

Sarah Dean

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RESEARCH INTERESTS	<i>I study the interplay between optimization, machine learning, and dynamics in real-world systems with the goal of understanding the fundamentals of data-driven methods for control and decision-making. My research is grounded in collaborative projects ranging from robotics to recommendation systems.</i>		
ACADEMIC POSITIONS	Assistant Professor, Department of Computer Science <i>Cornell University, Ithaca, NY.</i>	Jan 2022 – present	
	Postdoctoral Scholar, Paul G. Allen School of Computer Science & Engineering <i>University of Washington, Seattle, WA.</i> Advised by Prof. Jamie Morgenstern.	Aug 2021 – Dec 2021	
EDUCATION	University of California, Berkeley Ph.D., Electrical Engineering and Computer Science, August 2021. <i>Thesis: Reliable Machine Learning in Feedback Systems, advised by Prof. Benjamin Recht.</i> M.S., Electrical Engineering and Computer Science, May 2019. University of Pennsylvania B.S.E., Electrical Engineering and Mathematics, May 2016.		
HONORS AND AWARDS	Best Paper Finalist, <i>Conference on Robot Learning</i>		2020
	Best Paper Award, <i>NeurIPS Joint Workshop on AI for Social Good</i>		2019
	Best Paper Award, <i>International Conference of Machine Learning</i>		2018
	Best Student Paper in Imaging Systems, <i>OSA Imaging Applied Optics Congress</i>		2018
	Tong Leong Lim Pre-Doctoral Prize, <i>UC Berkeley EECS Department</i>		2018
	Atwater Kent Prize in Electrical Engineering, <i>University of Pennsylvania</i>		2016
	Albert P. Godsho Engineering Prize, <i>University of Pennsylvania</i>		2016
	Hugo Otto Wolf Memorial Prize, <i>University of Pennsylvania</i>		2016
	E. Stuart Eichert, Jr. Memorial Prize for Electrical Engineering, <i>University of Pennsylvania</i>		2015
	Good Teaching Award, <i>UPenn Math Department</i>		2015
GRANTS AND FELLOWSHIPS	AI2050 Early Career Fellowship, <i>Schmidt Sciences</i>		2024
	AWS Cloud Computing Grant, <i>Center for Data Science for Enterprise & Society</i>		2024
	2030 Project Fast Grant for Expanding Weather Data Coverage, <i>Cornell Atkinson</i>		2024
	NSF OAC Grant (co-PI), <i>Frameworks: arXiv as an accessible large-scale open research platform</i>		2024
	Research Award, <i>LinkedIn</i>		2023 and 2024
	Affinito-Stewart Award, <i>President’s Council of Cornell Women</i>	2023 NSF CCF Medium Grant (lead PI), <i>Machine Learning Markets: Dynamics, Competition, and Interventions</i>	2023
	Bias and Transparency in AI Award, <i>Mozilla Technology Fund</i>		2023
	Gift for Recommendations with Long-Term Strategic Objectives, <i>Wayfair</i>		2022
	Research Gift, <i>Meta</i>		2022
	Center for Longterm Cybersecurity Project Grant, <i>UC Berkeley</i>		2020
	Social Science Matrix Research Grant, <i>UC Berkeley</i>		2019
	Center for Longterm Cybersecurity Seed Grant, <i>UC Berkeley</i>		2019
	NSF Graduate Research Fellowship		2016
	Berkeley Fellowship, <i>UC Berkeley</i>		2016
	Tau Beta Pi Fellowship		2016
TEACHING	Instructor, Cornell University CS Department. <ul style="list-style-type: none">• Introduction to Machine Learning, Fall 2024. Co-teaching with Thorsten Joachims and John Thickstun.• Machine Learning in Feedback Systems, Fall 2022 and 2023.• Introduction to Reinforcement Learning, Spring 2022-2024. Graduate Student Instructor, University of California, Berkeley EECS Department. <ul style="list-style-type: none">• EECS Anti-Racism and Social Justice Course Development, Fall 2020.• Statistical Learning Theory, Fall 2019.• Introduction to Machine Learning, Fall 2018.		

Teaching Assistant, *John's Hopkins Center for Talented Youth at Skidmore College*.

- Electrical Engineering, Summer 2016.

Teaching Assistant, *University of Pennsylvania ESE Department*.

- Digital Audio Basics, Spring 2014, 2016.
- Introduction to Electrical and Systems Engineering. Fall 2013, 2014, 2015.

Teaching Assistant, *University of Pennsylvania Math Department*.

- Integral Calculus, Spring 2016.
- Multivariate Calculus, Fall 2014, Spring 2015.

Tutor, *University of Pennsylvania*.

- Multivariate Calculus, Spring 2013, Fall 2013, Spring 2014.
- Linear Algebra and Differential Equations, Fall 2013, Spring 2014.

INTERNSHIPS

Research Intern at Canopy

Summer 2019

Explored concepts relating to user agency and developed a computationally efficient audit of model "reachability."

SERVICE AND LEADERSHIP

Steering Committee for Northeast Systems and Control Workshop (2024–present). **Organizing Committee** for Workshop on Decision Making for Information Retrieval and Recommender Systems at WWW (2023) and Recommendation Ecosystems Workshop: Modeling, Optimization, and Incentive Design at AAAI (2024). **Publications Chair** for L4DC (2023).

Area Chair for NeuRIPS, ICML, and L4DC. **Conference reviewer** for ALT, ACC, CDC, ICML, ITCS, L4DC, and NeurIPS. **Journal reviewer** for IEEE-TAC, JMLR, SIMODS, and Springer Machine Learning.

Co-founder of Graduates for Engaged and Extended Scholarship in Computing and Engineering (geesegraduates.org), a cross-disciplinary group that aims to give graduate students a constructive place to reflect on issues of society and technology and **organizer** of affiliated panel and speaker events.

Women in Computer Science and Engineering lunch coordinator, 2018. **WITI@UC Women in Tech Symposium** planning committee, 2019.

Volunteer mentor for students in elementary school (Bay Area Scientists in Schools, 2017), middle school (Be A Scientist, 2016), high school (CalMentors, 2020), and college (BAIR Undergraduate Mentoring Program, 2017).

PUBLICATIONS

PREPRINTS

1. *Accounting for AI and Users Shaping One Another: The Role of Mathematical Models*. arXiv:2404.12366
Sarah Dean, Evan Dong, Meena Jagadeesan, Liu Leqi.
2. *Do Offline Metrics Predict Online Performance in Recommender Systems?* arXiv:2011.07931.
Karl Krauth, Sarah Dean, Alex Zhao, Wenshuo Guo, Mihaela Curmei, Benjamin Recht, and Michael I. Jordan.

CONFERENCE PAPERS

1. *Datasets for Navigating Sensitive Topics in Recommendation Systems*.
The Web Conference (WWW), 2025.
Amelia Kovacs, Jerry Chee, Sarah Dean.
2. *Initializing Services in Interactive ML Systems for Diverse Users*.
Advances in Neural Information Processing Systems (NeurIPS), 2023.
Avinandan Bose, Mihaela Curmei, Daniel L Jiang, Jamie Morgenstern, Sarah Dean, Lillian J Ratliff, Maryam Fazel.
3. *Harm Mitigation in Recommender Systems under User Preference Dynamics*.
ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), 2024.
Jerry Chee, Shankar Kalyanaraman, Sindu K Ernal, Udi Weinsberg, Sarah Dean, Stratis Ioannidis.
4. *Learning from Streaming Data when Users Choose*.
International Conference on Machine Learning (ICML), 2024.
Jinyan Su, Sarah Dean.

5. *Random Features Approximation for Control-Affine Systems*.
Learning for Dynamics and Control (L4DC), 2024.
Kimia Kazemian, Yahya Sattar, Sarah Dean.
6. *Strategic Usage in a Multi-Learner Setting*.
International Conference on Artificial Intelligence and Statistics (AISTATS), 2024.
Eliot Seo Shekhtman, Sarah Dean.
7. *Emergent specialization from participation dynamics and multi-learner retraining*.
International Conference on Artificial Intelligence and Statistics (AISTATS), 2024.
Sarah Dean, Mihaela Curmei, Lillian J. Ratliff, Jamie Morgenstern, Maryam Fazel.
8. *Ranking with Long-Term Constraints*
ACM International Conference on Web Search and Data Mining (WSDM), 2024.
Kianté Brantley, Zhichong Fang, Sarah Dean, Thorsten Joachims.
9. *Online Convex Optimization with Unbounded Memory*.
Advances in Neural Information Processing Systems (NeurIPS), 2023.
Raunak Kumar, Sarah Dean, Robert D. Kleinberg.
10. *Reward Reports for Reinforcement Learning*.
AAAI/ACM Conference on AI, Ethics, and Society (AIES), 2023.
Thomas Krendl Gilbert, Sarah Dean, Tom Zick, Nathan Lambert, Aaron Snoswell, Soham Mehta.
11. *Perception-Based Sampled-Data Optimization of Dynamical Systems*.
IFAC World Congress, 2023.
Liliaokeawawa Cothren, Gianluca Bianchin, Sarah Dean, Emiliano Dall’Anese.
12. *Modeling Content Creator Incentives on Algorithm-Curated Platforms*.
International Conference on Learning Representations, 2023.
Jiri Hron, Karl Krauth, Michael I. Jordan, Niki Kilbertus, Sarah Dean.
13. *Preference Dynamics Under Personalized Recommendations*.
ACM Conference on Economics and Computation, 2022.
Sarah Dean and Jamie Morgenstern.
14. *Towards Robust Data-Driven Control Synthesis for Nonlinear Systems with Actuation Uncertainty*.
IEEE Conference on Decision and Control (CDC), 2021.
Andrew J. Taylor, Victor D. Dorobantu, Sarah Dean, Benjamin Recht, Yisong Yue, and Aaron D. Ames.
15. *Quantifying Availability and Discovery in Recommender Systems via Stochastic Reachability*.
International Conference on Machine Learning (ICML), 2021.
Mihaela Curmei, Sarah Dean, and Benjamin Recht.
16. *Certainty-Equivalent Perception-Based Control*.
Learning for Dynamics and Control (L4DC), 2021.
Sarah Dean and Benjamin Recht.
17. *AI Development for the Public Interest: From Abstraction Traps to Sociotechnical Risks*.
IEEE International Symposium on Technology and Society (ISTAS), 2020.
McKane Andrus, Sarah Dean, Thomas Krendl Gilbert, Nathan Lambert, and Tom Zick.
18. *Guaranteeing Safety of Learned Perception Modules via Measurement-Robust Control Barrier Functions*.
Conference on Robot Learning (CoRL), 2020.
Sarah Dean, Andrew Taylor, Ryan Cosner, Benjamin Recht, and Aaron Ames.
19. *Balancing Competing Objectives with Noisy Data: Score-Based Classifiers for Welfare-Aware Machine Learning*.
International Conference on Machine Learning (ICML), 2020.
Esther Rolf, Max Simchowitz, Sarah Dean, Lydia T. Liu, Daniel Bjorkegren, Moritz Hardt, and Joshua Blumensstock.
20. *Robust Guarantees for Perception-Based Control*.
Learning for Dynamics and Control (L4DC), 2020.
Sarah Dean, Nikolai Matni, Benjamin Recht, and Vickie Ye.
21. *Recommendations and User Agency: The Reachability of Collaboratively-Filtered Information*.
Conference on Fairness, Accountability, and Transparency (FAccT), 2020.
Sarah Dean, Sarah Rich, and Benjamin Recht.

22. *Safely Learning to Control the Constrained Linear Quadratic Regulator*.
American Controls Conference (ACC), 2019.
Sarah Dean, Stephen Tu, Nikolai Matni, and Benjamin Recht.
23. *Regret Bounds for Robust Adaptive Control of the Linear Quadratic Regulator*.
Advances in Neural Information Processing Systems (NeurIPS), 2018.
Sarah Dean, Horia Mania, Nikolai Matni, Benjamin Recht, and Stephen Tu.
24. *Delayed Impact of Fair Machine Learning*.
International Conference on Machine Learning (ICML), 2018.
Lydia T. Liu, Sarah Dean, Esther Rolf, Max Simchowitz, and Moritz Hardt.

JOURNAL ARTICLES

1. *Axes for Sociotechnical Inquiry in AI Research*.
IEEE Transactions on Technology and Society, 2021.
Sarah Dean, Thomas Krendl Gilbert, Nathan Lambert, and Tom Zick.
2. *High-throughput fluorescence microscopy using multi-frame motion deblurring*.
Biomedical Optics Express, 2020.
Zachary Phillips, Sarah Dean, Laura Waller, and Benjamin Recht.
3. *On the Sample Complexity of the Linear Quadratic Regulator*.
Foundations of Computational Mathematics, 2019.
Sarah Dean, Horia Mania, Nikolai Matni, Benjamin Recht, and Stephen Tu.

WHITEPAPERS

1. *Choices, Risks, and Reward Reports: Charting Public Policy for Reinforcement Learning Systems*.
Center for Long-Term Cybersecurity Whitepaper Series, 2022.
Thomas Krendl Gilbert, Sarah Dean, Tom Zick, Nathan Lambert.

WORKSHOP PAPERS

1. *Recommender Systems as Dynamical Systems: Interactions with Viewers and Creators*.
Workshop on Recommendation Ecosystems: Modeling, Optimization and Incentive Design at AAAI, 2024.
Sarah Dean, Evan Dong, Meena Jagadeesan, Liu Leqi.
2. *To ask or not to ask: Robot-assisted bite acquisition with human-in-the-loop contextual bandits*.
Out-of-Distribution Generalization in Robotics at Conference on Robot Learning (CoRL), 2023.
Rohan Banerjee, Sarah Dean, Tapomayukh Bhattacharjee.
3. *Random Features Approximation for Fast Data-Driven Control*.
Gaussian Processes, Spatiotemporal Modeling, and Decision-making Systems NeuRIPS 2022.
Kimia Kazemian and Sarah Dean.
4. *Cross-Dataset Propensity Estimation for Debiasing Recommender Systems*.
Workshop on Distribution Shifts: Connecting Methods and Applications at NeurIPS 2022.
Fengyu Li and Sarah Dean.
5. *Engineering a Safer Recommender System*.
Responsible Decision Making in Dynamic Environments Workshop at ICML 2022.
Liu Leqi and Sarah Dean.
6. *Reward Reports for Reinforcement Learning*.
Responsible Decision Making in Dynamic Environments Workshop at ICML 2022.
Thomas Krendl Gilbert, Sarah Dean, Tom Zick, Nathan Lambert, Aaron Snoswell.
7. *Designing Recommender Systems with Reachability in Mind*.
Participatory Approaches to Machine Learning Workshop at ICML 2020.
Sarah Dean, Mihaela Curmei, and Benjamin Recht.
8. *Balancing Competing Objectives for Welfare-Aware Machine Learning with Imperfect Data*.
AI for Social Good Workshop at NeurIPS 2019.
Esther Rolf, Max Simchowitz, Sarah Dean, Lydia T. Liu, Daniel Bjorkegren, Moritz Hardt, and Joshua Blumenstock.

9. *Optimal Path and Illumination Design for Multiframe Motion Deblurring*. OSA Imaging and Applied Optics Congress 2018.
Sarah Dean, Zachary Phillips, Laura Waller, and Benjamin Recht.
10. *A Broader View on Bias in Automated Decision-Making: Reflecting on Epistemology and Dynamics*. Workshop on fairness, accountability, and transparency in machine learning. (FAT/ML), 2018.
Roel Dobbe, Sarah Dean, Thomas Gilbert, and Nitin Kohli.

INVITED TALKS

- *Foundations for Learning with Human Interaction & Dynamics*, Lehigh AIRLab Seminar, September 2024.
- *Learning Preference Dynamics from Partial Observations*
 - ICML Workshop on Foundations of RL and Control, July 2024.
 - Princeton Workshop on Optimization, Learning, and Control, June 2024.
- *Learning Models of Dynamical Systems from Finite Observations*, IFAC Symposium on SysId Plenary, July 2024.
- *User Dynamics in Machine Learning Systems*
 - Princeton Networks & Cognition Workshop, June 2023.
 - Brookings Virtual Seminar on AI, Economics, and Public Policy, July 2023.
 - ICML Workshop on Humans, Algorithmic Decision-Making and Society, July 2024.
- *On Uniform Error Bounds and Guarantees for Perception-Based Control*, ACC Workshop on Safe & Robust Learning for Perception-based Planning and Control, May 2023.
- *Online Convex Optimization with Unbounded Memory*, ACC Workshop on Online Optimization Methods for Data-driven Feedback Control, May 2023.
- *Preference and Participation Dynamics in Learning Systems*
 - L4DC Keynote, June 2022.
 - Cornell AI Seminar, September 2022.
 - NYU Math and Data Seminar, February 2023.
 - Cornell Econometrics Reading Group, May 2023.
- *Feedback, Dynamics, and Safety in Machine Learning Systems*, NCCR Symposium on Socially responsible Automation, October 2022.
- *Data-driven Control and Decision-making in Feedback Systems*, Cornell CAM Colloquium, January 2022.
- *Towards Certifiably Safe Nonlinear Control with Sensor and Dynamics Uncertainties*
 - UCSD Dynamic Systems & Controls Seminar, December 2021.
 - CISS Invited Session on Safe Reinforcement Learning, March 2022.
 - Minisymposium on Learning from scarce data at SIAM Conference on Mathematics of Data Science, September 2022.
- *Quantifying Availability and Discovery in Recommender Systems via Reachability*, Cornell AI Seminar, September 2021.
- *Reliable Machine Learning in Feedback Systems*
 - Robotics Institute Seminar at Carnegie Mellon University, April 2021.
 - CS Department Colloquium at Princeton University, March 2021.
 - CS Seminar at Brown University, March 2021.
 - Allen School Colloquium at University of Washington, March 2021.
 - ECE Seminar at University of Michigan, March 2021.
 - CS Colloquium at NYU, March 2021.
 - ESE Spring Colloquium at University of Pennsylvania, March 2021.
 - ECE Seminar at University of Wisconsin at Madison, March 2021.
 - CS Seminar at Northeastern University, February 2021.
 - ECE Seminar at Cornell Tech, February 2021.
 - EECS Seminar at Massachusetts Institute of Technology, February 2021.
 - CSE Colloquium at University of Minnesota, February 2021.
 - MINDS Symposium on the Foundations of Data Science at Johns Hopkins University, February 2021.
 - CS Seminar at University of Chicago, February 2021.
 - CS Lecture at University of Texas at Austin, February 2021.
 - MS&E Seminar at Stanford University, January 2021.
 - CS Colloquium at Cornell University, January 2021.
 - Frontiers in Computing and Mathematical Sciences at California Institute of Technology, January 2021.
- *On the Sample Complexity of the Linear Quadratic Regulator*, RL Theory Virtual Seminar, May 2020.
- *Safe and Robust Perception-Based Control*
 - Stanford Robotics and Autonomous Systems Seminar, February 2020.
 - CDS Seminar at California Institute of Technology, February 2020.

- *Delayed Impact of Fair Machine Learning*, Sister Conferences Track at the International Joint Conferences on Artificial Intelligence, August 2019.
- *Guarantees for Learning-Enabled Control*, Interplay between Control, Optimization, and Machine Learning Workshop at the American Controls Conference, July 2019.
- *Safely Learning to Control the Linear Quadratic Regulator*, CITRIS/CPAR Control Theory and Automation Symposium, April 2019.