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

PUBLICATIONS   ** indicates equal contribution*

Optimistic Whittle Index Policy: Online Learning for Restless Bandits
Under review
Kai Wang*, **Lily Xu***, Aparna Taneja, Milind Tambe

Ranger Patrols Deter Poachers: Causal Inference with Bayesian Modeling and Field Tests as an Instrument
Under review
Rachel Guo, **Lily Xu**, Andrew Perrault

Flexible Budgets in Restless Bandits: A Proximal Primal-Dual Algorithm for Efficient Budget Allocation
Under review
Paula Rodriguez Diaz, Jackson A. Killian, **Lily Xu**, Aparna Taneja, Milind Tambe

Robustness at Scale: Planning for Restless Bandits by Grouping over Large Populations
Under review

Jackson 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-22: 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-22: 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-22: 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-21: Proc. 37th Conference on Uncertainty in Artificial Intelligence
Lily Xu, Andrew Perrault, Fei Fang, Haipeng Chen, Milind Tambe
Oral Presentation (6.17% of submissions)

Envisioning Communities: A Participatory Approach Towards AI for Social Good
AIES-21: Proc. 4th AAAI/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-21: 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-20: Proc. 36th IEEE International Conference on Data Engineering 2020
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 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**, Remote	
	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*	
	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
	Harvard Business School, HBSMBA 2231. From Data to Decisions	Fall 2021
	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	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

Christopher Ong '23, Harvard College	Spring 2022
Rachel Guo '22, Harvard College	Summer 2020 –

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

Emilia Cabrera '21, Harvard College	Fall 2020 – Fall 2021

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

April Chen '22, Harvard College	Summer 2021

> *Adobe Research Women-In-Technology Scholarship Winner*

Ezenia Diaz-Lembert '23, Harvard College	Spring 2021

PROFESSIONAL SERVICE

Initiative Organization

Co-organizer, Mechanism Design for Social Good (MD4SG)	March 2021 –
Co-lead, MD4SG Community Engagement	Oct 2020 – Apr 2021
Co-organizer, MD4SG Working Group on Environment	Jan 2020 – Apr 2021

Program Organization

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 events co-chair, ACM EAAMO	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

Conference Chair

Session chair, INFORMS O.R. to Fight Climate Change / Sustainable O.R.   October 2022

Program Committee

Conferences

Artificial Intelligence, Ethics, and Society (AIES)	2022
ACM Conference on Fairness, Accountability, and Transparency (FAccT)	2022
Equity and Access in Algorithms, Mechanisms, and Optimization (EAAMO)	2021,

2022
ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS) 2021
AAAI Conference on Artificial Intelligence (AISI track) 2020, 2021

Workshops
Cooperative AI Workshop @ NeurIPS 2022
Black in AI Workshop @ NeurIPS 2020, 2021
Machine Learning for the Developing World (ML4D) @ NeurIPS 2020, 2021
Machine Learning for Public Health (ML4PH) @ NeurIPS 2021
Data-Driven Humanitarian Mapping @ KDD 2020, 2021, 2022
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

Competitions
EarthRanger Conservation Tech Award, *judge* 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 TALKS **Learning, Planning, and Optimization Under Uncertainty for Wildlife Conservation**
Analytics for a Better World September 2022
Harvard Kennedy School, Executive Education class July 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
INFORMS 2021, Doing Good with Good OR Finalists October 2021

Envisioning Communities: A Participatory Approach to AI for Social Good
Women4AI Daring Circle Forum June 2022
Conference on AI, Ethics, and Society (AIES-21) May 2021

Ranked Prioritization of Groups in Combinatorial Bandit Allocation
INFORMS Annual Meeting, "Fairness in Sequential Decision Making" October 2022
31st International Joint Conference on AI (IJCAI-22) July 2022

Robust Reinforcement Learning Under Minimax Regret for Green Security
Computational Sustainability (CompSust) Doctoral Consortium March 2022
Google Research India, AI for Social Good January 2022
Uncertainty in Artificial Intelligence Conference (UAI-21) July 2021
AAMAS Autonomous Agents for Social Good (AASG) Workshop May 2021

PAWS: AI to Predict and Plan Against Poaching

International Congress for Conservation Biology, Kigali, Rwanda	December 2021
IUCN 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, Webinar for International Women's Day	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
Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21)	February 2021
CompSust Doctoral Consortium	October 2020
CRCS AI for Social Good Workshop	July 2020
Carnegie Mellon University, AI and Social Good Symposium	April 2020
Harvard University, EconCS Seminar	March 2020

Poaching Prediction and Patrol Planning Under Uncertainty

Harvard CRCS Rising Stars Workshop	March 2020
IEEE International Conference on Data Engineering (ICDE-20)	April 2020
Harvard University, PhD on Tap	February 2020
Carnegie Mellon University, CompSust Doctoral Consortium	October 2019
KDD Data Mining and AI for Conservation Workshop	August 2019
AAMAS Strategic Reasoning for Societal Challenges Workshop	May 2019

OUTREACH

Speaking: Public Events

AI LA Earth Summit	April 2021
South by Southwest (SXSW), Wildlife AI Panel	March 2021
World Science Festival, Science and Storytime	June 2019

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
L.A. Unified School District (LAUSD), African American Family Day	May 2019
Zoo Magnet High School, College and Career Day	November 2018

Mentoring

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

Volunteering

A Guide to Your PhD, Harvard SEAS	October 2020
Project Teach, Harvard University	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	**INFORMS Resoundingly Human Podcast**	May 2022

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

Voice of America (VOA) News, Wildlife Rangers Use AI to Predict Poachers' Next Moves. January 2022

Harvard SEAS, Computer Conservation. November 2021

AIhub, Interview with Lily Xu. October 2021

Rethinking Economics NL, Disruptive Technologies podcast series. May 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