

Teaching Statement

Junfeng Guan | junfeng.guan@epfl.ch | <https://jguan.page>

To become a professor, my goal is to teach, advise, and mentor young talent to become successful researchers and engineers capable of generating a positive impact on the world. In fact, this is one of the main reasons I chose an academic career. To this end, I will always strive to ensure that my students become independent, capable of discovering interesting problems and developing novel and practical solutions on their own. I will also make sure to teach students, both undergraduates and graduates, methodologies to conduct research as well as the intricacies of practical systems design with the imminent confluence of Computer Science and Electrical Engineering.

Teaching and Course Design Experience

- *Computer Networks (UIUC CS/ECE 438)*: A senior level class cross-listed in CS and ECE that covers the Internet protocol stack from the Application layer to the Physical layer with over 100 students. It requires students to solve several homework assignments and large network programming assignments. As a teaching assistant (TA) for this course, I created and graded new homework assignments, remodeled programming assignments, and conducted office hours and review sessions. During this course, I learned to utilize online educational platforms, like Piazza and Gradescope, to efficiently manage large classes and timely answer questions from students.

- *Wireless Communications (UIUC-Zhejiang University (ZJU) Institute Undergraduate Summer School 2020)*: Later, during COVID, I served as the TA of a condensed 3-week online short course for 320 ZJU students attending online. In this course, my responsibilities included supporting live online lectures, hosting office hours, and creating and grading the final take-home exam. This was a unique experience that made me familiar with the new era of teaching after COVID that relies heavily on video streaming and online teaching platforms.

- *IoT and Software Defined Radio Lab (UIUC ECE 463)*: My first experience designing courses was working with my advisor to plan and develop this new laboratory course. We created this software-hardware course to give students a hands-on approach to learning about communication and IoT technologies. I developed new instructions and tasks for the weekly lab sessions from scratch and instructed the lab sessions with 12 students. Through the labs, we teach students how to build wireless communication systems using state-of-the-art software-defined radios (SDRs). To make the end goal more achievable, we create smaller, less daunting goals on the way to larger learning objectives. The lab material that I developed has been reused in the four subsequent offerings of the course by other instructors.

- *Communication Project (EPFL COM 304)*: I also helped design this new project-based course at EPFL, aiming to teach students the development, design, and prototyping of practical systems that solve real-world challenges. We try to provide students with background knowledge and fundamental skills in programming SDRs, radars, sensors, cameras, LiDARs, various robots, as well as real-time data extraction and processing using techniques in digital communication, signal processing, and machine learning. My responsibilities include participating in course planning discussions, preparing recorded video lectures on background materials, and designing tutorials on hardware.

My teaching experiences have humbled me to the idea of constantly evolving my teaching strategies. I look forward to learning new things from my students while teaching them the knowledge I gained through my own experience.

Course I can Teach

Moving forward, since my background and experience span both electrical and computer engineering and computer science, I can teach a variety of ECE and CS classes. My research and academic background make me particularly well suited to teach graduate classes in computer networks, mobile systems, and wireless communications. I am also qualified to teach undergraduate classes in computer networks, signals and systems, digital signal processing, as well as undergraduate-level RF circuits and systems courses, such as microwave devices and circuits.

In addition, I am excited to develop a new course based on my research expertise on wireless networks and sensing systems. In this course I plan to cover many recent research topics including 5G cellular systems, Internet of Things, millimeter wave, localization, wireless sensing and health monitoring, etc. Students will read and review around 20 recent research papers and complete hands-on lab assignments such as OFDM, MIMO, RFID Localization, and radar sensing where they use hardware platforms such as SDRs and mmWave radar sensors to collect data and construct algorithms to process the data. Students also complete an experimental research project over a semester in groups.

Student Mentoring

As the second student joining my advisor's research group, I started to mentor junior students in my second year of Ph.D. From 2019 to 2022, my advisor was not able to return to the US due to visa issues. For these three years without my advisor around, as the most senior person onsite, I stepped up and filled the leadership role to keep the research

lab running smoothly and productively. All the other students would come to me for advice and help in research. My advisor also entrusted me with running a series of projects related to mmWave radar imaging and sensing, and coordinating collaborations with other research groups. At peak time, I was involved in up to six projects.

At UIUC, I closely mentored five junior graduate students in my own research group and provided support and guidance to many more students in other groups with my expertise in RF circuits and hardware. I have also mentored many undergraduate students by offering opportunities to work on a submodule in my research or on follow-up work. Over the years, I have supervised three undergraduate thesis and four more students for summer interns and semester-long independent studies. The undergrad students I mentored were also admitted to top Ph.D. programs such as Cornell, UIUC, and EPFL. These mentoring experiences taught me a lot about mentoring students and leading research projects. I found that for most students, the keys to good mentorship are motivation, initial input to help them ramp up, and accessibility at all times.

First, I always get students excited about the project by explaining the big picture of the broader research to which they are contributing and the potential real-world applications. Besides, I would prioritize completeness over perfection at the beginning and try to get to a fully functioning system. This will greatly improve the morale of the students, gives them confidence, and drives them to push through the more tedious tasks of the project. In addition, I prefer to lead by example, as my experience taught me that once you show the students how much you are invested in the project, they become more invested themselves and willing to work harder.

Moreover, I believe it is very important to put in some effort at the beginning of a project to help students ramp up. I always make sure to prepare sufficient materials and resources for students, especially MS and undergrad students without research experience in close areas, to refer to. Some of the students I worked with were overwhelmed by the complexity of a new research project. They did not know where to start and ended up wasting a lot of time on orthogonal or irrelevant subproblems. Investing time to ensure that they understood the basics and were on the right track turned out to be very rewarding later in the project.

Furthermore, I found that MS and undergraduate students and even junior Ph.D. students are not resourceful enough to find solutions or even ways to approach challenging problems on their own. Being blocked on a problem can frustrate students and cause them to lose motivation to continue the project. Therefore, I always make sure that they are not stuck on a task by providing feedback on their questions as soon as possible. Even if I don't have exact solutions to their technical problem, I still try to provide any useful insights and help them find any helpful resources. To do so, I sometimes need to think ahead of my students to predict potential roadblocks or even spare some time to solve the problem myself while putting the student on a separate task.

My mentorship led to publications at top research venues, including CVPR, NSDI, ECCV, IPSN, and ICASSP.

Establishing a New Research Lab

My leadership role in the group naturally transitioned to a postdoc researcher position when I moved to EPFL with my Ph.D. advisor. It has been an extremely valuable experience for me to gain first-hand experience in establishing and managing a new academic research lab. In addition to mentoring junior Ph.D. and MS students, I helped write NSF, Swiss National Science Foundation (SNSF), and industry (Sony) funding proposals to secure funding for projects. I also led equipment purchases, lab and office space remodeling, MS and undergraduate student recruitment, and other daily lab operations. In 2023 alone, I recruited and mentored three MS students to work on semester-long projects and recruited three more thesis projects students starting in 2024. Additionally, I helped my advisor interview international undergraduate summer interns and mentored three of them for three months over the summer. To help new students quickly pick up the requirement background knowledge and get familiar with the common hardware and software we use in research, I designed tutorials on them and organized code repositories from previous projects to help junior students join the group jump start.

I believe that at the beginning of my career it is essential to build a solid hardware and software foundation for students to quickly master the necessary skills to start working on a novel research problem. It is also important to create a supportive environment and productive dynamic among students to get batches and batches of students to motivate and help each other and drive the group to success together.

Learning from the experience of my advisor, who was a second-year assistant professor when I joined his group in 2017, I know that my mentoring and leadership style will definitely evolve over time. I am ready to grow with my students and gradually improve my mentorship and leadership. At the beginning of my assistant professor career, I will need to play a mixed role as both an advisor and a senior to my students. However, after the first year or two, I will encourage senior students to help mentor junior students in the group and create a positive and supportive environment inside and outside the lab. Additionally, I will adjust my approach to different students depending on their background, skills, maturity in conducting research, and willingness to work hard. I tend to help them and train them a lot during their first year, but let them lead the projects and hold the reins as they grow and evolve.