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

		/
EDUCATION	Harvard University. Cambridge, MA PhD Candidate in Computer Science Advisor: Milind Tambe Thesis committee: Dimitris Bertsimas, Yiling Chen, Andrew Davies	expected 2024
	Dartmouth College. Hanover, NH A.B. with Honors in Computer Science, minor in Spanish Magna cum laude	2018
Honors	Siebel Scholar Grant awarded for academic excellence and demonstrated leadership.	2024
	Rising Star in Data Science (UChicago)	2023
	Rising Star in EECS (GATech)	2023
	Rising Star in Management Science and Engineering (Stanford MS&E	
	Google PhD Fellowship	2022
	One of 13 awardees in machine learning globally.	2022
		2021
	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 inde	viauais,
	communities, and organizations".	0001
	AAAI Best Paper Award Runner Up	2021
	3 best papers and 3 runner-ups were selected out of 9,034 submissions and	na 1,692 acceptea
	papers.	9091
	Harvard University Derek Bok Certificate of Distinction in Teaching	2021
	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 clindicated adequately by academic grades", received across five computer sometimes.	
	${\bf Adobe\ Women-In-Technology\ Scholarship-Honorable\ Mention}$	2017
Non-Profit Service	SMART Conservation Partnership. AI Lead I work with SMART to effectively integrate AI research into their consermanagement activities. The SMART Partnership is the global leader in a solutions, consisting of 8 leading conservation NGOs: WWF, WCS, Will Solutions, Frankfurt Zoological Society, ZSL, NC Zoo, Panthera, and Re.	protected area dlife Protection
Work Experience	Google Research. India, AI for Social Good lab Student Researcher	Spring 2022
LAI LIGHTON	Suddin Hoodh Chai	Sprii 2022
	Google. Seattle, WA	
	C-francis Francis - Intone	C 2017

Dyn, Inc. Hanover, NH Data Analytics Research Intern

 $Software\ Engineering\ Intern$

Spring 2016

Summer 2017

Preprints

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

 $(\alpha - \beta)$ Siddhartha Banerjee, Sean R. Sinclair, Milind Tambe, **Lily Xu**, Christina Lee **Y**u

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

Publications (Journals)

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

Publications (Conferences)

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 (ROOK CHAPTERS)

Environment, Society, and Machine Learning

(BOOK CHAPTERS) 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

INVITED TALKS

Does not include contributed conference and workshop talks Major talks $\underline{\text{underlined}}$

J			
High-stakes decisions from low-quality data: AI decision-maplanetary health	king for		
UChicago. Rising Stars in Data Science	November 2023		
Georgia Tech. Rising Stars in EECS	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		
J.P. Morgan. AI Research group	October 2023		
Stanford MS&E. Rising Stars in MS&E	May 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		
WWW. Land Schma Scriet on Conscivation III	11p111 2020		
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 Constant Harvard Kennedy School. "Leading in AI" Executive Education Penn State. CSRAI Young Achievers Symposium UC Berkeley. Global Policy Lab Centro de Analítica para Políticas Públicas (CAPP). (in Spanish) Georgia Tech. ISyE department seminar Analytics for a Better World. ABW Webinar Series Harvard Kennedy School. "Leading in AI" Executive Education UC Berkeley. Ethics and Practices of Algorithmic Conservation UCL. Climate Hack AI Competition, keynote Harvard University. HCI Colloquium: AI-Assisted Decision-Making Pasteur's Quadrant. Seminar Series INFORMS. Doing Good with Good OR Finalists	July 2023 March 2023 February 2023 December 2022 November 2022 September 2022 July 2022 April 2022 March 2022 February 2022 February 2022 October 2021		
Ranked Prioritization of Groups in Combinatorial Bandit A Sony. Computer Science Laboratories (CSL) Paris Stanford. Computing & Society group	llocation October 2022 October 2022		
INFORMS Annual Meeting. Fairness in Sequential Decision Making			
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			

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 Secu	ırity
	Beijing Academy of Artificial Intelligence.	March 2021
	University College London. AI Society	February 2021
Invited Panels	Hertz Foundation Workshop. AI Science and Policy, moderator panelists: Jacob Steinhardt, Julie Owono, Jessica Fjeld	July 2022
	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	
Guest Lectures	Cornell Tech. CS 6382. Data Science for Social Change	Fall 2023
	Cornell Tech. ORIE 5355/INFO 5370. Applied Data Science: Decision-r	
	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 Impac	t Spring 2022
	University of Pennsylvania. OIDD 941. Recent Advances in Data-Drive	en
	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 S	
	University of Pittsburgh. CS 1699. AI for Good: Ethics and Implication	
	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

Students Advised \rightarrow At Harvard College

Vincent Börsch-Supan '25 Sep 2022 -Jun 2022 - Dec 2022Alejandra Perea Rojas '24 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 Sep 2020 - Dec 2021

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

Rachel Guo '22 Jun 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

Fall 2020

Spring 2017

Approach for Causal Inference Using Field Tests as an Instrument

Next step: Stanford ICME PhD student

TEACHING EXPERIENCE

Harvard University

Head Teaching Fellow CS 182: Artificial Intelligence

Harvard Derek Bok Certificate of Distinction in Teaching

Dartmouth College

\rightarrow Teaching Assistant, Department of Computer Science	
CS 11: Foundations of Applied Computer Science, head TA	Spring 2018
CS 1: Intro to Programming and Computation	Spring 2018
CS 1: Intro to Programming and Computation	Fall 2017
CS 31: Algorithms	Winter 2017
CS 1: Intro to Programming and Computation	Spring 2017
CS 10: Object-Oriented Programming	Spring 2016
CS 1: Intro to Programming and Computation	Winter 2016
CS 1: Intro to Programming and Computation	Fall 2015
CS 10: Object-Oriented Programming	Spring 2015
\rightarrow Teaching Assistant, Tuck School of Business	
Tuck FWP: Fundamentals of Web Programming	Spring 2017

FUNDING: Proposals and

AWARDS

Lily Xu. Siebel Scholar, awarded 2023. \$35,000

Tuck DSA: Data Structures and Analytics

Co-I (submitted as PhD student, with 0% funding). Hannah Kerner, Sara Beery, Lily Xu, Jacob Muise, Shay Chan Hodges, Nicholas Winfrey. Combating Invasive Axis Deer in Maui, Hawaii with Earth 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

Professional Service		April 2023 – March 2021 – 2020 – Apr 2021 2020 – Apr 2021
	Workshop Organization Co-organizer, AI-Assisted Decision Making for Conservation Worksho	op October 2022
	with Esther Rolf and Milind Tambe Organizer, SMART/PAWS Workshop. Rio Bravo, Belize Lead organizer, Harvard CRCS Rising Stars Workshop Co-organizer, Computational Sustainability Doctoral Consortium with Priya Donti, Genevieve Flaspohler, Aaron Ferber, and Sebast	August 2022 March 2020 October 2019 ian Ament
	Tutorials Lead organizer, AI for Social Impact tutorial @ EAAMO with Emily Aiken, Priya Donti, Nikhil Garg, and Paul Gölz	October 2023
	Panels Co-organizer and co-moderator. The Future of AI for Social Impact panelists: Fei Fang, Lynn Kaack, Danaë Metaxa, Bryan Wilder	April 2022
	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 Social co-chair, Fourth Workshop on MD4SG	October 2021 August 2020
	Seminar Organization	
	Co-organizer, Harvard CRCS Social Impact Seminar Series	Spring 2022
	Co-organizer, Harvard CRCS Rising Stars Speaker Series Co-organizer, CompSust Open Graduate Seminar (COGS)	April 2021 Spring 2020
	Program Committee (Reviewing)	
	\rightarrow Conferences	0000 0000
	AIES. Artificial Intelligence, Ethics, and Society AAAI. AAAI Conference on Artificial Intelligence	2022, 2023 2023
		2020, 2021, 2022
	COMPASS. ACM SIGCAS Conference on Computing and Sustainable S	
	EAAMO. ACM Equity and Access in Algorithms, Mechanisms, and Opt 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
	ightarrow Workshops	
	AI for Wildlife Conservation @ SICSPATIAI	2023

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 Computational Sustainability @ NeurIPS Cooperative AI Workshop @ NeurIPS Black in AI Workshop @ NeurIPS Machine Learning for the Developing World (ML4D) @ NeurIPS Machine Learning for Public Health @ NeurIPS Resistance AI @ NeurIPS AI for Social Good @ IJCAI Mechanism Design for Social Good (MD4SG) AI for Social Good @ Harvard CRCS	2023 2023 2022 20, 2021, 2022 2020, 2021 2020 2020 2020 2020 2020
	Competition Selection Committee AI2, EarthRanger Conservation Tech Award	2022, 2023
	Reviewer Deep Learning Indaba Caltech Computer Vision for Ecology (CV4Ecology) Summer School ICML, subreviewer NeurIPS, subreviewer IJCAI Special Track on CompSust and Human Well-being, subreviewer COMPASS, subreviewer Bloomberg Data for Good Exchange (D4GX), subreviewer	2022 2022 2021 2020 2020 2019 2019
OUTREACH	GirlsComputingLeague. AInnovation Business Summit IEEE Computer Society. Women in Computing, Kerala Chapter Data Science Africa. Tutorial on MD4SG and the Environment Ledyard Canoe Club. Inclusivity in the Outdoors Dartmouth. Women in Computer Science, panelist Harvard SEAS. Diversity, Inclusivity, and Belonging, panelist Center for Initiatives in Jewish Education. High school student visit World Science Festival. Science and Storytime L.A. Unified School District (LAUSD). African American Family Day	March 2023 March 2021 Tovember 2020 Eptember 2020 Eptember 2020 July 2020 July 2020 May 2020 May 2020 March 2020 June 2019 May 2019 Tovember 2018
	Mentoring Harvard University. InTouch Peer Mentor Harvard University. Women in STEM Mentor Dartmouth College. Women in Computer Science	$2020 - \\2019 - 2020 \\2017 - 2018$
	Volunteering Harvard SEAS. A Guide to Your PhD Harvard University. Project Teach Cambridge Public Schools. STEAM It Up! Hustle N' Code. Hackathon, technical lead Hustle N' Code is a Los Angeles hackathon for youth in public housi My team won first place, and the four students each received a laptor	

Press

Case Studies

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

Podcasts

Ecochat. AI for Conservation - Using Machine Learning to Stop Poaching

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

Oct 2022

Video

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

Articles

Business Insider. Conservationists are using artificial intelligence to map out the best ways for saving threatened wildlife and resources $Oct\ 2022$

Oxford Science. AI in conservation: a modern-day solution to the biodiversity crisis? March 2022

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

Harvard SEAS. Computer Conservation. Nov 2021

Alhub. Interview with Lily Xu. Oct 2021

Engadagt PAWS anti-possibing Al predicts where illegal bunters will show up next. Mar

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

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

Nov 2020

Harvard SEAS.Preventing poaching.Jun 2020BBC Sounds.How tech is tackling wildlife trafficking.Jun 2020BBC World Service.Using technology to take on poachers.Aug 2019USC Viterbi Magazine.AI is for Animals.Apr 2019

References

Milind Tambe milind_tambe@harvard.edu

Gordon McKay Professor of Computer Science, Harvard University Director of AI for Social Good, Google Research

Yiling Chen yiling@seas.harvard.edu

Gordon McKay Professor of Computer Science, Harvard University

Andrew Davies andrew_davies@fas.harvard.edu

Assistant Professor of Organismic and Evolutionary Biology, Harvard University

Fei Fang feifang@cmu.edu

Associate Professor, Carnegie Mellon University

Nikhil Garg ngarg@cornell.edu

Assistant Professor, Cornell Tech