Teaching Statement

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I am thrilled by the opportunity to fully integrate teaching and mentoring into my daily routine. Not only do I consider these activities to be vital to my mission as a scholar, but I find them to be among the most impactful and personally rewarding. Below, I describe my prior experience teaching and advising students, as well as my philosophy for carrying out these responsibilities going forward.

1 Teaching

My experience teaching goes back to my time as an undergraduate at the University of Washington, where I was a TA for seven courses in mathematics and theoretical computer science, and a tutor for calculus and other introductory math courses. While I was a graduate student at Harvard, I served as a teaching assistant for an undergraduate introduction to cryptography (CS 127) where I was awarded a Certificate of Distinction in Teaching, and for a graduate topics course on differential privacy (CS 227r) where I received a perfect overall teaching rating. I was also a teaching assistant for a short graduate-level course on differential privacy as part of the IAS Park City Mathematics Program. My responsibilities in these courses included delivering guest lectures, leading discussion sections, preparing and grading problem sets and exams, and holding office hours. These experiences, especially when held in conjunction with my research activities, led me to develop the following teaching philosophy that I plan to use to shape my courses.

Teaching Philosophy. It is my firm belief that it is just as important, if not more important, for students to acquire broadly applicable skills in their coursework than mere knowledge of the content material itself. This belief shapes the specific courses that I plan to design and teach, as described below. For undergraduate and beginning graduate courses, the most important such skills include: how to think rigorously about algorithmic processes, how to apply this understanding to practical problems, and how to articulate mathematical and algorithmic ideas clearly and concisely. I implemented a portion of this philosophy while I was a teaching assistant for “Introduction to Cryptography,” where I added a number of (informal) programming exercises to the problem sets. Students reported that these exercises not only reinforced the theoretical concepts taught in the course, but also allowed them to engage with the material in a fundamentally different manner than what appeared in the lectures and texts.

For advanced graduate courses, on the other hand, the skills I intend to build center around the ability to do self-directed research. With this goal in mind, I plan to design courses culminating in final projects, with ample opportunity for feedback and iteration along the way. I intend to place an additional emphasis on written and oral communication skills through research paper reviews, paper presentations, and project presentations.
While the discussion above focuses on the skill-building aspect of my teaching philosophy, it also hints at a few other aspects that I would like to briefly make explicit. First, I believe in the importance of giving regular feedback throughout the duration of the course (both from the instructor to the student and vice versa). Whenever possible, I plan to use such feedback to adapt my courses to the backgrounds and interests of the students. Second, I believe in using my research and teaching activities to reinforce each other. For instance, when teaching new topics courses, I plan to carefully organize the materials so that they can also serve as useful research resources.

Courses. In addition to teaching core undergraduate and graduate courses in theoretical computer science (including discrete math, algorithm design and analysis, and introduction to the theory of computation), I would enjoy developing and teaching more specialized courses on a broad range of topics that intersect with my research interests.

Algorithmic Data Privacy. The course I would be most excited to teach is one based on my primary research interests in differential privacy. In my course, I intend to emphasize the connections between privacy and other areas of theoretical computer science (cryptography, optimization, combinatorics, and learning theory) that have characterized my own research. I also intend to raise discussion about the broader scientific, legal, and ethical context around issues of data privacy, as such an understanding is crucial to the long-term development of technical research.

Cryptography. I would enjoy teaching introductory or advanced topics courses on the foundations of cryptography. As an undergraduate or beginning graduate course in particular, I believe this class would give students a valuable opportunity to learn how to model real problems mathematically, reason about these models rigorously, and internalize the main principles of security.

Foundations of Machine Learning/Data Science. I would be happy to teach a course on the mathematical concepts and tools underlying modern data science, including topics in applied linear algebra, statistical learning theory, online learning, streaming/sketching, and clustering. An important goal in such a course would be to teach students how to identify real circumstances in which such tools are applicable, and apply them correctly.

Computational Complexity Theory. I was personally drawn to theoretical computer science through my first course on computational complexity theory, and would be delighted to share my enthusiasm for this deep, beautiful, and pervasive field. In addition to teaching a broad course on computational complexity, I would be interested in teaching more specialized courses in communication complexity, computational learning theory, and quantum complexity theory. Finally, I would be excited to develop a topics course on the research frontier in complexity theory, covering recent breakthroughs in areas such as pseudorandomness, circuit complexity, and fine-grained complexity.

2 Advising

One of the most rewarding aspects of my academic experience has been the opportunity to mentor junior colleagues. As part of my work in the Privacy Tools for Sharing Research Data project at Harvard, I co-supervised the research of four undergraduates over three years. In line with the
interdisciplinary scope of this project, these students had diverse backgrounds in both computer science and social science. Their research, in turn, took several forms—from refining, implementing, and evaluating differentially private data analysis tools to investigating how to make these tools accessible to social science researchers. The diversity of these students and their projects taught me the importance of adapting to each student’s abilities and interests. For example, I advised an excellent social science student who initiated an ambitious project going well beyond the scope of what we had planned for him. Nevertheless, I needed to dedicate additional time to introduce him to the necessary background in theoretical computer science and differential privacy to successfully carry out this work. In the end, all of my advisees completed projects with tangible impact on the Privacy Tools project as a whole.

To complement these more formal advising relationships, I have also informally mentored a number of beginning graduate students at Harvard and Yale. I helped introduce these students to the area of differential privacy, and our work together has resulted in several published (and submitted) conference results. It has been a joy to cultivate long-term relationships with these students, and see them grow into independent researchers.

As a primarily theoretical researcher, I have the flexibility to put the individual needs and interests of my future advisees first. To this end, I plan to help students find projects which reflect their own research tastes, and make sure they have access to resources needed to reach their scientific and broader career goals (be they in academia or industry). I also plan to take an active role in organizing seminars and reading groups, and to help my advisees build their professional networks. Through these actions, I hope to build a small, but vibrant, group of researchers.