Teaching Statement

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My teaching philosophies have stemmed from my own teaching and learning experiences. My experiences include being a Teaching Assistant for two introductory level undergraduate and specialized graduate classes of about 40 students each. I have also given guest lectures based on my research at CMU and other schools' classes. I have contributed to various teaching responsibilities spanning material creation, lecturing, mentoring, engaging in office hours and grading. These experiences have helped me grasp why teaching is enjoyable for me: (1) It keeps me grounded in my fundamentals; (2) I like breaking down advanced concepts into simple, digest-able ideas; (3) It brings me a sense of gratification when students thoroughly understand a certain topic; (4) Good teaching can unleash students' creativity to propel in new directions. My experiences have also helped me distill down best teaching methodologies. Some of these that I have incorporated into my teaching are as follows.

Sample-Assess-Cater to a wide audience: Students often come with varied backgrounds to each class. Specifying pre-requisites is one way to streamline this process and this encourages students to follow their tracks of interest. However, for newly designed courses that are at the intersection of two siloed tracks (e.g: machine learning and wireless), restricting based on pre-requisites might not cater to all interested students. I experienced this firsthand when designing my guest lecture which was a fairly advanced topic given the course's contents. I addressed this by building my lecture on top of what the class was already familiar with. This is based on the philosophy of instructional scaffolding [1]. In the future, for new courses, I want to adopt a similar process of sample-assess-cater. I aim to sample students' interest levels and backgrounds for different topics during course registration. I then assess and create a handful of fundamental abstractions that would accommodate the majority of interested students. I shall then structure my course to include relevant preliminaries to span all these abstractions. This would ensure that all interested students are on equal footing.

Storytelling: As a teacher, I am taking the students through the course with my own narrative. I associate this to be similar to reciting a story. I aim to choose an engaging narrative with my understanding of the various ideological battles that shaped a field. Inspired by Kurt Vonnegut's "shapes of stories" [2], I believe that the "Man in Hole" theme best suits technical lectures. This takes the students through the recurring journey of a problem, and then a solution. This instills problem solving and appreciating past efforts — rather than believing state-of-the-art at face value. I have incorporated this style in all my lectures as a Teaching Assistant and in guest lectures. Particularly, I have enjoyed dropping intriguing historical trivia to pique the interest of the curious. From my experiences, I have found this to enhance student-instructor interaction post class.

Peer review for subjective evaluation: Evaluating student progress and nurturing is key to successful courses. Many courses only need numerical or objective evaluation. For courses with subjective grading components (e.g: essays or paper reviews), I aim to employ ideas from how research is evaluated. Conference program committees meet and discuss a research paper on various metrics. This provides a platform for members to voice their opinions — even subjective opinions of the work (e.g: timely relevance and excitement). I have participated in the Shadow Program Committee of ACM Compass and chaired S3 Program Committee at ACM Mobicom. I want to build on this and set up mock meetings in class where students review their peers' work. This encourages evaluation from points of view different from that of the instructor. This also stimulates a lively class atmosphere and provides a voice to everyone.

Teaching Interests

I am comfortable teaching the following courses: Introduction to Computer Systems, Introduction to Embedded Systems, Computer Networks, Introduction to Signals and Systems, Introduction to Digital Communication Systems, Wireless Communications Systems, Fundamentals of Digital Signal Processing, Mobile and Pervasive Computing, Real-time Embedded Systems, Sensors and Sensor Interface Design, Wearable and Ubiquitous Computing Systems Design, Wireless Networking and Mobile Computing, Cyberphysical System Design, Full-Stack IoT Systems, The Fourier Transform and Applications, Advanced Digital Signal Processing, Sensor Array Signal Processing, Fields and Waves: Fundamentals of Information Propagation, Performance and Reliability of Computer Networks, Advanced Computer Networks.

In addition, I plan on creating the following new courses.

- *Machine Learning for Wireless:* This is an advanced course for senior undergrads and graduate students to equip them with skills for the upcoming data-driven revolution in wireless technologies. The course will (1) Introduce state-of-the-art wireless signal processing techniques and motivate the value of data-driven approaches across the stack. (2) Review successful applications of machine learning for radio propagation modeling, antenna design, baseband design, radio access network analytics, spectrum sensing and radio frequency imaging and sensing. (3) Carry a project component where students either pick a communication or sensing task, implement it on real systems and show the benefits of replacing traditional techniques with machine learning.
- *Reliable and Robust Cyber-Physical Systems:* This course is for students interested in pursuing careers related to building cyber-physical systems in the wild. This is of relevance with self driving car revolution pushing towards higher degrees of autonomy. This course will (1) Introduce state-of-the-art real time guarantees and fault tolerance. (2) Focus on sensor perception for automotive and robotics. (3) Provide case studies of successful reliable perception and failures. (4) Motivate radio frequency as a sensor option for robust perception. (5) Carry a project component where students show how their system adapts and handles adverse conditions. Example: a robot navigating in a dense foggy room.

Mentoring Statement

Mentoring as a teacher: I will encourage my students to interact throughout the class, after the class and during office hours. I aim to follow a student-goal oriented mentoring. During my office hours, I will seek to understand the student's goal with respect to the course. I will guide them on how to best utilize the course materials to achieve their objectives. Having worked with 3 undergrads in my Ph.D., I am a firm believer in undergraduate research. I shall offer beyond-class research opportunities in my lab to further engage with students. I will provide suggestions on the next courses to take and companies to look out for that are revolutionizing topics covered in the course. For me, a course's success is determined by students' learning. I plan on constantly evaluating this and adapting my teaching methodologies.

Mentoring as a researcher: I have had the privilege of working alongside numerous junior Ph.D., master's, and undergrad students. My approach has always been to encourage them to think big and take risks, while shielding them and navigating them through their project successfully. I strive to inculcate strong fundamentals and am always excited to teach. One of the things I am looking forward to the most is the opportunity to remain curious and constantly learn together with my students. As a mentor, I envision a hands-on role, always available to actively assist my students when needed. My greatest satisfaction arises from cultivating independent thinking, a process I believe in implementing incrementally. This involves (1) implementing a given solution, (2) encouraging the discovery of solutions when presented with a problem, and (3) jointly exploring problem and solution discovery. I plan on structuring my group to foster collaboration as I believe that it spurs interesting system research. Central to this is the cultivation of a spirit of mutual support among students, creating a cohesive and dynamic team. My aspiration extends beyond mere academic achievements. I aim to empower my students to emerge as global leaders in their respective fields. I am committed to leveraging my expertise to assist them in realizing their full potential.

References

[1] Arthur N Applebee and Judith A Langer. "Instructional scaffolding: Reading and writing as natural language activities". In: *Language arts* 60.2 (1983), pp. 168–175.

[2] Kurt Vonnegut on the Shapes of Stories. In: *https://www.youtube.com/watch?v=oP3c1h8v2ZQ* ().