Teaching Statement

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Teaching is one of the most vital and rewarding aspects of academia, and I am excited for the opportunity to fully integrate teaching and mentoring in my career. Beyond the contribution to the scientific advancements we make as researchers, I believe our impact on the society at large is determined by how we as educators influence the younger generation, and I recognize the great impact that faculty can have on students' lives from my own experience. I think our educational mission is both to give students solid understanding of knowledge in computer science, and also to foster the intangibles such as abilities to communicate, collaborate, and learn independently, which are especially critical due to the fast growing and ever-changing nature of our field.

My own experience of teaching goes back to my sophomore year in college. I served as teaching assistant at Cornell and UC Berkeley for a total of 12 semesters for classes ranging from introductory programming, discrete math, algorithm, theory of computation, to graduate-level algorithm and special topics. In Spring 2019, I will teach the core undergraduate algorithm class at Georgia Tech, which currently have more than 150 students enrolled. In Fall 2018 at Georgia Tech, together with Prof. Richard Peng, I taught a graduate course on the mathematical foundations of spectral algorithms. I significantly reoriented the syllabus to focus more on the connections of spectral algorithms to modern machine learning and data mining applications, and also restructured the project and presentation aspects of the course.

My main teaching philosophy are that 1) students learn more effectively in a small-group and interactive environment; and that 2) beyond the concrete knowledge of the course material, it is just as important, if not more important, for students to develop broadly transferable skills that are crucial for their future success in whatever career path they pursue. I implemented these principles in my courses by integrating components into the coursework to let students hone crucial skills such as communication, presentation and independent learning. In the graduate spectral algorithms class, I designed most homework questions to be variants and simplifications of classical research results not covered in class, and let students find and learn the relevant results independently. Of course in lectures I needed to set the students up with sufficient background to understand these results, and divided each problem carefully into steps to guide the students through their understanding of the result. Another component of the class was a group project, and each group needed to give a 5 to 10 minute oral presentation. I asked the students to think hard about how to make their presentations interesting to the audience in limited time without diving into the technical details. Moreover, the discussions between me and the students in scheduled meetings and office hours over their self-picked projects were naturally in a small-group setting and very interactive. In my experience as teaching assistant and instructor so far, I have focused on developing ways to better integrate such discussion components into the learning process. The challenges posed by varying class sizes also led me to try a wide range of approaches. In undergraduate recitations of reasonable size (with < 30 students), I routinely allocated at least half of the class time to let students work in groups of 2 or 3 on worksheet exercises, and stated clearly to the students that apart from solving the problems, they should also practice asking concrete questions and articulating technical ideas clearly. On my part, I observed the groups closely, and rotated between groups to facilitate discussion. For larger classes, the process of asking questions mostly relies on online interfaces or office hours, and feedbacks for group discussions in such classes can only be given through short answers to carefully prepared questions. On the other hand, my experiences with massive undergraduate algorithms classes (with > 400 students) suggest that technology such as Piazza is critical for a more one-on-one and interactive learning experience for students.

I also had the privilege to work with undergraduate and master students on research. From 2011 to

2013, I mentored UC Berkeley students Darren Kuo, Victor Huang, Andrew Gambardella and Chenyu Zhao on machine learning projects related to text mining. I guided them through the understanding of various statistical models and learning algorithms, the implementation of existing and new methods, the design of empirical evaluations and presentation of results. The wide range of interesting theoretical and empirical problems in this area allowed me to tailor my advising to the interests and goals of each individual student. Later on, the students were able to leverage their research experience to find AI related positions in industry, or continue the study of machine learning in graduate school. I am excited about the opportunity to supervise more research-oriented undergraduate and graduate students in the future.

As a new faculty, I would be qualified and enthusiastic to teach courses such as algorithms, discrete math, probabilities and theory of computing at undergraduate level, and algorithm related subjects at graduate level. In addition, I am interested in teaching topics on the foundations of modern data science, e.g. linear algebra and convex optimization, which have become increasingly important to our field both in theory and in practice. I find these topics are often under-emphasized in traditional CS curriculum, and courses on these topics from other departments usually lack the computation aspects. In particular, I plan to incorporate some basic methods such as gradient descent and multiplicative weights update into the undergraduate algorithm class I will teach in Spring 2019. I am also open to expand my horizons and the challenge of teaching a wider range of subjects, since I find teaching to be one of the best ways of learning.