Teaching Statement

Akshay Gadre
agadre@andrew.cmu.edu | www.akshaygadre.com

Teaching and mentoring have been two of the most fulfilling components of my research journey so far. I fundamentally believe that most students have the innate ability to learn new things, explore new ideas, and repeatedly face failure enroute to success. As an educator, I believe my role is to provide them with the support, guidance and morale to face these challenges that are inherent in learning a new skill. I also believe, in this modern world, that it is critical for us to provide students skills in a broader context for them to thrive in their careers in real world.

Teaching Philosophy: To achieve this, my teaching philosophy broadly builds on the basic principle of connecting the dots. The "connecting the dots" philosophy creates smaller, less daunting goals enroute to the larger learning objectives in a course. This makes the larger task seem less daunting and more achievable. While designing assignments for an undergraduate compilers course at IIT Madras, the final goal of the course lab component was for students to learn the ability to develop an end-to-end compiler for Java language. At first glance, for me as a student before, the tasks seems almost impossible to accomplish within the duration of six months. However, we noticed by breaking the larger goal into smaller one month steps, showed a drastic improvement in the morale of the students. Further, students learnt how to conceptualize the ideas of building a compiler step-by-step in other contexts they may face in their respective future jobs.

In another instance, I faced another fresh challenge while organizing the project component of undergraduate Computer Networks course at CMU – students wanted to self-evaluate. Specifically, I realized that many students prefer to self-evaluate their progress on particular lab components. The core edict behind many of these students was the joy of process of discovery as they progress along their assignments. Thus, to provide the ability to self-evaluate, I provided support code that can be run as a validator to check their code for errors ($\sim$like missing corner cases) before they submit their assignments for final evaluation. My evaluation across the assignments showed that this ability to realize mistakes prior to submission improved the scores of students on the coding assignments drastically. Further, over the duration of the course, almost all students built a demo version of YouTube website for video sharing over primitive network sockets based on the components built on the "connecting the dots" philosophy.

Teaching Experience: As an undergraduate student at IIT Madras, I was the teaching assistant for two core undergraduate courses in the Computer Science and Engineering curriculum, namely Compiler Design and Computer Networks. I developed multiple laboratory components for each course and, as part of the teaching team, evaluated and graded students' exams as well as laboratory deliverables. As an undergraduate myself and being an approachable mentor, one of my cherished experiences was providing students working late-nights on the assignments live support.

As a graduate student at Carnegie Mellon University, I was lead teaching assistant for an undergraduate course on Computer Networks as well as a graduate research course on Special Topics in Wireless Communication. In both courses, I provided the sole guidance throughout the courses on the lab and project components by teaching recitations, providing support, creating self-evaluation validators for students to self-evaluate and performing final grading based on a concrete pre-announced rubrik maximize the ability for students to succeed.

Mentorship Experience: Over my tenure as a doctoral student at Carnegie Mellon University, I have mentored four undergraduate, three graduate and two doctoral students in various research projects. My mentoring philosophy builds on clarity of expectations and reasoning. Building large systems and research projects are long-term multi-faceted processes which require multiple small components to be developed in parallel. Clarity of expectations enables mentees to develop components to gel together

with each other as well as provide intermediate checkpoints to measure continual progress. Clarity of reasoning builds the ability to reason about the design, components and motivation of the system which is the prime component for a research problem. My experience with the above philosophy and leveraging individual expertise of each mentee has led to not only great research output (publications, awards, theses) but also individual growth for each mentee to pursue their research goals.

Embracing Diversity: As three of the four courses, which I assisted in teaching, were undergraduate courses, students from varied backgrounds in expertise, experiences and situations faced different challenges throughout the courses. Throughout each course, I created an atmosphere of comfort for every student to participate in discussions about challenges they may face by developing engaging recitation sessions. Further, I created different avenues to achieve the same learning objectives while allowing students to attempt to overcome their individual learning challenges. For example, each practical coding assignment in the Computer Networks course had additional points that can be earned by students to compensate for missed assignments/incorrect answers in exams.

Courses I can teach: Based on my research and teaching experience, I believe I am equipped to teach undergraduate courses on Computer Networks, Data Structures and Algorithms, Compilers, Computer Systems, Embedded Systems and Signal Processing. I am also equipped to teach graduate courses in Wireless Communications, Advanced Computer Networks, Mobile Systems and Wireless Networks. In fact, I would like to start an hands-on IoT systems course which will teach students the principles to build real world IoT systems for agriculture, urban sensing and industrial IoT. It will provide undergraduate students a robust skill-set of building real IoT systems with expertise on system design, protocols and algorithm design for applications. It will also enable graduate students the ability to build IoT deployments relevant to their research given the wide applicability of IoT systems. Finally, I will also be interested in teaching a new research project-driven course on Space IoT and Urban City-Scale IoT driven by my interest in exploring these areas.

Finally, my teaching experiences have humbled me to the notion of constantly evolving my teaching strategies based on student needs. I believe as educators training every student for real world challenges and providing them with a robust decision making ability empowers not only the individual student but future of humanity as a whole. I look forward to learning new things from my students enroute to teaching them the knowledge garnered through my own experience.