Teaching Statement

Tingjun Chen
Electrical Engineering, Columbia University
http://www.columbia.edu/~tc2668

Teaching and mentoring are rewarding and inseparable parts of an academic career. As an educator, my goal is to deliver solid knowledge of fundamental concepts to students, as well as to motivate them to approach and tackle important problems. I am also committed to helping students develop independent research and leadership skills which will assist them in becoming the next generation of professionals in both academia and industry.

Teaching

As a graduate student at Columbia University, I have gained valuable teaching experience through serving as a Teaching Assistant for (i) Wireless Communications (ELEN 4703) in Spring 2015, (ii) Wireless & Mobile Networking I (ELEN 6950) in Fall 2016 and Fall 2017, (iii) Wireless & Mobile Networking II (ELEN 6951) in Spring 2016, (iv) Large Data Stream Processing (ELEN 6889) in Spring 2018, and (v) Computer Networks (CSEE 4119) in Spring 2017, Summer 2017, Summer 2018, and Summer 2019. These courses included on-campus and online sessions with enrollments ranging from 15 to 140 students. The Computer Networks classes, for example, included undergraduate and graduate students from a mix of Electrical Engineering, Computer Engineering, and Computer Science majors. My interaction with this group of students allowed me to practice a variety of teaching strategies designed for students with different backgrounds and different levels of technical experience. For instance, students majoring in Computer Science from Columbia College, Barnard College, and General Studies have often taken fewer engineering/computing classes than students from Columbia Engineering. I also independently ran and managed an online course on Computer Networks through the Columbia Video Network in 2019.

My teaching responsibilities included designing and grading course projects and exams, holding recitations, conducting office hours, and grading homework assignments. In all the classes, I relate textbook knowledge to real-world systems and networks based on my practical experience in order to motivate students and strengthen their understanding of fundamental concepts. The students have always highly ranked my knowledgeability, approachability, and communication skills in course evaluations. My teaching efforts were recognized by the Columbia University Electrical Engineering Jacob Millman Award for Outstanding Teaching Assistant in 2018.

I have also been engaged in the teaching efforts within the Cloud-enhanced Open Software-defined MOBILE wireless testbed for city-Scale deployment (COSMOS) project. The COSMOS testbed is currently being deployed in West Harlem as part of the NSF Platforms for Advanced Wireless Research (PAWR) program, and targets the technology “sweet spot” of ultra-high bandwidth and ultra-low latency. I co-developed several COSMOS tutorials integrating my research components with topics on: (i) experimentation with open-access full-duplex wireless using software-defined radios, and (ii) experimentation with optical-wireless x-haul networking using the COSMOS’ dark fiber infrastructure deployed in New York City and software-defined networking controllers. These tutorials were conducted at ACM SenSys’19, ACM MobiCom’19, the 2019 NSF Midscale Experimental Research Infrastructure Forum (MERIF) Education Workshop, and the 2019 COSMOS Experimenters Workshop.

In the future, I would like to teach undergraduate and graduate courses in computer networks, wireless communications and networks, signals and systems, embedded systems, and optimization. I would also like to design and teach new graduate or advanced undergraduate courses in the areas of advanced wireless technologies and future wireless networks, such as Millimeter-Wave Communications for 5G and Beyond, Internet-of-Things (IoT) Systems, and Edge Cloud and Heterogeneous Computing. I also plan to develop hands-on labs where students can learn and experiment with advanced wireless and networking technologies in real-world environments. This can be done by remotely using the open-access COSMOS testbed and by locally using the COSMOS education kit (a small scale wireless testbed with software-defined radios, IoT nodes, and various sensors and peripherals). The education kit can also be used for various outreach and community events as I discuss in my Diversity Statement.
Mentoring and Leadership

I always enjoy helping students develop and achieve their fullest potential. While working towards my Ph.D., I have been fortunate to mentor more than 20 high school, undergraduate, and Master’s students. These students came from local high schools, the Electrical Engineering, Computer Engineering, and Computer Science programs at Columbia University, and from 4 universities in South America and Asia. They have a variety of technical experience and included females and students from minorities underrepresented in STEM. Overall, approximately 30% of my mentees were from underrepresented populations.

I firmly believe that positive and successful mentorship is driven by students’ motivations and their resonant collaboration with their mentor. I lead and mentor students on multi-disciplinary collaborations within the COSMOS project and the Full-duplex wireless: From Integrated Circuits to Networks (FlexICoN) project. These projects span areas that include wireless/wired networking, IoT systems, embedded platforms, software-defined radios, circuit design, and radio frequency/millimeter-wave measurements and systems. I also work with students on hardware and software skill sets across different layers of the networking protocol stack. Together, we develop projects with specific timelines and milestones based on each student’s interests and experience. During this collaborative work, I provide guidance and feedback on students’ progress through individual and project meetings. I also learn a lot from the students – a great source of inspiration for me to grow and improve as an educator.

My mentees co-authored papers at the ACM MobiCom’19 Workshop on Millimeter-Wave Networks and Sensing Systems (mmNets) and the IEEE ICNP’19 Workshop on Midscale Education and Research Infrastructure and Tools (MERIT). They also co-authored multiple demo and poster abstracts in top venues such as ACM MobiCom’19, IEEE INFOCOM’18, ACM SenSys’16, and ACM MobiHoc’16. Our joint work received the Creative Tech Award in Engineering at the 2018 NYC Media Lab’s Annual Summit and the Honorable Mention Award at the 2016 NYC Media Lab’s Annual Summit. In addition, one of my undergraduate students and one of my Master’s students were the key contributors to the integration of the first open-access full-duplex radios in the ORBIT and COSMOS testbeds. More recently, two of my undergraduate students presented our work in collaboration with Nokia Bell Labs on extensive 28 GHz channel measurements in the COSMOS testbed area at the 2019 MIT Undergraduate Research Technology Conference. The students that I have mentored have joined Ph.D. and M.S. programs at top universities (e.g., Stanford, Princeton, UIUC, UT Austin) as well as top technology companies (e.g., Amazon, Bloomberg LP, Facebook, LinkedIn, Microsoft). My mentees received the Columbia Electrical Engineering Outstanding Undergraduate Research Awards in 2019 and 2016, and the Columbia Electrical Engineering M.S. Research Awards in 2018 and 2017, which are given to only one graduating senior student and one outstanding Master’s student annually.

I look forward to exploring more teaching, mentoring, and leadership experiences, and to engaging students of diverse backgrounds. I am excited to develop creative multi-disciplinary curricula and projects, and to continue my teaching journey with the goal of inspiring the next generation of professionals.