Teaching Statement

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Since my elementary school days, I have been filled with a tremendous sense of fulfillment each time I've been able to teach something to a friend or peer. After moving on to college and, later, graduate school, I decided to become more actively involved in teaching, and I took part in a variety of teaching experiences:

- **A broad spectrum of subjects:** I served as a teaching assistant for courses on Programming, Statistics, Signal Processing, Algorithms, and Machine Learning.

- **Teaching large classes:** I guest-lectured in large classes (>100 enrollment) at UIUC and UPenn.

- **Peer mentoring:** I had the opportunity to mentor younger, often undergraduate, students. In some cases, their projects resulted in publications at prestigious conferences.

- **Community teaching:** Over the past years, I have dedicated time to teach basic computer science to underprivileged students (e.g., teaching web-design to West Philadelphia high school students).

Throughout my journey, both as a student and as an instructor, I have experienced many teaching styles and have developed a taste for what I believe would result in an effective communication channel between teachers and students. In the following sections I elaborate my teaching philosophy. First, I focus on the importance of creating an interactive learning environment where students feel comfortable and encouraged to participate. Then I emphasize the effectiveness of high-level understanding, as opposed to less important details. Finally, I end with a look into future plans.

Creating an Interactive Environment

The classroom climate plays an important role in the quality of learning. Teaching should keep students engaged and active. Incorporating an interactive exercise into each lecture could help their understanding of the ongoing lecture and give them a break to process everything learned so far. One way to do this is by posing a thoughtful question and letting the class discuss it (in small groups or with the whole class) by reflecting on what they have learned so far. Instructor-led activities have the potential to expose students' reasoning flaws and address their misconceptions.

I experienced the way this could benefit students first-hand in a class that I taught. To motivate students to recognize the importance of "receptive fields," I opened with the question; "how would you feed a bunch of images with variable size to a feed-forward neural network?" I was delighted to hear a diverse set of responses. In some cases, students pointed out others' mistakes and helped them identify better solutions. I let the conversation go on for 5-10 minutes, before laying out my proposal. While explaining the answer, I tried to cover how it addresses the issues in solutions proposed earlier by the students during the discussion. After the class, I was satisfied to see many students were eager to engage in deep conversations about issues beyond what was discussed during the lecture.

There are other perks that come with this teaching style. Active learning will fill students with self-confidence and self-worth. Over the course of my classes, I always felt that students were more motivated when I remembered their names. This simple act shows them that they have worth and that I genuinely

care about their success. Whenever they try to answer a question in the class, giving credit to their effort, even if it's not completely correct, can boost their morale. Students should feel that the effort they put into work is being credited.

Focusing on the "Big Picture"

It is important to regularly remind students of the journey, so that they are not lost in details. The class should open and close with a reflection on the course and a brief look into the next section, to put what they have learned into context. The lecture must contain an engaging activity—a question or exercise to spark student curiosity and motivate them to discover what they are supposed to learn.

Building the high-level picture is important in every step of teaching. We all forget about details; only intuitions stay with us. Throughout my studies, I have seen great mathematicians with significant rigor fail to focus enough on intuition and let their students (including myself at times) get drawn into the swamp of details and equations. Sometimes it is easy to forget that equations and formulas are not the holy grail, but rather a formal medium to express a certain class of intuitions.

Take the Backpropagation algorithm, for example, which is a key algorithmic tool in deep learning and widely used. Any effort to jump into the algorithm in its full glory, without a proper build-up, could result in a dramatic failure. The algorithm contains many notations and seemingly complicated equations. A successful approach for introducing this algorithm has to focus on building the intuition. To start with, one has to know only three ideas to understand the whole thing: (a) chain rule from basic calculus, (b) gradient descent, and (c) dynamic programming. With these tools at hand, students should be able to understand and describe the Backpropagation algorithm, in plain English. At this point, even if the students fail to follow the details of the equations for whatever reason, they will never forget the core idea of the algorithm.

Future Teaching Plans

I enjoy teaching a variety of subjects, in particular those that are foundational to my research area (natural language processing, artificial intelligence, and machine learning). I would like to develop courses that enable students to use computational tools for language problems, which would involve understanding of both NLP and AI. The contributions of the two subjects would depend on the focus of classes: *an NLP-focused course which makes uses of off-the-shelf AI tools*, or *an AI-focused course, with NLP challenge problems*. The ratio of theory and practice usually depends on the course level and subject area; advanced courses usually demand more theoretical content, while elementary courses often focus on building basic intuitions, often with empirical work.

Teaching has been an important part of my education thus far, and I believe teaching is one of the key jobs in any society. It is the teachers who have to inspire curious minds and spread critical thinking throughout the society. I have enjoyed teaching in the past, and I look forward to pursuing it more seriously. It's a beautiful thing when a career and a passion come together.