Teaching Statement

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My experiences as a student, mentor, and teacher have revealed the profound rewards that education brings to both learners and educators. The teachers during my undergraduate education helped me understand the significance of combining knowledge with practice to create meaningful impacts in the real world. My advisor's mentorship played a critical role in guiding my career path, showing me how committed educators can guide students' development and inspire them to envision new possibilities. During my PhD, I have had the privilege of delivering guest lectures to a 250-student undergraduate security course, serving as a graduate student instructor and substitute instructor for advanced graduate-level courses in computer security, and mentoring undergraduate, master's, and junior PhD students. These experiences—along with the opportunity to shape future generations of computer scientists, engineers, and entrepreneurs—fuel my aspiration to become a faculty member.

Teaching My teaching philosophy focuses on four core principles, which are developed based on my previous experience in both teaching and learning:

- *Practice-Focused Learning*: Encouraging students to weave theory with hands-on projects to foster better understanding of the fundamentals as well as to equip students with practical skills.
- *Inclusive, Student-Centered Learning*: Tailoring teaching methods and course curriculum to recognize and accommodate the diverse backgrounds, perspectives and aspirations of each student, creating an environment where each student's participation elevates the overall learning experience of the entire class.
- *Reflective Teaching and Learning***:** Fostering a classroom that solicits and integrates student feedback, promoting continuous reflection in my teaching practices (e.g., by staying current with the latest advances in pedagogical techniques), while inspiring students to adopt a lifelong learning mindset.
- *Ethics***:** Integrating ethics into the coursework through tangible examples.

Teaching Experience My primary classroom experience in teaching is in computer security and networking, as well as serving as a guest speaker on specialized topics like Internet measurement. As a teaching assistant, I've contributed to both undergraduate introductory security courses and graduate-level advanced computer security seminars. In these roles, I've consistently found hands-on practice to be a powerful tool for enhancing student engagement and learning. As an example, I helped develop an interactive class project where students were tasked to implement a simplified version of the Signal protocol, which is widely used in today's secure messaging apps. Student feedback confirmed that such assignments helped them appreciate both the core cryptographic primitives and, in particular, the complexities of applying them in practice. At the graduate level, I served first as a Graduate Student Instructor and later as a substitute instructor for two separate semesters of U-M's Advanced Computer & Network Security course. In these classes, my co-instructors and I guided semester-long research projects where student groups tackled open research questions in security—from initial ideation through experiment design and execution. Remarkably, so far at least four of those student projects evolved into top-tier conference publications.

One of the great strengths of computer security is its relevance across a wide range of computer science fields. In the advanced security seminars I co-led, students—primarily Master's and PhD students—came from diverse academic backgrounds. The majority specialized not in security but in other computer science areas, such as the Internet of Things, autonomous vehicles, hardware, HCI, etc. Acknowledging this diversity, my co-instructors and I tailored our curriculum each semester to leverage and highlight students' varied backgrounds. We began each semester with foundational discussions on developing a "security mindset", a skill broadly

valuable to all computer scientists. Students then practiced applying this mindset to view their own fields from the perspective of an attacker. Then, during class discussions, we invited students with relevant backgrounds to share their unique perspectives—for example, encouraging those experienced in IoT to lead when discussing IoT security. Through my experience, I have observed that this approach create rich in-class discussion and elevated the overall experience for all participants, as exemplified by this anonymous comment from the class evaluation:

> "*The strong focus on everyone participating … teaches me a lot about a wide variety of topics within security—everything from network protocol vulnerabilities to mathematical definitions of privacy.*" (WN'25)

The rapidly evolving nature of computer science necessitates continuous learning and adaptation, especially in teaching. An essential part of my teaching philosophy involves soliciting feedback and constantly reflecting on past experiences to improve my teaching practices. For example, during my first semester instructing the grad-level security seminar, my co-instructor and I noticed that class participation soared when students felt more confident in a topic, but waned when the subject was outside their expertise. For this, in the following semesters, we introduced dedicated "student panels", where four to six students would facilitate discussions during each session. Panel members typically prepare by viewing the assigned readings more thoroughly, formulating discussion prompts, and anticipating questions—practices that we found significantly improved the quality and depth of class discussions. Rotating panel membership provided each student multiple opportunities throughout the semester to lead and moderate discussions, often on topics that they weren't familiar with before the class. Student panels have since become an integral part of each iteration of this security seminar course, appreciated by both students and instructors for their effectiveness in fostering engagement and learning. I intend to maintain this reflective practice, continuously refining my instruction practices through direct feedback as well as staying current with pedagogical best practices within and outside my institution.

Finally, given technology's profound role in shaping society, and particularly the double-edged nature of many computer security techniques, we as instructors have a responsibility to teach students how to reason carefully about the ethical and societal implications of their work. My co-instructors and I integrate ethics into our classes, often in the very first session, by presenting tangible examples and encouraging students to critically evaluate the ethical decisions made in state-of-the-art research papers. What are the potential benefits of a research against possible risks, and do the intended benefits justify these risks? I believe emphasizing the societal impacts of computer science practice instills a lasting ethical awareness in students, guiding them toward a more thoughtful and responsible approach throughout their careers within academia and beyond.

Future Teaching I envision teaching courses that reflect my research interests in security, networking, and measurement, while also fulfilling my passion for introducing undergraduate students to the excitement and rigor of CS. Indeed, some of my ongoing research collaborations have originated from mentoring undergraduates who began in foundational courses and went on to excel in research. Example courses I would love to teach include: (1) **Introduction to Computer Security**: A foundational course that introduces mid-to-upper level undergraduate students to essential concepts in computer security, emphasizing on developing a "security mindset". Students learn to evaluate software, networks, and systems from an attacker's perspective. Topics will include basic (applied) Cryptography, network security, OS security, web, and privacy. (2) **Advanced Computer and Network Security**: A grad-level course that is structured as an intensive research seminar, focusing on both seminal work and emerging directions in computer security, with an emphasis on networked systems. Through research papers, discussions, guest lectures and research projects, students will be prepared for security research and gain hands-on experience evaluating secure systems. (3) **Internet Measurement**: A special topic seminar examining how empirical measurements of the Internet can yield meaningful security insights. The course will explore standard and ad hoc measurement techniques and evaluate recent work and existing gaps in Internet measurement research.

Mentoring During the later stages of my PhD, I have had the privilege of mentoring and closely collaborating with several undergraduate and junior PhD students. Experiencing mentorship from both sides—as mentee and mentor—has shaped how I work with students. Following the example set by my own advisor, Roya Ensafi, I strive to customize my guidance based on each student's strengths, gaps, and individual working styles, rather than applying a one-size-fits-all approach. For example, some of my mentees thrive with independence, requiring only a sounding board for ideas and strategic planning, while others benefit more from frequent check-ins, detailed feedback, as well as clear, structured milestones. Overall, as a mentor I believe in balancing freedom with structure: encouraging students to pursue their interests and appreciate their unique qualities, while pairing this autonomy with clear milestones and scoping for time constraints to ensure consistent, meaningful progress.

So far during my time at U-M, I have mentored two graduate students and three undergraduates, experiences that have proven deeply fulfilling. One example is Anna Ablove, who started as an undergraduate research assistant, initially handling a self-contained data-collection task within a larger Internet measurement project. Encouraged by her interest and enthusiasm, we continued collaborating closely on a follow-up work, where she became a co-first author with me. Watching Anna grow into an independent researcher, now pursuing her PhD at Michigan, has been incredibly rewarding. Similarly, I guided undergraduate students Arham Jan and Robert Stanley on research involving traffic analysis, breaking projects into clear, achievable milestones—from defining research questions and reviewing literature to conducting experiments and writing papers. Providing them with ownership at each step helped them build different technical and research skills. Robert is now set to start his PhD at UCLA, and Arham is currently a SWE at Google. Beyond direct mentorship, I have actively participated in outreach efforts, such as serving as a panelist for U-M's "Explore Graduate Studies" workshops. These events have allowed me to connect with undergraduate students, share insights into graduate studies, and introduce them to opportunities in computer science research.

Back in 2018, as an undergraduate myself, I was uncertain if pursuing a PhD was the right path for me. The decision weighed heavily until advisor at the time, Joseph Bonneau, shared a glimpse of his own doctoral journey—he described it as "the best five years of my life", a time filled with personal growth, exploration, fulfillment, and joy. That conversation, and his genuine enthusiasm, inspired me to embark on my own PhD journey, and my experience in the years since has been nothing less than that. I cherish the freedom to explore new ideas, the excitement of collaborative discovery, and the sense of achievement that comes from seeing a project evolve from concept to reality. My time in graduate school has been a remarkable gift, shaped by the generosity and wisdom of my mentors. As I step into the role of an educator, I want nothing less for my own students. My hope is to create an environment where they, too, feel inspired to learn, supported by mentors who foster their curiosity, and emboldened to grow both as scientists and as individuals.