Teaching Experience and Interests

Ilan Goodman

Teaching has been a central part of my academic and professional journey, and my experiences in both the classroom and industry have shaped my dedication to fostering deep learning and critical thinking in computer science and data science. I believe that effective teaching is about not only delivering technical content but also cultivating students' problem-solving skills, confidence, and curiosity in a supportive environment.

Teaching Experience:

At Washington University in St. Louis, currently I am the instructor of an *Introduction to Data Engineering* course of my own design, which is a required foundational course for data science majors. This course covers essential principles of data engineering and gives practice with industry-standard tools, preparing students for practical applications and laying a foundation for students to design and implement their own data projects. Additionally, I co-teach a *Data Structures and Algorithms* course, which is a large introductory class with over 260 students that serves as a prerequisite for most other courses in the Computer Science department. Balancing the needs of a large group, I prioritize active engagement and diverse instructional techniques to ensure students build both a strong technical foundation and confidence in solving a wide range of problems.

My experience as a teaching assistant (TA) is extensive. I served as Head TA for three distinct Computer Science classes and TA for seven additional CS courses, as well as two Physics courses. As a (head) TA, I gave three lectures for three classes. I also taught a specialized course for new Section Leaders on teaching practices and classroom management, preparing them to effectively support and lead students. My dedication to teaching was recognized with the Centennial Teaching Assistant Award for Outstanding TAs, which I received for my work as a student instructor.

In industry, I led numerous training sessions and designed modules to upskill data scientists and engineers, covering essential coding and data science skills that were immediately applicable in their roles. These sessions sharpened my ability to break down complex topics, customize training to diverse skill levels, and lead hands-on labs with real-world applications.

Beyond my teaching responsibilities, I have actively initiated and engaged in several departmental initiatives. These include mentoring

students on independent projects, participating in professional development programs, and focusing on curriculum development. I am designing a core course on working with large-scale data for a new Data Science graduate program and exploring the development of additional courses to further enrich the curriculum, including an *Advanced Data Structures* course, an *Introduction to Probability and Statistics for Computer Scientists*, a course on *Experimental Design and the Scientific Method*, and a Python-focused *Data Structures and Algorithms* course with an emphasis on coding skills. Alongside a colleague, I am establishing a committee on the program's algorithms course offerings, as well as advising the data science curriculum committee on course requirements and essential content. These initiatives reflect my passion for creating courses that blend rigor with practical skills, preparing students for the dynamic demands of the field.

In my teaching practice, I have utilized traditional classrooms, led small group studios and labs, implemented flipped classroom setups, and explored innovative methods like oral exams (to simulate job interview scenarios) and incorporating physical movement to enhance engagement and retention. I also attend biweekly seminars on teaching and pedagogy and I regularly observe other lecturers teach to learn new strategies and tricks. These experiences have taught me the importance of adaptability and the value of varied, interactive learning formats in supporting students' mastery of the material and sense of belonging.

Teaching Interests:

I am passionate about teaching a range of topics, including theoretical computer science—particularly data structures, algorithms, and computation theory—as well as AI and machine learning, statistics, and data science. I am also eager to share with students my data engineering expertise that I developed over eight years in the tech industry. I am excited about the opportunity to teach at various levels, from introductory classes that lay a strong foundation to upper-division and graduate-level courses, where students can explore more advanced topics in depth. My preference is for teaching upper-division courses and late introductory classes, where I can help students deepen their understanding of core concepts and begin to specialize in areas that intrigue them.

I am committed to creating an inclusive, supportive, and challenging classroom environment that emphasizes both technical rigor and practical application. My goal as an educator is to inspire students to think critically, develop confidence in their skills, and prepare for careers that leverage their knowledge and creativity to solve real-world problems. I look forward to

bringing my experience and enthusiasm to every class, contributing to a dynamic learning environment, and continuing to evolve as a teacher alongside my students.

Teaching Philosophy and Methods

From a young age, I have been deeply passionate about the sciences, captivated by the natural world and drawn to the elegance of physics and mathematics. Entering college at Stanford University, computer science was nowhere on my radar. However, my journey took an unexpected turn freshman year when I took a few introductory computer science courses for fun. The educators teaching these courses were fantastic, igniting a newfound enthusiasm within me. This transformative experience led me to pursue a Master's degree in Computer Science and ultimately inspired my commitment to teaching and mentoring others in this field.

My experience is far from unique: research has suggested that the biggest predictor of college major is the quality of instructor in introductory classes.[1] At the core of my teaching philosophy is the belief that the purpose of an educator transcends the mere transmission of knowledge; it extends to the profound task of inspiring and empowering students. As a teacher, I see myself as a catalyst for intellectual curiosity, a source of inspiration, and a guide to see the world through a new lens. Beyond equipping students with the requisite skills and competencies, my ultimate goal is to ignite a passion for learning, instill a sense of wonder, and cultivate a lifelong love for the subject matter. I view myself not only as a facilitator of information but also as a role model and mentor who empowers students to explore, question, and discover their own unique potential.

One key aspect of my teaching methodology is I actively encourage peer learning and collaboration as integral components of the educational experience. Fostering teacher-to-student and peer-to-peer connections in the class environment is just as important to the students' development as imparting the class' particular material. I believe that one never understands a concept completely until she or he has taught that concept to another person. One of the great joys of teaching for me is that I learn the material better as I find new ways to explain it to someone and as I observe how others approach the same problems. By creating opportunities for students to learn from one another through group discussions, collaborative projects, and peer mentoring initiatives, I aim to harness the collective wisdom and expertise of the classroom community. One approach I employ to this end in introductory programming courses, for example, is having students work on

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[1] https://www.insidehighered.com/news/2013/08/12/study-finds-choice-major-most-influenced-quality-intro-professor

assignments in pairs or small groups and review each other's code. This way students can learn from each other and develop crucial skills testing and providing meaningful feedback. The individual midterm and final still keep the students honest so that everyone has to master the material, but these group assignments allow for deeper exploration and more collaboration. Through peer interaction, students not only gain valuable insights and perspectives but also develop essential social and communication skills that are vital for success in academia and beyond.

In today's rapidly evolving technological landscape, the emergence of generative AI tools, such as ChatGPT, has become increasingly prevalent and influential. Recognizing the potential impact of these tools on academic integrity, I believe it is imperative to address their usage in the assessment process in a responsible and proactive manner, while acknowledging that these tools will also be necessary to master for success in post-university life. While I typically do not ban the use of generative AI tools outright, I am committed to fostering a culture of academic honesty and integrity in my classroom. To this end, I ask students to acknowledge any instances where they have utilized such tools in their assignments or coursework. This transparency enables me to gain insights into the ways in which these tools are being used and ensures that I design meaningful learning opportunities in the future that reflect the tools that will be available to the students after school. To ensure that the students nevertheless master the material without relying on AI helpers, I still base a majority of the final grade on exams that do not allow access to these tools or other students.

I am enthusiastic and deeply grateful for the opportunity to contribute to the Washington University community as a lecturer, and I am excited about the prospect of continuing to inspire and empower students on their educational journey at the next stage in my career. As I look ahead to the future, I am eager to leverage my diverse experiences and expertise gained from studying and teaching at Stanford University and Washington University in St. Louis, as well as my eight years in industry, to continue shaping the educational experiences of my students. My journey as both a student and practitioner has afforded me unique insights into the intersection of theory and practice, and I am looking forward to sharing these perspectives in the classroom.

Course and Curriculum Design

My approach to course and curriculum design is rooted in both my teaching experience and my industry background, which have given me a pragmatic perspective on preparing students for both academic and professional success. Designing a course goes beyond content; I strive to create courses that fill curriculum gaps, meet emerging student needs, and integrate skills that will be essential for students in the evolving fields of data science and computer science, all while balancing allocation of teaching resources.

A recent example of my course design work is *Data Manipulation and Management* (soon to be renamed *Introduction to Data Engineering*), a required course for data science majors that I effectively designed and implemented from scratch. Focusing on the skills I would have liked to have as a data engineer fresh out of school, I developed this course in response to an identified gap in data engineering fundamentals within our curriculum, building it to provide the hands-on experience with data manipulation and management that is critical for working with data in any practical context. From defining learning objectives to designing assessments, I have ensured that each element supports the learning goals of the course and equips students with industry-relevant skills. For example, I incorporated modern data engineering tools and principles used in industry, which I know from experience are essential to success in data science careers. As another example, as both a formative and summative assessment, I structured the midterm as an oral exam that mimics a design interview to give students additional practice with a seasoned, well-calibrated interviewer.

Successful curriculum design requires careful consideration of curriculum gaps, anticipated student demand, and resource allocation. In planning new courses, I evaluate not only what subjects are needed based on current coverage and overlap with other courses, but also how creating new courses could impact our ability to offer and support existing classes. At the same time, there needs to be enough faculty demand for the course to be able to staff it consistently. This process requires forecasting enrollment to allocate departmental teaching capacity wisely, identifying the intended audience, and ensuring the new course complements the rest of the curriculum.

To meet evolving demands in computer science and data science, I am currently advising on changes to the data science curriculum, using my industry background to offer insights that reflect current professional

expectations. I actively participate in curriculum discussions to help shape new offerings, advocate for relevant content, and prioritize the preparation of students for professional environments. My experience outside academia gives me a perspective that is especially valuable for students who will transition to industry roles post-graduation and I endeavor to incorporate that experience whenever possible.

In addition to *Introduction to Data Engineering*, I am designing a *Data Manipulation and Management at Scale* course for a new Data Science graduate program, and I am laying the groundwork to create several more courses: *Advanced Data Structures*, *Introduction to Probability and Statistics for Computer Scientists*, *Experimental Design and the Scientific Method*, and a Python-based *Data Structures and Algorithms* course that would differ from our existing *Data Structures and Algorithms* course by emphasizing coding skills and spending a bit less time on mathematical rigor. Each of these courses would address specific curriculum needs and introduce critical skills, while also broadening the pathways available to students within our department.

In developing a new course, I begin by aligning on the course's overall purpose and vision. I then break down this vision into smaller, concrete learning goals and build the syllabus around them, ensuring that each lecture, reading, assignment, and topic ties back to one or more of these goals. This approach maintains focus, clarity, and relevance, helping students understand the importance of each topic and connect it to broader course objectives.

I have also found that practical structure and format decisions are essential to effective course design. For example, determining the right balance between lecture and studio time, assessing whether the course would benefit from a flipped classroom format, and choosing appropriate assessment strategies are integral to achieving the learning goals. I make it a priority to keep the learning experience engaging and supportive, using modern education research to inform my choices. In *Data Manipulation and Management*, alongside more traditional lectures, I have experimented with a combination of hands-on labs and collaborative exercises that encourage students to practice and apply new skills in real-world scenarios.

A key aspect of course design is recognizing that no course is perfect in its first iteration. I advocate for beginning new courses with a smaller cohort when possible and iterating based on feedback from both students and instructors. For instance, I adjust content in response to points of confusion or low engagement and continue refining each element of the course until it reaches a stable, effective structure—typically after the third iteration. This

iterative approach also includes regular opportunities for feedback to determine whether the material is still relevant, how it might be presented more effectively, and how we can better assess students' understanding.

An example of this iterative improvement is my current work with co-instructors on the *Data Structures and Algorithms* course, where I regularly initiate discussions on student engagement, areas of confusion, and alternative teaching techniques. In addition to making changes last semester and rethinking some elements of our course for this semester, these conversations have led us to establish a dedicated committee to evaluate and refine our algorithms curriculum, aiming to improve content alignment, coverage, and pedagogy across several related courses.

In designing new courses or implementing curricular changes, I believe it is essential to gather input from diverse voices in the department, as this collaborative approach brings in different perspectives and strengthens our understanding of the curriculum landscape. However, I also find that there is value in having one or two individuals subsequently flesh out a draft plan for approval or critique, as this allows for more efficient and focused progress toward course creation and implementation.

By combining industry insights, collaboration, and responsiveness to student needs, I strive to create courses that prepare students for the technical and adaptive challenges they will face beyond their academic careers. As I continue to build out the data science and computer science curricula, my goal is to ensure our students gain both a deep understanding of core principles and the skills needed to apply them in meaningful, real-world ways.

Evaluation of Teaching Effectiveness

Student and Peer Feedback as a Lecturer:

- Quotes from anonymous end-of-semester student evaluations (emphasis mine):
  - "Actually a beast, so helpful and kind, clearly has a deep understanding of material and **explained confusing concepts well**. Was super accessible for anything we needed. **Listened to our feedback** and adjusted deadlines as needed instead of trying to rush through the material. Also **loved the midterm format, really unique and felt valuable**. Seriously one of my favorite CS professors I have had here."
  - "[The] lectures were well synthesized and he did a **good job painting a story**."
  - "Professor Goodman is **very patient**, and his logic is very clear. He is **excellent at breaking down complex concepts** into simpler, more digestible parts."
  - "Kindness and patience radiate warmth and support"
- Feedback from faculty classroom observations (emphasis mine):
  - "I saw **a lot of engaged students** and really liked how you had built-in opportunities [for] them to break into pairs or small groups to discuss examples, etc. I know it can be a challenge in morning courses to get the students into gear!"
  - "You seemed to have some interim deadlines for big projects, made a lot of ties to industry/non-academic work, included concrete examples, and gave the students time to troubleshoot software in class. […] You did have one interaction with students during group discussion time and I liked that you said, 'I wanted to elevate a discussion we were having over here…' so that all students could benefit from it."
- Quotes from anonymous student mid-semester feedback (emphasis mine):
  - "I have loved the **interactive sessions** to get complex points across"
  - "I really liked the format of the midterm. It made me prepare a lot and **I felt like I learned the material itself, rather than just memorizing how to answer certain types of problems**." (Context: this class had an oral midterm in the style of a design interview)

    - "I also sincerely appreciate the interview practice. All of the time invested into preparing myself for the midterm **will continue to provide me value in my job search** as well."
    - "I've been impressed with your **focus on internal improvement**. You are very clearly trying to make this class helpful for us as students and **have made the class feel collaborative**. I also appreciate how **you get participation in class even when topics may be hard to get interaction on** (like sql)."
    - "I was not really good with SQL before the class so the interactive lecture was really good at [filling] in my gaps in knowledge and also **keeping me engaged**."
    - "I really like how **open you are to feedback**. You've made [it] your mission to **ensure that every student understands the topics** which is different to other CS classes I have taken at this school. You are willing to slow down or speed up when needed and very open to questions."

Student and faculty feedback as a TA:

- Feedback from faculty in courses I was a (head) TA:
    - "Ilan basically **kept all of the logistics in the class up and running**. He **coordinated all the grading and alternate exam logistics on top of his normal TA responsibilities**. He also **put together some of the best and most useful gradebooks and stats that I've ever seen**. It was a pleasure getting to work with him." (*Advanced Data Structures*)
    - "Great TA! Very good grasp of the material, very **in-tune with student needs**, overall, responsive and a **good communicator**." (*Design and Analysis of Algorithms*)
    - "Ilan was **very pro-active** and a great CA. He served as head CA for the class and **did a great job managing the other CAs**. Would love to work with him again." (*Introduction to Probability and Statistics for Computer Scientists*)
    - "Ilan really **cares about students** and is **passionate about the course material**." (*Programming Abstractions (Accelerated)*)
    - "Made **fun midterm problems**. Had good feedback on the class. Seemed to know his material." (*Introduction to Artificial Intelligence*)
- Quotes from mid-quarter and end-of-quarter student evaluations (emphasis mine):

- "One of the smartest people I have ever met. Such a great teacher. So **patient, generous, willing to help out**. Can totally tell he loves physics and loves teaching it just as much."
- "I thought Ilan was such a good section leader that I started meeting with him an extra time outside of section, for 2 hours/week, in Gates. He was so helpful and willing to meet with me to go over even more Physics practice problems. I seriously owe so much of my physics understanding to this one Physics TA, and **I couldn't be more grateful to have had the opportunity to learn from him!!**"
- "Very **thorough in explanations** and was very **supportive of his students**. **Made sure that every student understood why answers were [the] way [they] were**."
- "I learned about tries in the guest lecture, and I visited office hours and he explained concepts as well as shared lots of relevant advice about future CS plans. He was **incredibly good at teaching** and always willing to spend time answering CS and non-CS related questions! […] Extremely **well prepared** for the lecture he gave - came with examples and **clear explanations** […] **Well informed about the CS department** and **excited to share advice and opinions**"
- "Ilan did a great job of guiding us to the right answers when we asked him for help. He had an excellent ability to ask you a string of answers that you knew the answer that would all lead up to the explanation for why a certain answer is correct. This method of **probing us for the answer instead of just telling us outright** really helped to solidify our understanding of the material."
- "He knows what he plans to teach to develop our understanding and he **deliberately and clearly executes his plan**."
- "Answered questions with guiding questions so that **students developed thinking skills**"
- "Super **kind**, **caring**, and definitely **made the effort to reach out to his students**. Always answered emails clearly and thoroughly and responded very quickly. **Great communicator over electronic media**"
- "Very good at explaining things and **allowing students to get to a conclusion on their own**."
- "Always came with **a lot of energy** and you can tell **he loves what he does**."

- "**Stays on track** and gives **great examples** to assist learning difficult topics."
- "Super knowledgeable; always knew what he was doing and had a firm grasp of the material and what **concepts would trip students up**."
- "**Easy TA to talk to** who was **concerned about how well you did** in class. Very knowledgeable and clear."
- "Ilan does a great job of simplifying the concepts and **making the material easier to understand**."
- "Ilan is always **patient** with students and willing to take out the time to explain problems that don't make sense. His explanations are super helpful!"
- "So far all of his answers to questions have been on the mark - clear and the right length. The best part is that he'll **add in tricks that he uses to remember concepts**. This helps to solidify understanding and **makes the learning fun**."
- "Writes on board neatly and clearly and **organizes information well** when doing handwritten work."
- "great question answering, effective teaching - **I came out of section understanding the material better**"
- "Super nice and **cared a lot about his students**. I felt very dumb in this class and **he helped me feel less stupid**!"
- "Very clear in lecture and helpful examples. **Made sure that the class understood everything before moving on**."
- "I learned a lot from Ilan's lecture, and I found it to be really **entertaining**."
- "Ilan is the man and the **best TA I've had at Stanford**."
- "The best Phys 41 TA there is. **No one can top Ilan. He's kind, nice, caring, incredibly intelligent, and always available**. Definitely want to have him as a TA for Phys 43."
- "Very effective section leader - **best TA I've had at Stanford**."
- "A great section leader that **truly wants his students to learn** and is glad to help them get what they want out of the course. Two thumbs way up!"
- "Nice job and thanks for bringing blueberries to section that one time - it was a great gesture and reflects the fact that you **actually care about your students** (we notice so thank you)"
- "Ilan was a fantastic section leader and **I would take any section he teaches**"

    - Out of 38 responses, 35 students (**92%**) did not disagree with the statement: “I would be interested in taking a course with Ilan as the lecturer.” This question was asked in the end-of-quarter feedback in CS 109, winter quarter 2016.
- Awards:
    - (2016) Centennial Teaching Assistant Award for Outstanding TAs