Teaching Statement

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I find teaching and mentoring to be a very enriching and fulfilling experience. I believe as educators and researchers, it is our primary responsibility to introduce students to the joy of discovering new ideas and to the challenges of taking these ideas to real-world systems. These experiences excite students, invoke curiosity, and equip them with professional skills required to thrive in their careers, both in industry and academia.

Teaching Experience: As an undergraduate student at Indian Institute of Technology, Delhi, I created new teaching centers for kids from slums around campus, taught basic computer skills to incoming undergraduates who had never used a computer before, and was a teaching assistant for the introductory Data Structures class. Through these experiences, I shared the joy of my students when they got excited about certain scientific concepts, submitted their first problem sets, or even created their first social media account. I realized that discovery of new concepts and their connections to students' past understanding/experiences engage and excite students.

I put this realization to practice as a teaching assistant for the graduate Computer Networks class at MIT. I was responsible for creating and grading problem sets, creating subset of lecture materials, conducting office hours and review sessions, and helping students define and execute their final projects which constituted about 50% of the class grade. To help students get a headstart on the project, I created a new lab for the class, that allowed student groups to put to test the concepts that they had learnt in class. To familiarize students with the setup, I scheduled individual two-hour lab sessions with each group (12 groups of 3 to 4 students). This lab helped students understand the systems challenges and perceive limitations of the methods they had learnt in class.

To continue the engagement built up in the lab, I helped students define projects that could combine material in the class with their own interests. I setup various platforms (like APIs for drones, software defined radios, wireless chipsets, etc.) for the students to explore their interests. This effort was very rewarding because the students were more excited and felt a sense of ownership for their projects. The end products of the projects were very interesting and touched on topics in computer security, machine learning, and robotics in addition to networks. For instance, one group was interested in computer security. I motivated them to explore the security of wireless networking protocols used for commercial drones. The students took this up and showed that they could take over control of a commercial drone, without the consent of the drone operator, by relying on wireless networking techniques. We invited an expert drone operator, who failed to maneuver the drone when the students sent competing commands to the drone using their device. Students continued some of the projects, beyond the scope of the class, and published papers in top networking conferences like SIGCOMM, HotNets, and MobiCom. At the end of the class, in anonymous feedback, students found me 'very knowledgeable' and appreciated the support in labs, office hours, and final projects.

Mentorship Experience: During my Ph.D., I have been fortunate to mentor four graduate students at MIT (Anubhav Jain, Guo Zhang, Aniruddh Raghu, Colin Marcus), a graduate student at UCSD (Roshan Ayyalasomayajula), two undergraduate students at MIT (Stef Ren, Francisca Vasconcelos), and an undergraduate at IIT Delhi (Akshansh Chahal). In mentoring all these students, my central philosophy has been to excite students about the projects by building on their strengths. The students I have mentored over the years have had very different technical backgrounds: hardware, computer networks, machine learning, computer systems. I crafted initial sub-projects that sit at the intersection of our areas of expertise. This allowed me to share my existing knowledge in the field, while giving them scope to bring in their own ideas at the very beginning. The fact that they could contribute intellectually helped establish a sense of ownership of the projects among the students. Once the initial phase was done, the students invariably steered the projects in directions that would not have been possible with either of us working alone.

For instance, Anubhav loves to build stuff and is always excited about maker tools like embedded systems, laser cutters, 3D printers, etc. When he joined the group, he was excited to explore wireless networks. To tap into his interests, I crafted a project that focussed on building a localization platform using an Intel Galileo microcontroller. This helped him gain knowledge of wireless localization and understand the design choices

involved in building RF localization systems. His work on the sub-project was so exciting that I decided to deploy the system in my home and our offices. These deployments helped me and Anubhav understand the shortcomings of localization systems in a real-world deployment scenario and led the foundations for a UbiComp paper.

I believe learning is a collaborative process. My mentorship and teaching experiences have nudged me to look at my existing ideas from new perspectives and equipped me with technical skills and knowhow from different areas – skills that proved valuable in my future projects. In addition, my collaborations have led to conference papers at top conferences like SIGCOMM, UbiComp, and CoNext.

Courses I can Teach: Given my research experience, I am excited and equipped to teach graduate classes in computer networks, mobile systems, wireless communications, and embedded systems. I am also qualified to teach undergraduate classes in computer networks, programming, algorithms, signals and systems, etc. In addition, I would love to create hands-on IoT systems classes for both undergraduate and graduate students. These classes will give students the opportunity to build system designs, protocols, and algorithms for real-world IoT systems. I believe these classes will excite undergraduate students about computer science by showing them how computing can permeate their daily lives. For graduate students, it will make them explore the intersection of their own research areas with the IoT system paradigm, given the cross-layer nature of IoT systems.

Outreach and Community: I believe teaching and mentorship extend beyond classrooms and lab spaces. Therefore, I constantly engage with the general computer science community (researchers, and practitioners) through general purpose write-ups and tutorials. I have written articles for ACM Queue, ACM GetMobile, and CACM, and gave a tutorial on Low Power Networks at ACM MobiCom 2018. I frequently reach out to communities beyond Computer Science, engaging with people from various background, demographics, and social backgrounds. I have collaborated with architects, medical practioners, and farmers, and presented my work to families of MIT undergraduates, farm broadcasters, nano technology researchers & practitioners, radiation therapists, and mechanical engineers. These interactions have served as fertile ground for cross-pollination of ideas from multiple communities. Finally, I actively promote undergraduate involvement in research through mentorship. I have served on the Program Committee for the MIT Undergraduate Research Conference. I serve as an alumnus mentor at IIT Delhi, where I mentor undergraduates interested in pursuing research careers, some of who have gone on to become graduate students/interns at MIT, UC Bekeley, and UCSD.

In conclusion, I see teaching and mentorship as an opportunity for us to shape the next generation of researchers and practitioners in computer science. Engaging with students also challenges our existing ideas and beliefs and compels us to look at them from fresh perspectives, often leading to new breakthroughs. I am very excited by the opportunity to teach and to learn from students.