

# Teaching Statement of Shyamnath Gollakota

I see teaching students as an important aspect of a faculty job. I had a few opportunities to teach and found the experience very fulfilling. My first exposure to teaching was as an undergraduate at IIT Madras, where I was given an opportunity to teach trigonometry to younger students whose parents could not afford private tutors. Initially, I struggled to convey the intuition underlying my solutions to trigonometric problems. Upon asking my mentor for advice, I realized that they couldn't understand me because my reasoning was significantly colored by my past knowledge. For example, my solutions used complex trigonometric identities that I took for granted. However, the students were comfortable only with the most basic identities such as  $\sin^2 + \cos^2 = 1$ . For the rest of the term, I made a conscious effort to break down my reasoning into its simplest form. I noticed that the students started responding positively, and by the end of the term, most of them could easily solve complex equations and had developed their own tricks and intuitions for solving trigonometric problems. I was extremely happy to contribute to their learning.

Later at MIT, I was a teaching assistant for the core undergraduate class *Introduction to EECS II*. This is a hands-on class geared towards students in their first or second years to engage them in all aspects of communications and networking. The class starts with the basic concepts of signals, channels, bits, and packets. It then touches on modulation, coding, compression, queuing, networks, and protocols. All these concepts are integrated into simple labs where the students transmit and receive signals using software radios. The beauty of the class stems from its ability to teach the basic concepts underlying communication systems without invoking heavy mathematical techniques. The class is taken by both CS and EE undergraduates. The heterogeneity in students' backgrounds required me to appeal to different perspectives and use different examples when talking to different students. I was lucky in that my research naturally made me aware of both the EE and CS perspectives on communications and networking. I also enjoyed interacting with the students immensely and was amazed how much I learned as I tried to explain the material. During recitations and office hours, a few students always asked challenging questions that were peripherally related to the scope of the class. I found it useful to admit to the student that I was not certain about these questions, then do my own reading and ultimately follow up with a concrete answer. At the end of the term, I received emails from some students stating that they immensely enjoyed these follow-up conversations and that these discussions made them interested in doing research in communications and networking.

I also taught a few guest lectures in the core graduate class *Computer Networks* while it was being taught by my advisor, Prof. Dina Katabi. Further, for the last four years, I have been teaching junior students in our research group how to use software radios. I found that they were initially overwhelmed by the complexity of a practical wireless system. To help them understand, I purposely omitted multiple signal processing blocks essential for the system to work. I then encouraged them to get their hands dirty and debug the code by looking at the wireless signal received on the radio. This not only gave them a feel for how real wireless signals look, but also helped them understand how the various components in the system interact with each other.

During my first year at MIT, I was mentored and taught a lot by Sachin Katti, now a professor at Stanford. As a senior graduate student, I have had the opportunity to give back by mentoring undergraduate and junior graduate students. My approach to mentoring has evolved over the past three years. Initially, my sole focus was to finish the project on time by setting definite goalposts and telling the student what to do at every step. I learned that students love when they get to discover things on their own. For example, when Fadel Adib started working with me, I noticed that he had a zeal for challenges and was often disappointed with easy-to-solve problems. Accordingly, in the initial phase of the TIMO project, I gave him challenging assignments for which I already knew the answers. However, the confidence he gained solving these assignments, allowed him to later innovate and contribute significantly to the final TIMO design.

I also believe that one can teach a lot by being a role model to younger researchers. For example, by giving the highest priority to students, talking to them regularly, and being around in the lab, an advisor indicates that students are important and their work matters. This is likely to make the students reciprocate by putting more effort in their work and feel satisfaction with their technical achievements.

Finally, given my research background, I can teach graduate courses on networking, wireless communications theory, and security. I can also teach basic undergraduate classes in computer science, math, and signal processing, e.g., undergraduate algorithms, probability, discrete math, signals and systems, etc. Further, I would like to use my experience with software radios to develop an interdisciplinary graduate class that gives students hand-on experience with wireless communication systems and innovative cross-layer network designs. Multiple NSF studies and workshops have highlighted the need for such classes that bridge CS and EE. Such courses will provide our graduates with interdisciplinary tools that allow them to innovate and stay ahead of the curve.