Teaching Statement

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One of the unique aspects of a faculty position—and a key reason that I decided to pursue one—is the opportunity to mentor and teach students. For me, every class is a chance to better understand the fundamentals and subtleties of computer science and to pass down my passion for it to a new generation. To that end, one of my educational goals is to integrate, as much as possible, the state-of-the-art and industry best practices into my courses. As the state of real networks and distributed systems continue to progress at astounding rates, keeping up with these changes is an essential part of teaching the material properly and imparting an appreciation for one of the most exciting parts of computer and information science.

Thus far, I have had the pleasure of teaching both three iterations of CIS 553 and two iterations of a seminar course. Next semester, I will be teaching another course, CIS 455/555, with the intention of taking over part of that course load as well. I will discuss these courses along with my experience mentoring students outside of the classroom environment below.

1 Networked Systems (CIS 553)

CIS 553 is a course that covers the design, operation, and concepts behind modern computer networks with a focus on the primary collection of such networks—the Internet. While the course is rostered at the master’s level, it serves as the only computer networking course in the department and is therefore taken by undergraduate and graduate students as well. It serves as one of the options for a project elective in Penn’s undergraduate curriculum and one of the core systems courses in Penn’s graduate curriculum.

CIS 553 has been taught by several others in the past; however, when I took over, I decided to completely rearchitect the course to incorporate lessons I learned from my work with industry collaborators. Since then, each iteration of the course has attracted a successively larger set of students (Fall ’17: 44, Spring ’18: 64, Spring ’19: 122).

Overall, the course takes a bottom-up approach. The first half of the semester is spent building up (layer by layer) the concepts and protocols that underpin the original design of the Internet—concepts and protocols that have withstood several decades and tectonic shifts in scale and usage patterns. The second half of the semester then builds on top of that understanding to cover several aspects of how the Internet is used today, including video streaming protocols and the operation of wireless and data center networks. We even talk about how entities are able to disrupt the Internet through malicious attacks and network-level censorship. Although the core protocols of the Internet have not changed significantly over the years, users, companies, and countries have found ways to work around the existing protocols in unexpected ways. The foundation laid by the first half of the class enables the students to understand and appreciate their modern usage. At the end of the course, the students have learned about the operation of the Internet, understand the concepts and protocols essential to connecting two or more computers, and to get a glimpse into the subtleties of designing systems for flexibility and longevity.

Along with the material, the class includes several projects that allow the students to translate the concepts from lectures into practical implementations. An important aspect of the design of protocols and large systems is the ability to take high-level design documents and translate them
to implementations that address all the subtleties of the protocol/system. The projects aim to
develop exactly those skills. These include, at the lowest layer of the network stack, a project on
implementing a router in the P4 packet-processing language, and at the highest layer of the stack,
a project on designing and implementing a music streaming service.

2 Seminars on Cutting-edge Networking (CIS 700/800)

In addition to the undergraduate- and masters-focused CIS 553, I have also taught two seminars on
recent research in networks and systems. The first offering, CIS 700, covered a personally curated
list of papers that describe the current state of cloud network design and implementation. Several
undergraduate and master’s students took the class alongside Ph.D. students, and they ended up
doing exceptionally well. One such student came into the class without any prior computer science
research experience and she is now a CS Ph.D. student at Cornell working at the intersection of
computer science and early childhood education. A subsequent offering, CIS 800, was primarily
composed of younger (≤3rd year) Ph.D. and master’s students, so I opted to have them read a split
of research published in the past two years and research that had won a 10+ year “test-of-time”
award from the SIGCOMM, NSDI, or OSDI/SOSP communities.

In addition to providing students with valuable experience in reading, understanding, and dis-
cussing cutting-edge research, the projects from the seminars have already developed into one
co-advising relationship, two master’s theses, and several papers in top networking, systems, and
database conferences.

3 Student Mentoring

Last, but not least, another vital aspect of academics is guiding student research. To that end, I
have had the opportunity to mentor five undergraduate and master’s students in an official capacity,
a couple more in an unofficial capacity, and two groups during their senior design projects. For two
female students in particular, I have served as a close mentor for their journey into research. One
of them, Ji Yong Cho, attended my CIS 700 seminar and through the following year, I met with
her regularly, advising her on courses, research, and graduate school. She eventually joined Cornell
as a Ph.D. student in Fall 2018. The other, Simran Arora, took my CIS 553 class, was a member
of a senior design group I advised that won second place within the CIS department, and was a
co-author on our SIGMOD ’19 paper. In addition to my frequent contact with her for each of the
above undertakings, I also met with her throughout her application process to various fellowships
and graduate schools. She is planning on attending Stanford as a Ph.D. student in networks and
systems this fall.