Teaching Statement

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My core teaching philosophy revolves around instilling a sense of purpose in my students. I encourage them to feel like their knowledge can address and solve social issues, empowering them to become proactive contributors to their communities and the world at large. While I absolutely want students to grasp key concepts and master fundamental techniques, I believe that encouraging them to care deeply about their impact can be a fruitful way to help them plow through the more difficult and tedious parts of the study. I especially care about reaching students who have faced more challenges in entering my classroom—whether due to their gender identity, language barriers, socioeconomic status, or racial discrimination. During my PhD, I focused my time outside of research on mentoring students from underrepresented groups (gender-based and race-based) and helping students from various backgrounds (art, science, engineering) to find their "individualized curriculum" toward research.

Teaching Experience: While at CMU as a doctoral candidate, I have been fortunate to have teaching assistant (TA) experiences that gave me valuable insights into effective course design and student engagement. As a TA for the Advanced Machine Learning and Game Theory course, I designed weekly quiz questions, mentored course projects, and created a programming assignment. As a fast-paced, advanced-level course offered to both undergraduate and master's students, the professor and I needed to accommodate students from various backgrounds and with different levels of mathematical maturity. We provided support materials for struggling students who needed to catch up on some basics. For students who were more advanced and had special interests in certain topics, we provided pointers to interesting papers. I also held weekly office hours to answer questions and provide more individualized feedback and support.

Creating the programming assignments was challenging. To integrate the most recent research advances in Large Language Models (LLM) into this course, I designed the assignment based on Werewolf—one of the most popular social deduction games where two teams of players with hidden roles need to communicate with natural languages to discover each other's identity and eliminate their opponents. With my previous research experience in Multiagent Reinforcement Learning (MARL), I broke down the task into two parts: generate a diverse set of strategic actions with LLM, and train a policy that can achieve strategic play using MARL. To provide clear and effective instructions, I carved out specific functions to be implemented and specified the input and output formats in detail. Since it was the first time we used the assignment in class, I enlisted help from lab mates for pilot testing and to calibrate the difficulty of the assignment. We offered students computing resources, cloud services, and GPUs. For students with less coding experience, I wrote snippets of sample codes for them to imitate, and skeleton code to circumvent installation and compatibility issues. Designing this programming assignment has been a labor of love and a truly rewarding experience. Many students have found the project very interesting. Inspired by this, I will design my future courses similarly. I also enjoyed mentoring course projects. We introduced potential project ideas in the first lecture so that students could start with clear learning objectives and a vision of what they could accomplish with the knowledge learned in class. Other course designs that I will integrate into my teaching include paper presentations, where students learn by teaching their peers and grading with peer review, which fosters a collaborative learning environment. Bringing students back to the classroom post-pandemic was challenging, but activities like these helped to provide a more interactive and engaging experience.

Aside from experiences with advanced programming-heavy courses, I've also experienced another type of course—I served as a TA for "Decision Models and Games," an undergraduate-level course for students from social decision science and business school. When we learned that most students were lacking exposure to virtual environments and debugging, I created step-by-step video demos for students to kick-start assignments that involved simulation software. I also learned from the instructor and prior TAs of the course how to adapt the rubrics for a new cohort of students. We strive for personalized but fair grading and constructive feedback so that the students can adjust

and improve their learning experience throughout the course. I also got to hone my ability to handle logistical problems, such as late submissions and regrade requests. It is important to be explicit and transparent so that students have a clear reference about the expectations of the course. It is also critical to strike a balance between discipline and accommodation for special needs. CMU has a diverse population of international students from various communities; we provided accommodations for Islamic students during their fasting practice and grace days during Hispanic Heritage Month so that they could participate in parades and events.

Teaching Interest: With my background in Computer Science, Cyber Security, and Social Decision Science, I have learned various subjects. **I am interested in teaching courses related to cybersecurity, programming, and data analytics**. I am also interested in teaching seminar courses that involve reading and discussing research papers. I am also inspired to propose a multidisciplinary course on Human and AI Decision-Making in Cybersecurity that would bring students from different backgrounds together. Students will study and learn about the human factors in cybersecurity and the application of artificial intelligence for cyber defense. This course would help students understand the complementary strengths of human analysts and AI defense techniques. I'm refining the design of this course under the guidance of teaching consultants in the **Future Faculty Program at CMU**. It is an effective way for me to reflect on the long-term impact of my research and how to prepare a new generation of students.

Mentoring: I mentored several undergraduate and master's students on their research projects. I learned from my advisors, Prof. Cleotilde Gonzalez and Prof. Fei Fang, how to guide students from various backgrounds with different levels of research experience. Using this principle of advising, I helped students identify their skill sets and areas of interest, and translate abstract ideas into concrete, feasible research plans. In Spring 2024, I advised a team of two master's students on their course project in AI for Social Good. One student has an extensive working knowledge of offensive security and digital forensics. The other student specializes in cloud computing and is familiar with major cloud platforms like Amazon Web Services (AWS). Despite a limited background in AI, this team was in a perfect position to examine work in game theory for cybersecurity from the perspective of practitioners. I helped outline a course project where the students first investigated the assumptions about attacker and defender capacities and their implementability. With their insights as domain experts, they proposed a game model that is better aligned with real-world computer networks. Our hacker expert designed a vulnerable network and an automated attacker, while the cloud computing expert designed a command and control infrastructure and deployed the network on AWS. In their final presentation, their enthusiasm was obvious and one told me they were planning to continue the project as their master's thesis topic. In the Summer of 2024, I advised an undergraduate student in the REU program. The student was also interested in the area of AI for cybersecurity. However, he had just finished his freshman year and needed more hands-on guidance. To make sure he could fully understand the research papers, I designed toy tasks that required him to put the knowledge to use. With a limited background, the student inevitably came across many fascinating unknown areas and was frequently distracted. I encouraged him to build a treasure map of the research landscape in various domains and discover new connections, while at the same time trying to stay on a path toward steady progress of the research project. By the end of the summer, he successfully built a translation layer between reinforcement learning-based policy and the AWS network. As the student stayed on the project the forthcoming fall semester, I felt that my ability to provide hands on mentorship and inspire students to pursue research at a higher level fulfilled my desire to assist the younger generation of scholars. As such, these mentoring experiences have led me to invest in working with undergraduate and graduate students in the future.