Teaching Statement

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My goal in teaching is to help students develop the skills, knowledge and skepticism necessary to become independent engineers, thinkers and researchers. Given my research style, this translates to training students to learn how to tackle challenging practical problems using innovative theoretical ideas, and to evaluate them in practice by engineering deployable solutions. As networked systems grow more complex and become specialized, there is a tendency in students to stay safely on one side, be it theoretical analysis or system implementation. While either approach is useful and valuable, the separation encourages homogeneity, suppressing innovative ideas which arise from the cross-pollination of concepts. My goal is to train students to bridge this divide. I plan to equip students with the appropriate analytical tools to understand and research theoretical techniques, but also insist on careful system design and implementation to develop their engineering skills. Implementations and experimental evaluations impart hard to teach skills which you get only from doing; such as conceptualizing the interplay of various systems components, design approaches and devilish practical details (which are hard to model in theory).

Ultimately, a teacher's responsibility is to empower students to discover their own interesting problems and learn how to tackle and solve them independently. As a senior graduate student, I had the privilege of working with incoming graduate students who my advisor (Dina Katabi) paired with me so that they could hit the ground running. I believe I learned as much from them about supervising as they did from me about research. The challenge was to make sure the students progressed by providing them with concrete achievable goals, while maintaining and communicating a high-level vision or open-ended problems that the students could work towards. I discovered that students were especially motivated by projects that had a nice conceptual touch to them, instead of heavy tedious implementation, since it encouraged them to think of other problems where those concepts could be applied. For example, Shyam Gollakota worked with me when he initially came in on Analog Network Coding (SIGCOMM 2007), which developed a new approach towards wireless interference in mesh networks. The high-level philosophy is that we can use interference to our advantage instead of treating it as always harmful. Shyam built on this philosophy of rethinking interference, proposing a new technique to deal with collisions in 802.11 access-point networks, which was published in SIGCOMM 2008. Playing such a productive role in a student's research career is as satisfying to me as developing innovative solutions in my own research.

Beyond supervising research, I enjoy teaching students within the classroom setting. I served as a teaching assistant for the core graduate "Computer Networks" class at MIT. I was responsible for conducting weekly recitations, and co-designing and grading problem sets. The recitations were held with smaller groups, and I structured them into two halves: first, to clear concepts taught during lectures, and the second to provide an overview of advanced research in the corresponding topic. The overviews were especially popular, since the course also had a strong research project component and the discussions provided students with ideas for projects. The projects became springboards for graduate students into their own research, even producing a MOBICOM 2007 paper from a class project.

Given my research background, I am qualified to teach a variety of courses including networking, wireless communications, signal processing, network security and distributed systems. I am particularly excited to start and teach a new networking class which gives students hands on experience with all the layers in the stack. Currently, students learn the basic concepts behind communication networks in several separate classes: learning basic signal processing and communication techniques in one or more introductory EE classes, while learning about packets, internetworking and distributed systems in separate CS classes. Due to a variety of reasons, many students do not either take all the classes, or even if they do, the classes often are disconnected from each other and do not provide a holistic view. Instead, I propose to teach an introductory undergraduate class where the students are exposed in a hands-on fashion to all the layers: going from building basic modems for point-to-point communication channels to stringing them together to form larger networks. Wireless is an attractive practical setting for such a class, due to the availability of software radios from which students can learn hands-on about basic ideas in signal processing, coding, modulation/demodulation, and also build networks out of simple wireless links.

Finally, I believe that an important component of teaching is to communicate ideas yourself as well as train students to do so, both within the research community, as well as to the general public. I plan to organize seminars and reading groups, to enable students to stay abreast of the latest research, and learn to give talks. Recently, I had the opportunity to give a tutorial with Prof. Dina Katabi at a top wireless conference (MOBICOM 2008) on my research area. I realized how important it is to disseminate new advanced techniques and introduce the community to ideas from other fields that may have impact on networking research. Conference talks do part of the job, but often fail to provide the "big picture" due to their limited duration, and I believe research tutorials can bridge that gap. And last, but not the least, academia today recognizes that to excite students to pursue careers in EECS, we will have to do a better job of communicating our discoveries, inventions and style of thinking to them. From designing and teaching exciting introductory classes to giving public talks, I hope I have the opportunity to do my bit in this endeavor.