Lily Xu

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

EDUCATION	**Harvard University**. Cambridge, MA	2019 – present
	PhD Candidate, School of Engineering and Applied Sciences	
	Advised by Prof. Milind Tambe	
	Dartmouth College. Hanover, NH	2014 – 2018
	A.B. with Honors in Computer Science, minor in Spanish	
	Magna cum laude	

HONORS AND AWARDS		
	Google PhD Fellowship	2022
	INFORMS Doing Good with Good OR Competition Winner	2021
	AAAI Best Paper Award Runner Up	2021
	Harvard University Certificate of Distinction in Teaching	2021
	Certificate of Appreciation from the SMART Consortium	2018
	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."

    Computational Photography (Wojciech Jarosz, CS 89.15)
    Latin American Film (Silvia Spitta, Spanish 63.01)
    Computer Graphics (Emily Whiting, CS 77)
    Object-Oriented Programming (Travis Peters, CS 10)
    Introduction to Programming and Computation (Hany Farid, CS 1)

	Adobe Women-In-Technology Scholarship – Honorable Mention	2017
	Rick Angulo World Experience Award	2016

For "intellectual openness, enthusiasm, and impressive academic performance" following a study abroad program in Cusco, Peru. Award in $1,500.

	James O. Freedman Presidential Scholar	2016
	Willis S. Fitch '17 Metropolitan Washington Scholarship	2015
	Bank of America's Joe Martin Scholarship	2014

NON-PROFIT SERVICE	**SMART Conservation Partnership.**	
	AI Lead	2022 – present

I advise SMART on how to effectively integrate AI, computation, and research into their management activities. The SMART Partnership is the global leader in protected area solutions, consisting of 9 leading conservation NGOs: WWF, WCS, Peace Parks Foundation, Wildlife Protection Solutions, Frankfurt Zoological Society, ZSL, NC Zoo, Panthera, and Re:wild.

PUBLICATIONS

* *indicates equal contribution*
† *indicates undergraduate I advised*
$(\alpha-\beta)$ *indicates alphabetical ordering*

Ranger Patrols Deter Poachers: Causal Inference with Bayesian Modeling and Field Tests as an Instrument
In preparation; preliminary at EAAMO 2022
Rachel Guo†, **Lily Xu**, Andrew Perrault

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

Decisions without models: Bridging adaptive management and artificial intelligence
Under review
Melissa Chapman, **Lily Xu**, Marcus Lapeyrolerie, Carl Boettiger

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

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

Robust Planning over Restless Groups: Engagement Interventions for a Large-Scale Maternal Telehealth Program
AAAI 2023. Thirty-Seventh 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

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

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

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

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

Envisioning Communities: A Participatory Approach Towards AI for Social Good
AIES 2021. Proc. 4th AAI/ACM Conference on AI, Ethics, and Society
Elizabeth Bondi*, **Lily Xu***, Diana Acosta-Navas, Jackson A. Killian

Dual-Mandate Patrols: Multi-Armed Bandits for Green Security
AAAI 2021. Proc. 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 (top 0.08% of submissions)

Stay Ahead of Poachers: Illegal Wildlife Poaching Prediction and Patrol Planning Under Uncertainty with Field Test Evaluations
 ICDE 2020. Proc. 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

WORKSHOP PAPERS	**Enhancing Poaching Predictions for Under-Resourced Wildlife Conservation Parks Using Remote Sensing Imagery**

 NeurIPS MD4D. Workshop on Machine Learning for Development 2020
Rachel Guo†, **Lily Xu**, Andrew Plumptre, Drew Cronin, Francis Okeke, and Milind Tambe
    [Best Lightning Paper](#)

Game Theory on the Ground: The Effect of Increased Patrols on Deterring Poachers
Working paper
Appeared at Harvard CRCS Workshop on AI for Social Good 2020
Lily Xu, Andrew Perrault, Andrew Plumptre, Margaret Driciru, Fred Wanyama, Aggrey Rwetsiba, and Milind Tambe

A High-Performance Graph Model for Near-Optimal Payments for Ecosystem Services
Working paper
Appeared at Mechanism Design for Social Good (MD4SG) Workshop 2020
Florian Berlinger*, **Lily Xu***, Yiling Chen
*Equal contribution

RESEARCH EXPERIENCE	**Harvard University**. Cambridge, MA	
	Doctoral Research Assistant	2019 – present
	Advised by Prof. Milind Tambe	
	University of Southern California. Los Angeles, CA	
	Doctoral Research Assistant	2018 – 2019
	Advised by Prof. Bistra Dilkina and Prof. Milind Tambe	
	Dartmouth College. Hanover, NH	
	Undergraduate Senior Thesis Researcher	2017 – 2018
	Advised by Prof. Amro Farid	
	Presidential Scholar Research Assistant	2016 – 2017
	Advised by Prof. Emily Whiting and Prof. David Kotz	
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

Teaching Experience	→ *Guest Lecturer*	
	Harvard University. CS 288. AI for Social Impact	Fall 2022
	Wellesley University. CS 115. Computing for the Socio-Techno Web	Fall 2022
	Ohio State University. CSE 3521. Survey of Artificial Intelligence I	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 University. CS 96. Machine Learning for Social Impact	Spring 2022
	Cornell Tech. ORIE 5355/INFO 5370. People, Data, Systems	Fall 2021
	Wellesley University. 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 University. CS 182. Artificial Intelligence	Fall 2020
	Dartmouth College. CS 11. Foundations of Applied Computer Science	Spring 2018

Harvard University
→ *Head Teaching Fellow*
CS 182: Artificial Intelligence Fall 2020

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

Students Advised	→ *At Harvard College*	
	Vincent Börsch-Supan '25	Sept 2022 –
	Alejandra Perea Rojas '24	June 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 –
	NCWIT Collegiate Award Winner	

CRA Outstanding Undergraduate Researcher Award — Honorable Mention
Harvard Hoopes Prize for Outstanding Thesis
Thesis: On the Effect of Ranger Patrols on Deterring Poaching: A Bayesian
Approach for Causal Inference Using Field Tests as an Instrument

<table>
<tr><td>PROFESSIONAL
SERVICE</td><td colspan="2">Initiative Organization</td></tr>
<tr><td></td><td>Co-organizer, Mechanism Design for Social Good (MD4SG)</td><td>March 2021 –</td></tr>
<tr><td></td><td>Co-lead, MD4SG Community Engagement</td><td>Oct 2020 – Apr 2021</td></tr>
<tr><td></td><td>Co-organizer, MD4SG Working Group on Environment</td><td>Jan 2020 – Apr 2021</td></tr>
</table>

Program Organization

Co-organizer, AI-Assisted Decision Making for Conservation Workshop at Harvard CRCS	October 2022
Social chair, ACM EAAMO'22	October 2022
Organizer, SMART/PAWS Workshop. Rio Bravo, Belize	August 2022
Co-organizer, Harvard CRCS Panel on the Future of AI for Social Impact	April 2022
Co-organizer, Harvard CRCS Social Impact Seminar Series	Spring 2022
Social co-chair, ACM EAAMO'21	October 2021
Co-organizer, Harvard CRCS Rising Stars Speaker Series	April 2021
Co-organizer, CompSust Open Graduate Seminar (COGS)	Spring 2020
Social co-chair, Fourth Workshop on MD4SG	August 2020
Lead organizer, Harvard CRCS Rising Stars Workshop	March 2020
Co-organizer, Computational Sustainability Doctoral Consortium	October 2019

Program Committee (Reviewing)

→   *Conferences*

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

→   *Workshops*

RL Ready for Production Workshop @ AAAI	2023
AI for Social Good Workshop @ AAAI	2023
Cooperative AI Workshop @ NeurIPS	2022
Data-Driven Humanitarian Mapping @ KDD	2020, 2021, 2022
Black in AI Workshop @ NeurIPS	2020, 2021, 2022
Machine Learning for the Developing World (ML4D) @ NeurIPS	2020, 2021
Machine Learning for Public Health (ML4PH) @ NeurIPS	2021
Autonomous Agents for Social Good (AASG) Workshop @ AAMAS	2021
AI for Social Good Workshop @ IJCAI	2020
Resistance AI @ NeurIPS	2020
Fourth Workshop on Mechanism Design for Social Good (MD4SG)	2020
AI for Social Good Workshop @ Harvard CRCS	2020

Competition Selection Committee

AI2, EarthRanger Conservation Tech Award	2022

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

INVITED PANELS

Hertz Foundation Workshop. AI Science and Policy, *moderator* — July 2022
Jacob Steinhardt, Julie Owono, Jessica Fjeld

Harvard CRCS. The Future of AI for Social Impact, *co-moderator* — April 2022
Fei Fang, Lynn Kaack, Danaë Metaxa, Bryan Wilder

South by Southwest (SXSW). AI for Wildlife — March 2021

Harvard CRCS. AI for Social Impact, *moderator* — March 2020
Susan Murphy, Erez Yoeli, Desmond Patton

INVITED TALKS

Does not include contributed conference and workshop talks

Causal AI and Conservation
WWF. Fuller Seminar Series on Conservation AI — January 2023

Learning and Planning Under Uncertainty for Wildlife Conservation

Operations Research Society of South Africa.	2023
HKUST Business School. 13th POMS-HK International Conference	January 2023
Georgia Tech. ISyE DEI seminar	November 2022
Analytics for a Better World.	September 2022
Harvard University. Kempner Institute celebration	September 2022
Universität Tübingen. Decision Making Group	August 2022
Harvard Kennedy School. "Leading in AI" Executive Education	July 2022
Harvard SEAS. Summertime Seminar Series	June 2022
UC Berkeley. Ethics and Practices of Algorithmic Conservation	April 2022
MD4SG. Environment Working Group	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
Harvard Business School. From Data to Decisions	October 2021
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
Harvard. AI for Social Impact (CS 288)	September 2022
Women's Forum. Women4AI Daring Circle workshop	June 2022

Robust Reinforcement Learning Under Minimax Regret for Green Security

CompSust. Computational Sustainability Doctoral Consortium	March 2022
Google Research India. AI for Social Good	January 2022

PAWS: AI to Predict and Plan Against Poaching

ICCB. International Congress for Conservation Biology. Kigali, Rwanda	December 2021
IUCN WCC. World Conservation Congress. Marseille, France	September 2021
WILDLABS. Tech Tutors: Season Three	September 2021
AI for Climate. Mexico Lightning Talks Series powered by Huawei	July 2021
SMART Partnership. International Women's Day Webinar	March 2021
WWF. Webinar on SMART	April 2020

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

Beijing Academy of Artificial Intelligence.	March 2021
University College London. AI Society	February 2021
Harvard University. EconCS Seminar	March 2020

Poaching Prediction and Patrol Planning Under Uncertainty

AI LA. Earth Summit	April 2021
Harvard CRCS. Rising Stars Workshop	March 2020
Harvard University. PhD on Tap	February 2020

OUTREACH

Speaking

Harvard. Tech for Social Good, *panelist*	April 2021
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

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

Text

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

NON-ACADEMIC
LEADERSHIP

Ledyard Canoe Club at Dartmouth. *Secretary, Canoeing Leader*   2014 – 2018
- Co-governed club functions for over 100 undergraduates. Managed club assets that include $1M in endowments, a student-run rental business with annual revenues of $50K, and boats and equipment valued at $150K.
- Co-organized an Explorers Symposium featuring ten notable speakers, including Olympic racers and members of National Geographic–sponsored expeditions.
- Led a group of twenty-eight students on a nine-day, 220-mile canoe expedition.
- Voted by my peers to receive the Jay Evans '49 Award for service and commitment to the club.

Fusion Dance Ensemble. *Director*   2014 – 2018
- Led a group of fourteen dancers. Choreographed, taught, and performed contemporary and hip-hop dances, with over 20 performances each year.

Dartmouth Sophomore Trips. *Co-director*   2015 – 2016
- Planned the Sophomore Trips program for 130 undergraduates across 14 three-day outdoor trips throughout New Hampshire and Vermont.

Dartmouth First-Year Trips. *Grant Crew Volunteer*   Summer 2015
- Served on a nine-person crew for a 21-day, round-the-clock commitment to assist with five-day outdoor orientation trips for 1,000 incoming students.

PERSONAL   Residential member, Los Angeles Eco Village   2018 – 2019