Teaching Statement

Hitesh Ballani

I relish the simple joys and challenges of teaching. Very few things top the satisfaction that I gain from helping hard-working students learn a skill or solve a problem. I distinctly remember my first student lecture at Cornell where I was supposed to explain data structures such as stacks and queues to non-engineering students. While such concepts are second nature to anybody majoring in computer science, I did not want to assume that the same held for, lets say a fine arts student. To account for this, I tried to relate the data structures to their real-life counterparts. For instance, I used a box of Pringles to illustrate how the notion of "Last-In First-Out" captures the operation of a stack and the memory of the entire class appreciating how simple these fundamental programming constructs are has stayed with me ever since.

The above example illustrates one element of my teaching philosophy. In general, I strive to imbibe the following in my teaching:

- I don't treat teaching as a chore. Instead, I see it as an opportunity to interact with young and curious minds and this reflects in the energy and passion with which I teach.
- I try to make my classes, be it a lecture for a hundred students or a review session for just five students, as engaging as possible. I have found that only by involving my students in a discussion do I establish a feedback loop. This allows me to determine what techniques and examples are effective and which ones need to be refined.
- I firmly believe that the "One Size Fits All" approach does not apply to teaching. Based both on my personal experience as a student and as a teacher, I have realised that the best way to get an idea across depends on numerous factors such as the concepts at hand, the familiarity of the students with the topic and even the class size. For instance, I found that it was easier to explain programming language concepts based on mathematical constructs while students better understood network protocols and underlying principles by seeing the protocols in action.
- It is critical to strike a balance between well-established and well-understood concepts against work that represents the cutting-edge technology both in industry and research. This, I believe, is especially true for systems courses. Students get more involved and interested when told about how the algorithms and techniques they have studied are being used in new applications and products. Further, this results in well-rounded students who are better at applying the concepts that they have learnt.
- Teaching is a two-way street. I take my teaching assignments very seriously and try to ensure that students get a complete understanding and appreciation of the subject being taught. On the other side, teaching classes also results in a lot of takeaways for me. For one, explaining ideas to students allows me to understand how other people look at technical issues and by extension, lets me determine the best way to present and portray my research. More importantly, interacting with students who don't have many pre-conceived notions can lead to questions about fundamentals that many of us in the research community have simply accepted on blind faith. Such out-of-the-box discussions help me question my ideas and influence the direction of my research.

As far as *teaching experience* is concerned, I have served as the teaching assistant for two courses, "Programming Practicum" that introduces students to the ways of software engineering and "Computer Networks", an advanced networking course. As a TA, I was responsible for various course tasks, including

project design, review sessions, grading and lectures. For the latter course, I personally designed and implemented a set of programming assignments, including a user-level IP stack. I am very proud of the quality of these assignments which is illustrated by the fact that the same set has been used by the following offerings of the course for the past five years. Further, I also received an "Outstanding TA Award" from the department as a recognition of my contribution to the course and its students. Beyond this, I have given occasional lectures in both undergraduate and graduate-level networking courses.

Another important aspect of the teaching process is *mentoring* students. The focus here is less on imparting knowledge and more on being a *facilitator*. Such facilitation can range from defining and providing direction for a research project to helping out with low-level system idiosyncracies. I have had the pleasure of mentoring two amazing graduate students – Andrey Ermolinskiy (Berkeley) for a brief duration in 2005 and Tuan Cao (Cornell) for the past year. In both cases, I relished the opportunity to guide very bright students who were eager to learn the intricacies of Internet routing. I helped them appreciate why inter-domain routing works the way it works and what can be done to improve it. Seeing them make mistakes similar to the ones that I made when I was starting routing research but spend less time on finding a work-around due to my guidance was indeed very gratifying and contributed to my conviction to pursue an academic career.

I have been fortunate to have had many dedicated teachers who have influenced and inspired me deeply. For instance, it was the way that the teachers at my undergraduate institution piqued and encouraged my interest in systems and networking that convinced me to pursue graduate studies. My thesis advisor, Paul Francis, proved that having a good advisor can go a long way in making graduate school an amazingly enriching experience. I have consciously tried to imbibe the qualities of my teachers and it is their influence and my experience as a teacher and mentor that has shaped the teaching philosophy described above.

Given my research and teaching background, I will be most interested in teaching undergraduate and graduate-level networking courses. I would love to teach seminar and paper-chase courses on a number of special topics including routing, wireless networks, network games, application of game theory to networking problems, network security, etc. I will also be comfortable teaching other systems courses, such as operating systems, distributed systems and software engineering. My teaching vision is to impart my students with not only an understanding of how systems work and the ability to build them but to equip them with a toolset that can be used to solve real-world problems in novel and interesting ways. To this effect, I will strive to ensure that my courses strike the right balance between both "old-school" vs "new-school" concepts and text-based vs hands-on teaching. I also hope to give my students just the right dose of skepticism so that they can evaluate ideas in an objective fashion.

To summarize, I believe that being part of the academic world bestows upon us the very important responsibility of preparing the next generation to face the challenges of the world. As I get ready to pursue a career in academia, I feel fortunate that I will have a chance to mold so many young minds and I am confident that I will be able to guide them to bigger and better things in life.