

Teaching Statement

Lily Xu (Harvard University)

LILY XU!!!!!!!!!!!!!! She's an absolute angel. Besides giving really good feedback on grades and the usual stuff, SHE WAS SO HELPFUL. On multiple occasions, I was staying up all night to finish a lab assignment, and I emailed her at 3 or 4 in the morning, and she said to come by to Novack because she was still awake. I walked over, and she helped me with the material for no less than an hour each time. She is amazing. I cannot recommend Lily highly enough; she was a fantastic section leader and I hope I get her next term in CS 10.

— Anonymous evaluation, Winter 2016

This anonymous student feedback came from course evaluations for one of the 11 courses for which I served as a teaching assistant while an undergraduate at Dartmouth College. While I likely will no longer have capacity to hold spontaneous office hours past midnight when I am a professor, this comment exemplifies my longstanding views on teaching: I am passionate about the material and immensely committed to students.

As an educator and mentor, (a) I work to understand each students' individual goals, to cultivate *intellectual curiosity*; (b) I seek to be accessible and caring, to foster a *psychologically safe* environment; and (c) I emphasize real-world impact of computational techniques, to *motivate* students to see the bigger picture.

1 Teaching experience

I actively sought out teaching experiences starting in my first year of college, when I first worked as a teaching assistant (TA) for our undergraduate CS course on data structures. As part of this role, I held weekly recitation sections, anticipating which course concepts would be most confusing to students and designing mini-lectures to review that material. I called on students to explain the benefits of a hash function, brainstorm use cases for a deque versus a queue, and visually recreate Dijkstra's algorithm. Every moment I spent at the front of that classroom or working one-on-one with a student during office hours, I was looking out for that "aha!" moment where students demonstrated deepened understanding — and, eventually, keen excitement about the material.

*Lily Xu was a fantastic TA who helped me **think more critically** about the material and gain a better understanding of it.*

*Lily Xu was an amazing section leader. She made concepts **clearer** and was always happy to take extra time to help us. She even set up a study session on her own time during finals.*

As a PhD student at Harvard, I served as **head TA** for Artificial Intelligence in fall 2020 — the first fully remote, pandemic-afflicted semester. I was tasked with managing 12 TAs and a class of 100 students as we developed all-new lectures, assignments, and recitation content. In this role, I was the first point-of-contact for triaging all challenges: from students asking for extensions after catching COVID, to TAs developing assignments that were too difficult, to helping grad students cope with mental health challenges arising from starting a program virtually while in a different country. In response, I worked closely with the instructor to adapt the course content to those extraordinary times. I also gave one lecture, which was well received:

*Lily was amazing, honestly her lecture on decision trees was **the best lecture of the class**. Super clear and very engaging.*

*Lily's lecture was one of my favorite the entire semester — it was just **super clear, understandable, and the slides were beautiful!** I wish she gave more lectures.*

For my work in this course, I received a 4.91/5.0 ($N = 11$ students) overall evaluation as a section leader, and I was recognized with a Derek C. Bok **Certificate of Distinction in Teaching**.

Experience teaching broad audiences. I have lectured in front of a broad range of audiences, giving **20 guest lectures** to students ranging from first-years at all-women liberal arts Wellesley to MBA students at Harvard Business School to PhD students at Cornell Tech and Wharton. I worked as a TA for two **MBA classes** at the Tuck School of Business, holding office hours for industry professionals looking to be better prepared to work in Silicon Valley. I have also given two lectures for an Executive Education course at Harvard Kennedy School — as the only PhD student among a slate of Harvard faculty — presenting to **nonprofit CEOs and government leaders** on how research advances in AI and data science can help solve real-world problems. With every lecture, I take care to make my technical research in multi-armed bandits and reinforcement learning accessible, whether the audience is nontechnical or PhD researchers in my field.

2 Mentoring experience

As a PhD student, I've directly advised 7 undergrads in research, which have resulted in **two senior theses** [2, 4], one NeurIPS workshop paper [5], and one journal submission [6]. One of my former advisees, whom I advised for three years, has just begun her PhD at Stanford.

My goal as a research mentor is to instill the lesson that *intellectual curiosity and rigor are the most valuable qualities in research*. Intellectual curiosity is what keeps us going through the frustrating lows of research, and also what instigates bright ideas. Rigor promotes healthy skepticism, which is both valuable when reading research papers and necessary when evaluating our own results to produce good science.

To foster intellectual curiosity and self-motivation, I strive to balance crafting well-scoped, feasible projects with open-ended support of students' interests. When one of my advisees was interested in causal inference, I encouraged several weeks of broad reading and brainstorming on the topic; that exploratory phase has matured into a large-scale project on causal inference that we have now submitted to a major journal [6]. Similarly, I believe that focusing on real-world impact and giving students ownership over their work both recognizes their contributions and gives them necessary domain exposure. Towards this end, I have set up opportunities for my advisees to present their work to our conservation partners at Wildlife Conservation Society and industry partners at Microsoft AI for Earth. One of my advisees wrote to me at the end of their college career¹:

*As you've probably observed, I've gained more confidence in myself over the years, and especially throughout the thesis process. And I just wanted you to know that **out of all the professors and TAs**² **I've had during my undergrad, you have had the greatest impact on my growth as a person and as a researcher**, constantly encouraging me, supporting me, and most importantly, helping me find that confidence within me.*

3 Teaching philosophy and future plans

Teaching is a strong personal motivator; I gain immense satisfaction seeing students deeply understand fundamental concepts and develop an appreciation of the subject. The following principles of *real-world engagement* and *psychological safety* guide how I will teach in the classroom and direct my research lab.

Real-world engagement and focus on the “why”. Although I find immense satisfaction in pure computer science, I recognize that students will be most engaged if they are exposed to concrete examples of *why* computer science matters to the problems they care about, including environmental challenges, democratic voting, clinical health, and misinformation. The Public Interest Technology University Network (PIT-UN) highlights that students — particularly those from diverse and historically underrepresented backgrounds — are extraordinarily engaged in promoting “public interest technology”, but relevant course offerings and extracurricular opportunities at most universities are underdeveloped [7]. I am excited to build courses, workshops, and a research lab to meet these student demands, based on my deep engagement with interdisciplinary research and extensive research on biodiversity conservation.

I already have experience designing impact-oriented curricula: I co-founded and co-led for two years the **MD4SG Environment Working Group**, where we brought together an interdisciplinary audience for biweekly discussions on AI and OR research on environmental planning, disaster management, and climate adaptation. Additionally, I conceived, led, and co-taught a tutorial on Doing AI for Social Impact, centered on thoughtful partnership-building and deployment [10]. Further exemplifying the pedagogical lessons from my applied work, my research has been written into a **Harvard Business School case** [9], which I worked with Prof. Brian Trelstad to develop.

Psychological safety. Psychological safety is a shared culture that permits pitching ideas, raising questions, and admitting mistakes, all without fear of negative consequences [3]. Psychological safety is a prerequisite of the two qualities of good research that I highlighted previously: risk-taking and freely discussing ideas are necessary for *intellectual curiosity*, and open questioning is necessary to maintain *rigor*.

¹ Email excerpt from 2022 shared with permission. ² “Teaching fellow” (TF) is the term Harvard uses to refer to teaching assistants.

*Lily Xu was the best section leader ever. She was **kind, helpful, and EXTREMELY accommodating**. According to what I've heard about other section leaders, I think Lily went above and beyond. She even made us pancakes on the last day of recitation :)*

*In the past I was always scared to ask mentors questions, but **you're always so willing to explain things** and you don't make me feel dumb for not knowing. I could not ask for a better mentor. :)*

Future teaching plans. I am enthusiastic about teaching everything from introductory CS to advanced topics in AI, such as machine learning, reinforcement learning, game theory, multi-agent systems, and optimization. I am particularly excited about teaching AI classes at both the undergraduate and graduate level that focus on socially impactful applications, where — as I have done in my own research [1, 8] — I will draw inspiration from other subfields such as human-computer interaction (HCI), and other disciplines such as sociology and developmental economics, to develop computational methods for positive, real-world impact. I envisioning teaching a course called *The “Who” and the “Why” of AI for Social Impact* to reflect these principles, where I invite nonprofit practitioners for a discussion of their operations, priorities, and challenges, then mentor student groups to design algorithmic solution tools for different stakeholders. Overall, my goal as a teacher is to inspire students to pursue real-world impact in their work, and to equip them with the technical foundation and thoughtful nuance needed to do so.

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