Reilly Raab

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Education

University of California, Santa Cruz — Fall 2019 – Winter 2024*
PhD, Computer Science and Engineering

University of California, Santa Barbara — Fall 2011 – Spring 2015
BSc, Physics — College of Creative Studies
High Honors, Distinction in the Major
Fall 2013 at The University of Edinburgh

Proficiencies

Machine Learning	Game Theory	GPU Programming	Dynamical Systems
Nonlinear Optimization	Stochastic Calculus	Python	Differentiable Programming
Convex Optimization	Variational Calculus	JavaScript	Classical Mechanics
Reinforcement Learning	Information Theory	C	Statistical Mechanics
Signal Processing	Linear Algebra	GNU/Linux	Quantum Mechanics

Work & Research Experience

Human-Centered Machine Learning — Sept 2019 – Present
Graduate Student Researcher — UC Santa Cruz

- Published fixed-point analysis of dynamical systems of mutual learners using evolutionary game theory [3].
- Discovered exact, least-squares correspondence between replicator dynamics and natural gradient descent [5].
- Established adversarial bounds for constraint violation by data-driven policy due to distribution shift [4].
- Proposed constrained optimization algorithm for machine learning with policy-induced distribution shift [7].
- Adapted online reinforcement learning methods to systems of mutually interacting learners [6].
- Wrote multi-agent simulations in Python using JAX and Taichi for GPU acceleration.

Breadware, Inc. — Oct 2016 – Aug 2018
Software Developer — Reno, NV

- Mapped abstract hardware APIs to I2C bus protocols for modular embedded devices (Python, C).
- Implemented web-based testing of user-logic for embedded devices in simulated environments (JavaScript).
- Wrote scripts for automating electronic design tasks, such as PCB layout (Python).

Josephson Junction Quantum Computing — Feb 2013 – Jun 2015
Undergraduate Intern — UC Santa Barbara

- Wrote software to automate phase-noise characterization of GHz oscillators (Python).
- Calculated effect of first-order IQ-mixing imperfections on superconducting quantum gate error [2].

Organic Electric Devices and Characterization — Jan – Jul 2011
Undergraduate Intern — UC Santa Barbara

- Fit models for spectroscopic ellipsometry to measurements on organic molecules [1].
- Conducted laser-induced photoluminescence decay measurements and fit to physical models [1].
- Performed atomic force microscopy measurements and performed statistical analyses.

Teaching Experience

Machine Learning Basics — Winter 2022 | Spring 2021
Course Design Consultant — UC Santa Cruz

- Designed autograding infrastructure providing instant assignment feedback for a class of ~ 100 students (Python).
- Authored interactive assignments with automated tests, written assignments, and exams (Python).
- Led grading team of undergraduates.

*Anticipated

Machine Learning Fall 2020
Teaching Assistant UC Santa Cruz

- Authored and graded written assignments on machine learning fundamentals.
- Presented supplementary material to students in discussion sections.

The Summer Science Program Summer 2016 | Summer 2015
Teaching Assistant and Residential Mentor Boulder, CO | Socorro, NM

- Mentored advanced high school students in a residential university environment.
- Graded assignments in celestial mechanics, programming, and mathematics.
- Supervised student operations in observational astronomy.

Fellowships & Awards

2024	Dissertation Year Fellowship (Winter)	UC Santa Cruz
2023	Dissertation Year Fellowship (Fall)	UC Santa Cruz
2023	Best Paper Runner-Up [6]	ICLR[†] (RMTL[‡] Workshop)
2023	Highlighted Paper [6]	ICLR (RMTL Workshop)
2022	ARCS Scholar	ARCS Foundation, Inc. (Northern California Chapter)
2021	Advancement with Honors	UC Santa Cruz
2021	Spotlight Paper [3]	NeurIPS[§]
2019	Regents Fellowship	UC Santa Cruz
2019	Dean's Fellowship	UC Santa Cruz
2015	High Honors (BSc in Physics)	UC Santa Barbara
2015	Distinction in the Major (Physics)	UC Santa Barbara
2013	Education Abroad Scholarship	UC (All Campuses)
2013	Education Abroad Scholarship	UC Santa Barbara
2011	Undergraduate Research Fellowship	UC Santa Barbara

Publications

[7] Fair Participation via Sequential Policies.
Reilly Raab, Ross Boczar, Maryam Fazel, and Yang Liu. *AAAI*, 2024.

[6] Long-Term Fairness with Unknown Dynamics.
Tongxin Yin[¶], **Reilly Raab**[¶], Mingyan Liu, and Yang Liu. *NeurIPS*, 2023.

[5] Conjugate Natural Selection.
Reilly Raab, Luca de Alfaro, and Yang Liu. *arXiv Preprint*, 2023.

[4] Fairness Transferability Subject to Bounded Distribution Shift.
Yatong Chen[¶], **Reilly Raab**[¶], and Yang Liu. *NeurIPS*, 2022.

[3] Unintended Selection: Persistent Qualification Rate Disparities and Interventions.
Reilly Raab and Yang Liu. *Neurips* ***[Spotlight Paper Award]***, 2021.

[2] Single-Gate Error for Superconducting Qubits Imposed by Sideband Products of IQ Mixing.
Reilly P. Raab. *UC Santa Barbara Physics Department Website*, 2015.

[1] Systematic Study of Exciton Diffusion Length in Organic Semiconductors by Six Experimental Methods.
Jason Lin **et al**. *Materials Horizons*, 2014.

[†] International Conference on Learning Representations (ICLR)
[‡] Trustworthy and Reliable Large-Scale Machine Learning Models (RTML)
[§] Conference on Neural Information Processing Systems (NeurIPS)
[¶] Equal contribution