Lily Xu

lily_xu@g.harvard.edu
lily-x.github.io

EDUCATION	**Harvard University**. Cambridge, MA	expected 2024
	PhD Candidate in Computer Science	
	Advisor: Milind Tambe	
	Thesis committee: Dimitris Bertsimas, Yiling Chen, Andrew Davies	
	Dartmouth College. Hanover, NH	2018
	A.B. with Honors in Computer Science, minor in Spanish	
	Magna cum laude	

HONORS	Siebel Scholar	2023
	Awarded for academic excellence and demonstrated leadership	
	GATech Rising Star in EECS	2023
	Stanford Rising Star in Management Science and Engineering (MS&E)	2023
	Google PhD Fellowship	2022
	One of 13 awardees in machine learning globally.	
	INFORMS Doing Good with Good OR Competition Winner	2021
	Recognizes the "most exciting work performed by students in partnership with public and private organizations that yields tangible and beneficial outcomes for individuals, communities, and organizations".	
	AAAI Best Paper Award Runner Up	2021
	3 best papers and 3 runner-ups were selected out of 9,034 submissions and 1,692 accepted papers.	
	Certificate of Appreciation from the SMART Partnership	2019
	Recognition for contribution to developing PAWS system.	
	Five Citations for Academic Excellence at Dartmouth College	2014 – 2018
	Special distinction rarely awarded by faculty members "for meritorious characteristics not indicated adequately by academic grades", received across five computer science and Spanish courses.	
	Adobe Women-In-Technology Scholarship – Honorable Mention	2017

NON-PROFIT SERVICE	**SMART Conservation Partnership**.	
	AI Lead	2022 – present
	I work with SMART to effectively integrate AI, computation, and research into their conservation management activities. The SMART Partnership is the global leader in protected area solutions, consisting of 8 leading conservation NGOs: WWF, Wildlife Conservation Society, Wildlife Protection Solutions, Frankfurt Zoological Society, ZSL, NC Zoo, Panthera, and Re:wild.	

WORK EXPERIENCE	**Google Research**. India, AI for Social Good lab	
	Student Researcher	Spring 2022
	Google. Seattle, WA	
	Software Engineering Intern	Summer 2017
	Dyn, Inc. Hanover, NH	
	Data Analytics Research Intern	Spring 2016

* *indicates equal contribution*
† *indicates undergraduate I advised*
(α–β) *indicates alphabetical ordering*

Reinforcement learning with combinatorial actions for coupled restless bandits
Under review
Lily Xu, Bryan Wilder, Elias B. Khalil, Milind Tambe

Ranger patrols deter poaching: first causal insights for improving protected area management
Working paper
Rachel Guo†*, **Lily Xu***, Andrew Perrault, Luke W. Miratrix, Andrew J. Plumptre, Joshua Mabonga, Herbert Kitimbo, Fredrick Wanyama, Simon Nampindo, Milind Tambe, Andrew B. Davies

Artificial Replay: A Meta-Algorithm for Harnessing Historical Data in Bandits
Under review
(α–β) Siddhartha Banerjee, Sean R. Sinclair, Milind Tambe, **Lily Xu**, Christina Lee Yu

Reflections from the Workshop on AI-Assisted Decision Making for Conservation
White paper
Lily Xu*, Esther Rolf*, Sara Beery, Joseph R. Bennett, Tanya Berger-Wolf, Tanya Birch, Elizabeth Bondi-Kelly, Justin Brashares, Melissa Chapman, Anthony Corso, Andrew Davies, Nikhil Garg, Angela Gaylard, Robert Heilmayr, Hannah Kerner, Konstantin Klemmer, Vipin Kumar, Lester Mackey, Claire Monteleoni, Paul Moorcroft, Jonathan Palmer, Andrew Perrault, David Thau, Milind Tambe

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Bridging adaptive management and reinforcement learning for more robust decisions
Philosophical Transactions of the Royal Society B, 2023. Vol. 378, Issue 1881.
Melissa Chapman, **Lily Xu**, Marcus Lapeyrolerie, Carl Boettiger

Stay Ahead of Poachers: Illegal Wildlife Poaching Prediction and Patrol Planning Under Uncertainty with Field Test Evaluations
ICDE 2020. 36th IEEE International Conference on Data Engineering
Lily Xu*, Shahrzad Gholami*, Sara Mc Carthy, Bistra Dilkina, Andrew Plumptre, Milind Tambe, Rohit Singh, Mustapha Nsubuga, Joshua Mabonga, Margaret Driciru, Fred Wanyama, Aggrey Rwetsiba, Tom Okello, Eric Enyel

Dual-Mandate Patrols: Multi-Armed Bandits for Green Security
AAAI 2021. 35th AAAI Conference on Artificial Intelligence
Lily Xu, Elizabeth Bondi, Fei Fang, Andrew Perrault, Kai Wang, and Milind Tambe
   Best Paper Award Runner Up
   Top 6 of 1692 accepted papers

Envisioning Communities: A Participatory Approach Towards AI for

Social Good
 AIES 2021. 4th AAI/ACM Conference on AI, Ethics, and Society
Elizabeth Bondi*, **Lily Xu***, Diana Acosta-Navas, Jackson A. Killian

Robust Reinforcement Learning Under Minimax Regret for Green Security
 UAI 2021. 37th Conference on Uncertainty in Artificial Intelligence
Lily Xu, Andrew Perrault, Fei Fang, Haipeng Chen, Milind Tambe
   Oral Presentation
   Top 6.17% of submissions

Coordinating Followers to Reach Better Equilibria: End-to-End Gradient Descent for Stackelberg Games
 AAAI 2022. 36th AAAI Conference on Artificial Intelligence
Kai Wang, **Lily Xu**, Andrew Perrault, Michael K. Reiter, Milind Tambe

Ranked Prioritization of Groups in Combinatorial Bandit Allocation
 IJCAI 2022. 31st International Joint Conference on Artificial Intelligence
Lily Xu, Arpita Biswas, Fei Fang, Milind Tambe

Restless and Uncertain: Robust Policies for Restless Bandits via Deep Multi-Agent Reinforcement Learning
 UAI 2022. 38th Conference on Uncertainty in Artificial Intelligence
Jackson A. Killian, **Lily Xu**, Arpita Biswas, Milind Tambe

Optimistic Whittle Index Policy: Online Learning for Restless Bandits
 AAAI 2023. 37th AAAI Conference on Artificial Intelligence
Kai Wang*, **Lily Xu***, Aparna Taneja, Milind Tambe

Robust Planning over Restless Groups: Engagement Interventions for a Large-Scale Maternal Telehealth Program
 AAAI 2023. 37th AAAI Conference on Artificial Intelligence
Jackson A. Killian*, Arpita Biswas*, **Lily Xu***, Shresth Verma*, Vineet Nair, Aparna Taneja, Aparna Hegde, Neha Madhiwalla, Paula Rodriguez Diaz, Sonja Johnson-Yu, Milind Tambe

Flexible Budgets in Restless Bandits: A Proximal Primal-Dual Algorithm for Efficient Budget Allocation
 AAAI 2023. 37th AAAI Conference on Artificial Intelligence
Paula Rodriguez Diaz, Jackson A. Killian, **Lily Xu**, Aparna Taneja, Arun Sai Suggala, Milind Tambe

PUBLICATIONS (BOOK CHAPTERS)	**Environment, Society, and Machine Learning** *Oxford Handbook of the Sociology of Machine Learning* (2023) Caleb Scoville, Hilary Faxon, Melissa Chapman, Samantha Jo Fried, **Lily Xu**, Carl Boettiger, J. Michael Reed, Marcus Lapeyrolerie, Amy Van Scoyoc, Razvan Amironesei

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Observations and Machine Learning. Submitted to NASA in response to 2022
Research Opportunities in Space and Earth Sciences (ROSES) A.40 Earth Science
Applications: Ecological Conservation (ECON)

Lily Xu. Google PhD fellowship, awarded 2022. $88,029

INVITED TALKS | *Does not include contributed conference and workshop talks*

High-stakes decisions from low-quality data: AI decision-making for planetary health

Georgia Tech. EECS Rising Stars	November 2023
UC Berkeley. Data Science Toolbox Series	October 2023
INFORMS Annual Meeting. ML for Social Good session	October 2023
Cornell ORIE. Young Researchers Workshop	October 2023

Causal AI and Conservation

ICCB. SMART Symposium, Kigali, Rwanda	July 2023
Microsoft Research New England. Machine Learning Ideas seminar	June 2023
United Nations ITU. AI for Good Summit	June 2023
WWF. Fuller Seminar Series on Conservation AI	April 2023

Minimax Regret Optimization: Robust Planning for Conservation and Maternal Health

Berkeley MARL. Multi-Agent Learning Seminar	March 2023
Brown University. Algorithmic Game Theory group	March 2023

Learning and Planning Under Uncertainty for Wildlife Conservation

Harvard Kennedy School. "Leading in AI" Executive Education	July 2023
Penn State. CSRAI Young Achievers Symposium	March 2023
UC Berkeley. Global Policy Lab	February 2023
Centro de Analítica para Políticas Públicas (CAPP). (in Spanish)	December 2022
Georgia Tech. ISyE seminar	November 2022
Analytics for a Better World.	September 2022
Harvard Kennedy School. "Leading in AI" Executive Education	July 2022
UC Berkeley. Ethics and Practices of Algorithmic Conservation	April 2022
UCL. Climate Hack AI Competition, *keynote*	March 2022
Harvard University. AI-Assisted Decision-Making Colloquium	February 2022
Pasteur's Quadrant. Seminar Series	February 2022
INFORMS. Doing Good with Good OR Finalists	October 2021

Ranked Prioritization of Groups in Combinatorial Bandit Allocation

Sony. Computer Science Laboratories (CSL) Paris	October 2022
Stanford. Computing & Society group	October 2022
INFORMS Annual Meeting. Fairness in Sequential Decision Making	October 2022

Envisioning Communities: A Participatory Approach to AI for Social Good

MIT. AI Ethics group	September 2022
Women's Forum. Women4AI Daring Circle workshop	June 2022

Robust Reinforcement Learning Under Minimax Regret for Green Security

Google Research India. AI for Social Good research group	January 2022

PAWS: AI to Predict and Plan Against Poaching

ICCB. International Congress for Conservation Biology		December 2021
IUCN WCC. World Conservation Congress		September 2021
WILDLABS. Tech Tutors: Season Three		September 2021
AI for Climate. Mexico Talk Series powered by Huawei		July 2021
SMART Partnership. International Women's Day Webinar		March 2021
WWF. Webinar on SMART		April 2020
AI LA. Earth Summit		April 2021

Dual-Mandate Patrols: Multi-Armed Bandits for Green Security

Beijing Academy of Artificial Intelligence.	March 2021
University College London. AI Society	February 2021

INVITED PANELS	*Hertz Foundation Workshop.* AI Science and Policy, *moderator*	July 2022
	panelists: Jacob Steinhardt, Julie Owono, Jessica Fjeld	
	South by Southwest (SXSW). AI for Wildlife, *panelist*	March 2021
	Harvard CRCS. AI for Social Impact, *moderator*	March 2020
	panelists: Susan Murphy, Erez Yoeli, Desmond Patton	

PROFESSIONAL SERVICE	**Mechanism Design for Social Good (MD4SG)**	
	Nonprofit incorporation and Executive Director recruitment, lead	April 2023 –
	MD4SG initiative-wide co-organizer	March 2021 –
	with Charles Cui, Francisco J. Marmolejo Cossío, George Obaido,	
	Matthew Olckers, and Ana-Andrea Stoica;	
	previously with Rediet Abebe, Irene Lo, and Wanyi Li	
	Community Engagement team, founder and co-lead	Oct 2020 – Apr 2021
	Working Group on Environment, co-founder and co-organizer	Jan 2020 – Apr 2021

Workshop Organization

Co-organizer, AI-Assisted Decision Making for Conservation Workshop	October 2022
with Esther Rolf and Milind Tambe	
Organizer, SMART/PAWS Workshop. Rio Bravo, Belize	August 2022
Lead organizer, Harvard CRCS Rising Stars Workshop	March 2020
Co-organizer, Computational Sustainability Doctoral Consortium	October 2019
with Priya Donti, Genevieve Flaspohler, Aaron Ferber, and Sebastian Ament	

Tutorials

Lead organizer, AI for Social Impact tutorial @ EAAMO	October 2023
with Emily Aiken, Priya Donti, Nikhil Garg, and Paul Gölz	

Panels

Co-organizer and co-moderator. The Future of AI for Social Impact	April 2022
panelists: Fei Fang, Lynn Kaack, Danaë Metaxa, Bryan Wilder	

Conference Event Organization

Social co-chair, ACM EAAMO'23	October 2023
Social co-chair, ACM EAAMO'22	October 2022
Social co-chair, ACM EAAMO'21	October 2021
Social co-chair, Fourth Workshop on MD4SG	August 2020

Seminar Organization

Co-organizer, Harvard CRCS Social Impact Seminar Series	Spring 2022

Co-organizer, Harvard CRCS Rising Stars Speaker Series	April 2021
Co-organizer, CompSust Open Graduate Seminar (COGS)	Spring 2020

Program Committee (Reviewing)

→ *Conferences*

AIES. Artificial Intelligence, Ethics, and Society	2022, 2023
AAAI. AAAI Conference on Artificial Intelligence	2023
AAAI AISI track. AAAI Conference on Artificial Intelligence	2020, 2021, 2022
COMPASS. ACM SIGCAS Conference on Computing and Sustainable Societies 2021	
EAAMO. Equity and Access in Algorithms, Mechanisms, and Optimization 2021, 2022, 2023	
FAccT. ACM Conference on Fairness, Accountability, and Transparency	2022, 2023
IAAI. AAAI Innovative Applications of Artificial Intelligence	2023
NeurIPS. Neural Information Processing Systems	2023
UAI. Uncertainty in Artificial Intelligence	2023

→ *Workshops*

AI for Wildlife Conservation @ SIGSPATIAL	2023
Autonomous Agents for Social Good (AASG) @ AAMAS	2021, 2023
AI for Social Good @ AAAI	2023
Data-Driven Humanitarian Mapping @ KDD	2020, 2021, 2022
Regulating Machine Learning @ NeurIPS	2023
Computational Sustainability @ NeurIPS	2023
Cooperative AI Workshop @ NeurIPS	2022
Black in AI Workshop @ NeurIPS	2020, 2021, 2022
Machine Learning for the Developing World (ML4D) @ NeurIPS	2020, 2021
Machine Learning for Public Health @ NeurIPS	2021
Resistance AI @ NeurIPS	2020
AI for Social Good @ IJCAI	2020
Mechanism Design for Social Good (MD4SG)	2020
AI for Social Good @ Harvard CRCS	2020

Competition Selection Committee

AI2, EarthRanger Conservation Tech Award	2022, 2023

Reviewer

Deep Learning Indaba	2022
Caltech Computer Vision for Ecology (CV4Ecology) Summer School	2022
ICML, *subreviewer*	2021
NeurIPS, *subreviewer*	2020
IJCAI Special Track on CompSust and Human Well-being, *subreviewer*	2020
COMPASS, *subreviewer*	2019
Bloomberg Data for Good Exchange (D4GX), *subreviewer*	2019

STUDENTS ADVISED → *At Harvard College*

Vincent Börsch-Supan '25	Sept 2022 –
Alejandra Perea Rojas '24	June 2022 – Dec 2022
Christopher Ong '23	Spring 2022
April Chen '22	Summer 2021
Adobe Research Women-In-Technology Scholarship Winner	
Ezenia Diaz-Lembert '23	Spring 2021
Emilia Cabrera '21	Sept 2020 – Dec 2021

*Thesis: Protecting the Lion's Share: Mitigating Illegal Wildlife Poaching
with Multi-Agent Reinforcement Learning*

Rachel Guo '22   June 2020 – May 2023

   NCWIT Collegiate Award Winner
   CRA Outstanding Undergraduate Researcher Award — Honorable Mention
   Harvard Hoopes Prize for Outstanding Thesis
   NSF Graduate Research Fellowship
   *Thesis: On the Effect of Ranger Patrols on Deterring Poaching: A Bayesian
    Approach for Causal Inference Using Field Tests as an Instrument*
   Next step: Stanford ICME PhD student

TEACHING
EXPERIENCE

→   *Guest Lecturer*

Cornell Tech. CS 6382. Data Science for Social Change		Fall 2023
Cornell Tech. ORIE 5355/INFO 5370. Applied Data Science: Decision-making beyond prediction		Fall 2023
Harvard. CS 182. Artificial Intelligence		Fall 2023
Cornell. INFO 6960. Data Science for Global Development		Spring 2023
MIT. 15 076. Analytics for a Better World		Spring 2023
Harvard. CS 96. Machine Learning for Social Impact		Spring 2023
Wellesley. CS 115. Computing for the Socio-Techno Web		Fall 2022
Ohio State. CSE 3521. Survey of Artificial Intelligence I		Fall 2022
Harvard. CS 288. AI for Social Impact class		Fall 2022
University of Southern California. ISE 599. Analytics for Social Impact		Spring 2022
University of Pennsylvania. OIDD 941. Recent Advances in Data-Driven Decision-Making		Spring 2022
Harvard. CS 96. Machine Learning for Social Impact		Spring 2022
Cornell Tech. ORIE 5355/INFO 5370. People, Data, Systems		Fall 2021
Harvard Business School. HBSMBA 2231. From Data to Decisions		Fall 2021
Wellesley. CS 115. Computing for the Socio-Techno Web		Fall 2021
Australian National University. CECS8001. Building Cyber-Physical Systems		Fall 2021
University of Pittsburgh. CS 1699. AI for Good: Ethics and Implications		Spring 2021
University of Michigan. SI 431. Algorithms and Society		Spring 2021
Harvard. CS 182. Artificial Intelligence		Fall 2020
Dartmouth. CS 11. Foundations of Applied Computer Science		Spring 2018

Harvard University

→   *Head Teaching Fellow*

CS 182: Artificial Intelligence	Fall 2020

Certificate of Distinction in Teaching

Dartmouth College

→   *Teaching Assistant, Department of Computer Science*

CS 31: Algorithms	Winter 2017
CS 11: Foundations of Applied Computer Science, *head TA*	Spring 2018
CS 10: Object-Oriented Programming	Spring 2016
CS 10: Object-Oriented Programming	Spring 2015
CS 1: Intro to Programming and Computation	Spring 2018
CS 1: Intro to Programming and Computation	Fall 2017
CS 1: Intro to Programming and Computation	Spring 2017
CS 1: Intro to Programming and Computation	Winter 2016
CS 1: Intro to Programming and Computation	Fall 2015

→	*Teaching Assistant, Tuck School of Business*	
	Tuck FWP: Fundamentals of Web Programming	Spring 2017
	Tuck DSA: Data Structures and Analytics	Spring 2017

OUTREACH

Speaking

Harvard. Tech for Social Good and Harvard Computer Society	March 2023
Harvard SEAS. PhD Admitted Students Open House, *panelist*	March 2021
Harvard SEAS. Research Labs Open House	November 2020
GirlsComputingLeague. AInnovation Business Summit	September 2020
IEEE Computer Society. Women in Computing, Kerala Chapter	September 2020
Data Science Africa. Tutorial on MD4SG and the Environment	July 2020
Ledyard Canoe Club. Inclusivity in the Outdoors	July 2020
Dartmouth. Women in Computer Science, *panelist*	May 2020
Harvard SEAS. Diversity, Inclusivity, and Belonging, *panelist*	May 2020
Center for Initiatives in Jewish Education. High school student visit	March 2020
World Science Festival. Science and Storytime	June 2019
L.A. Unified School District (LAUSD). African American Family Day	May 2019
Zoo Magnet High School. College and Career Day	November 2018

Mentoring

Harvard University. InTouch Peer Mentor	2020 –
Harvard University. Women in STEM Mentor	2019 – 2020
Dartmouth College. Women in Computer Science	2017 – 2018

Volunteering

Harvard SEAS. A Guide to Your PhD	October 2020
Harvard University. Project Teach	April 2020
Cambridge Public Schools. STEAM It Up!	October 2019
Hustle N' Code. Hackathon, *technical lead*	December 2018

Hustle N' Code is a Los Angeles hackathon for youth in public housing.
My team won first place, and the four students each received a laptop.

PRESS

Case Studies

Harvard Business School. SMART: AI and ML for Wildlife Conservation   October 2022

Podcasts

Ecochat. AI for Conservation - Using Machine Learning to Stop Poaching   2023
Cold Call (Harvard Business School podcast). Can AI and Machine Learning Help Park Rangers Prevent Poaching?   2023
INFORMS Resoundingly Human Podcast.   May 2022
Rethinking Economics NL. Disruptive Technologies podcast series.   May 2021

Video

AIhub. New Voices in AI: environmental conservation with Lily Xu.   October 2022
Voice of America (VOA) News. Wildlife Rangers Use AI to Predict Poachers' Next Moves.   January 2022

Articles

Business Insider. Conservationists are using artificial intelligence to map out the best ways for saving threatened wildlife and resources   October 2022
Oxford Science. AI in conservation: a modern-day solution to the biodiversity

crisis?   March 2022

The Hill. These new technologies could transform wildlife conservation.   February 2022

Harvard SEAS. Computer Conservation.   November 2021

AIhub. Interview with Lily Xu.   October 2021

Engadget. PAWS anti-poaching AI predicts where illegal hunters will show up next. March 2021

Mongabay. Where to patrol next: 'Netflix' of ranger AI serves up poaching predictions.   November 2020

Harvard SEAS. Preventing poaching.   June 2020

BBC Sounds. How tech is tackling wildlife trafficking.   June 2020

BBC World Service. Using technology to take on poachers.   August 2019

USC Viterbi Magazine. AI is for Animals.   April 2019