022): e2121338119. (link)

A.A. Klishin, **N.H. Christianson**, C.S.Q. Siew, D.S. Bassett. "Learning Dynamic Graphs, Too Slow." Under review at *Science Advances*, preprint: *arXiv:2207.02177*. (link)

N.H. Christianson, A.S. Blevins, D.S. Bassett. "Architecture and evolution of semantic networks in mathematics texts." *Proceedings of the Royal Society A* 476.2239 (2020): 20190741. (link)

N.J. Porter, N.H. Christianson, C. Decroos, D.W. Christianson. "Structural and Functional Influence of the Glycine-Rich Loop G302GGGY on the Catalytic Tyrosine of Histone Deacetylase 8." *Biochemistry* 55.48 (2016): 6718-6729. (link)

C. Decroos, N.H. Christianson, et al. "Biochemical and Structural Characterization of HDAC8 Mutants Associated with Cornelia de Lange Syndrome Spectrum Disorders." *Biochemistry* 54.42 (2015): 6501-6513. *Selected as "ACS Editors' Choice."* (link)

PRESENTATIONS

Optimal robustness-consistency tradeoffs for learning-augmented metrical task systems

- INFORMS Annual meeting, October 2023 (invited talk)

Robustifying machine-learned algorithms for efficient grid operation

- *NeurIPS Workshop on Tackling Climate Change with Machine Learning*, December 2022 (poster)

Chasing Convex Bodies and Functions with Black-Box Advice

- Asilomar Conference on Systems and Signals, November 2022 (invited talk)
- *Data Science Deep Dive seminar*, UMass Amherst, October 2022 (invited talk)
- INFORMS Annual meeting, October 2022 (invited talk)
- *Doctoral Consortium*, EAAMO, October 2022 (poster)
- *Workshop on Quantifying Uncertainty*, Simons Institute, September 2022 (poster)
- Conference on Learning Theory (COLT), July 2022

Dispatch-aware planning for feasible power system operation

- Power Systems Computation Conference (PSCC), June 2022

MENTORSHIP, TEACHING, AND ACADEMIC SERVICE

Undergraduate research advising

James Chen — Fall 2023–present
Topic: Learning-augmented metrical task systems with hard constraints

Junxuan (Helen) Shen — Spring 2022–present
Topic: Learning-augmented algorithms for multiserver convex function chasing

Jerry Huang — Spring 2022–present
Topic: Online algorithms with uncertainty-quantified predictions

Outreach and Mentorship

PhD application mentor – *Project SHORT* — 2020–present
PhD application mentor – *Caltech Accountability Partners Program* — 2022–present
Prelim exam preparation coordinator – *Caltech CMS* — Winter/Spring 2022
Research mentor – *i-STEM Scholars* — Summer 2021

Teaching

TA, CS 146 "Control and Optimization of Networks" – *Caltech* — Winter 2023
TA, CS 42 "Computer Science Education in K-14 Settings" – *Caltech* — Winter 2023
Peer Tutor – *Harvard Academic Resource Center* — 2018–20
CA, Math Ma "Introduction to Functions and Calculus I" – *Harvard* — Fall 2017

Academic Service

Workshop reviewer, *NeurIPS Workshop on Computational Sustainability*, 2023.

Program committee member, *Workshop on Bridging Learning and Algorithmic Fairness in the Operation of Urban Infrastructure and Network Systems* at CPS-IoT Week, 2023.

Conference reviewer, *Asilomar Conference on Systems and Signals*, 2022.

HONORS AND AWARDS

NSF Graduate Research Fellowship	2021
Phi Beta Kappa Junior 24 (Harvard)	2019
John Harvard Scholarship (Harvard)	2017, 19
Blair Research Fellowship (University of Pennsylvania)	Summer 2018
Detur Book Prize (Harvard)	2018

INDUSTRY EXPERIENCE

Microsoft Research – Research Intern | Redmond, WA — Summer 2023
Developed reliable machine learning methods to accelerate contingency analysis in power grids while ensuring provable guarantees on performance; conference manuscript in preparation

The Boston Consulting Group – Summer Associate | Boston, MA — Summer 2019
Partnered with a top-10 global biopharmaceutical company to optimize its supply and manufacturing networks, using data and digital-driven techniques to forecast production needs and increase efficiency

Covance – Data Science Intern | Princeton, NJ — Summer 2017
Developed statistical and machine learning models to forecast clinical trial patient recruitment

HOBBIES

Hiking, running, rowing (captain of Adams House crew at Harvard from 2018-20; currently a member at Los Angeles Rowing Club), reading, baking