Teaching Statement

Overview: I find teaching very rewarding and seek to create curiosity-driven and interactive classroom/lecture environments that not only teach students the necessary material, but leave them excited about the subject and eager to explore the concepts further. During my PhD, I have had the opportunity to serve as a teaching assistant, design and give guest lectures, present a tutorial at Microsoft Research, and mentor junior PhD students. These experiences, along with my methodology for each, are detailed below.

Teaching Assistantships: I served as a teaching assistant (TA) for two courses as a graduate student. The first was an undergraduate class on discrete math (Great Theoretical Ideas in Computer Science) that is one of the most challenging undergraduate classes at CMU. Not having had the opportunity to teach as an undergraduate, this was my first experience formally teaching. The first few recitations (review classes) were somewhat discouraging, since I had trouble getting the students to participate.

However, I listened to student feedback, observed the more experienced TAs teach, and carefully thought about how to organize the recitation to be more helpful and interactive. I restructured my recitation to first give a brief summary of the concepts that had been covered that week, which would usually lead students to volunteer which topics they had trouble with. After discussing these areas in more depth, I would move on to working through practice problems. By then, the students were refreshed enough about the material and could actively participate in proposing solutions and asking questions about the proofs.

As a result, my teaching skills improved immensely, and the students found my recitation much more valuable. The next semester, I served as a teaching assistant for an advanced graduate class, and received a nomination for the department teaching award. This experience also helped me shape my future guest lectures, tutorials, and research talks which have been consistently well received.

Lectures/Tutorials[1]: I am very fortunate to have had the opportunity to give a 3 lecture unit on kernel and spectral methods for graphical models during Spring 2012 (when I was a TA for an advanced graduate class) and again in Spring 2013. Since it was a very nascent research topic at the time, there was essentially no classroom-suitable material available, either from CMU or other schools. Thus, I studied the research literature and developed a coherent strategy to present the concepts in a way that was intuitive as well as substantive.

Prof. David Sontag at NYU later used a subset of these slides to teach spectral learning to his students. The material also served as a basis for a tutorial I later gave at Microsoft Research on the subject. Many others have told me they find my presentations much more clear and intuitive than other tutorials on spectral learning.

More generally, I believe a key challenge in teaching, is not to shy away from difficult concepts, but to present them in an understandable and thought-provoking way. Thus, my style tends to be defined by a unique mix of graphical illustrations/animations, which provide visual intuition, in combination with equations that give concreteness. Some other key aspects to my approach include motivating with small examples before presenting the more general algorithm, and grounding the new concepts in the context of previous ideas the students are already familiar with. Throughout the lecture, I encourage student participation by asking them to attempt to figure out the ``next step'' in the algorithm/derivation as opposed to simply revealing it. I have found this creates an interactive environment where many more students feel comfortable participating.

Mentoring: I also have the privilege to mentor two intelligent and highly motivated junior PhD students: Micol Marchetti-Bowick in machine learning/computational biology (Oct2013 - present) and Mrinmaya Sachan in machine learning/natural language processing (Oct2014 - present).

Overall, I tailor my mentoring style based on the student and nature of the project. In Micol's case, she already had some short-term projects, but was searching for a longer term direction. Thus, we spent considerable amounts of time jointly studying both the biology and machine learning literature to find an impactful applied direction that also posed theoretical and modeling challenges. Once we had found a general theme and narrowed it to a specific problem, I let her take the lead role in solving it, helping as necessary. Our work is currently under review at AISTAT 2015 (see research statement).

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[1]All these slides can be found on my website: `http://www.cs.cmu.edu/~apparikh/teaching.html`

Future Courses: Some examples of courses I would be excited to design and teach are below.

- *Graduate*: statistical machine learning, probabilistic graphical models, machine learning, natural language processing, other advanced topics related to my research

- *Undergraduate*: machine learning, algorithms/data structures, artificial intelligence, statistics/probability, discrete math, introduction to computer science/programming, AI for non-majors