

# Teaching Statement: Suraj Jog

One of the biggest appeals of an academic career for me is the chance to interact with students through teaching and mentoring. As educators and researchers, I believe it is our primary responsibility to introduce students to the joy of conceptualizing new ideas, and to the challenges of translating these ideas to real world technologies. Through my teaching and mentoring efforts as an academic, I hope to ignite students' passions about the intellectual rigor of problems, and equip them with the required skill set to excel in their careers, both in academia and industry.

## TEACHING EXPERIENCE

My first teaching experience was as a teaching assistant (TA) for first-year undergraduate students in my junior year at IIT Bombay. I held weekly tutorial sessions where I would help students with the material taught in class, and cover problems that illustrated the core concepts and how to apply them. During my TA experience, I realized that being an effective teacher requires one to have a holistic understanding of the subject matter with a strong command over the fundamentals. An effective teacher should be able to inculcate in the students the practice of reasoning and critical thinking about the subject matter.

During my tenure as a doctoral candidate at the University of Illinois at Urbana-Champaign (UIUC), I had the opportunity to work with my advisor to plan and develop the first offering of the advanced wireless networks and mobile systems course for graduate students. In the process of designing this course from the ground up, I got first-hand experience of organizing and creating lab sessions and problem sets. One of the crucial learning experiences for me was that, in order to engage the students in the course, it was important to relate the course material and assignments to real-world problems. This would encourage students to think about the problems in depth, and to continue thinking about them beyond the boundaries of the classroom. Towards this end, we designed our labs such that the students were tasked to use real wireless hardware like software-defined radios, RFID tags and readers, FMCW radars, and so on, to build end-to-end systems that could deliver on a range of wireless applications like tracking, localization, and MIMO communications. To familiarize students with the wireless hardware and toolkits, I scheduled individual lab sessions with each group (10 groups with 2 to 3 students) where I would give complete tutorials on how to operate the radio equipment. These lab sessions helped students understand the system-level challenges and they were excited to see the concepts learnt in class getting translated to tangible real world use cases. This effort was very rewarding for me since we were able to deliver an engaging learning experience for the students, and the lab assignments and problem sets that I developed have continued to be used in the subsequent offerings of the course. (<https://courses.engr.illinois.edu/ece598hh/fa2020/>)

In addition, I have also been a teaching assistant for an undergraduate course on computer networking at UIUC, where I was responsible for creating and grading problem sets, conducting office hours and review sessions, and helping students define and execute their final projects which constituted about 25% of their class grade. I have learnt a lot from my teaching experiences thus far, and hope to hone my skills further as I transition to designing entirely new courses by myself as a faculty member.

## MENTORING

During my Ph.D., I have been fortunate to mentor three graduate students at UIUC (Jiaming Wang, Sohrab Madani, Jitian Zhang), and three undergraduate students at UIUC (Kevin Liu), IIT Delhi (Aditi Jha) and USTC (Zikun Liu) respectively. Throughout all my mentoring experiences, my first goal has always been to excite students about the vision of the project, and carve out a clear path for how the students could use their specific technical background to contribute to the project. The students I have mentored over the course of my graduate studies come from diverse technical backgrounds: hardware, algorithms, machine learning and computer systems. I found that during the initial phases of the project, it was important to find a smaller technical sub-problem that sat at the intersection of our areas of expertise. This allowed the students to ease into the process of tackling the broader vision of the project, while also instilling in them a sense of ownership for the project as they felt that they could contribute intellectually to the solution.

One particularly memorable experience for me was working with Zikun, an intern in our group during the summer of 2019. Working with Zikun made me realize the importance of effective communication when working in a team. It also taught me about how to strike a balance between micromanaging and effectively supervising a mentee, so as to allow them to grow technically and form their own ideas, while staying focused on the project at hand. Zikun, having come from

a machine learning background, was new to wireless networking and I had to develop the maturity to explain advanced concepts in the field in a simple and intuitive manner. It was immensely satisfying to have completed a successful project with Zikun, that we went on to publish in NSDI'21. Zikun later got admitted to UIUC as a PhD student.

I have had very rewarding experiences mentoring junior graduate students as well. While working towards the CVPR'20 deadline with Jayden and Sohrab, our advisor was unavailable to work on the paper and he had asked me to mentor the junior students and lead the paper submission. This was a great learning experience for me, as it allowed me to step inside my advisor's shoes and get first-hand experience on how to manage students and deliver a full paper while managing the stress of a deadline. I learnt how to prioritize certain portions of the paper over others, and delegate tasks to each member such that we could produce the most polished version of the paper in the limited time frame before the submission deadline. Our efforts led to a paper acceptance at CVPR'20. As a faculty member, I want to take these learnings ahead and apply them towards managing my own research group and contribute towards mentoring the next-generation of scientists that can push the boundaries of technical innovation in my field.

## **COURSES I CAN TEACH**

My research and academic background make me particularly well suited 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, signals and systems, digital signal processing, data structures and algorithms, and probability theory, among others. In addition, I am excited about building on my research expertise to develop a new course on advanced wireless networks and IoT systems, with a particular emphasis on AI and machine learning for wireless and IoT technologies. The course will be a hands-on project-oriented class that teaches how this emerging category of systems can sense and interact with their environment. Lectures and labs would cover both system architectures and device designs and will give students the opportunity to build new applications, protocols, and learning algorithms for real-world wireless systems. I believe these classes will give undergraduate students the exposure to applications of computer science in the real world, and will equip them with the required skill set to build practical and deployable wireless systems in the wild. For graduate students, it will make them explore the intersection of their own research areas with the wireless and IoT paradigm, in turn allowing for inter-disciplinary impact through their research.

## **BROADER GOALS**

I believe that training the next generation of engineers and researchers is a huge responsibility as much as it is a privilege. As a teacher, I want to be able to instill a sense of wonder and curiosity in my students to learn the subject matter in depth. But most importantly, I want to make quality education accessible to students all across the world. Towards this end, I have two paths in mind. First, I wish to develop new course content and textbooks on the topic of wireless systems and networking. The field is rapidly growing and branching out, and I want to make the latest research accessible and easy-to-follow for students. Second, I wish to develop online course content and educational material, particularly in the vernacular languages of India. My father, having come from a small village in India, often tells me about his struggle with learning material due to his inexperience with English. I wish to remove this language barrier and make quality education accessible to everyone in the language they are most comfortable with. I believe this would go a long way in transforming society and giving everyone an equal opportunity to fulfill their ambitions.