Teaching Statement

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Teaching

I believe teaching is a position of power, and thus a position of great responsibility. I look forward to the responsibility and privilege to teaching and advising students. Among many things, I believe a teacher has two primary responsibilities:

- Exposing students to problems that help them discover their interests; and
- Empowering them with the skills, confidence, and independence required to solve these complex problems.

A good teacher uses a course not only to impart knowledge but also to instill excitement about the material and help students discover new interests. Lectures provide a unique opportunity to present new problems to students and challenge them to think in new ways. A good lecture should pay particular attention to engage students by making the unfamiliar topics more relatable to them. For example, in my lectures, rather than speaking exclusively in the abstract, I motivated content-delivery networks with cat videos and used real-world configurations from Princeton's network to explain firewalls and border routing. I also believe a good lecture should discuss recent research advancements, showing students how the field is still evolving and encouraging them to make an impact of their own.

Given the vast array of careers that students embark upon after graduation, I believe that it is crucial to provide students with transferable problem-solving skills. I think programming assignments are the right medium to hone such skills. They not only help students to understand the concepts taught in the classroom more deeply by applying them in practice but also provides them a practical system building experience using various state-of-the-art tools. For example, one of my programming assignment required students to express monitoring tasks as map-reduce queries using Apache Spark. A few months later, some of the students complimented me saying that their experience with Spark helped them excel in their internships that were unrelated to networking.

I also believe, translating cutting-edge research into programming assignments not only creates a lot of excitement for the students but also adds a new dimension to the research itself. For example, my experience designing programming assignments for the *SDX* [8] and the *Sonata* [9] projects forced me to make the programming interface for these systems more intuitive and easy-to-use. This experience paid-off when I had to train network operators deploying my solutions in the production network.

So far, I have worked with the instructors for Princeton's undergraduate (COS 461 [1]) and graduate (COS 561 [2]) networking courses to prepare precept lectures and designed programming assignments. I have also contributed to the graduate seminar course on **Securing Cyberspace with Big Data** (COS 598 [3]) at Princeton and the undergraduate seminar course on **Software-Defined Networking** (CS 4270 [5]) at Georgia Tech. I have also worked as TA for the popular *Software-Defined Networking* course over **Coursera** [4] . My teaching experiences confirmed that I enjoy teaching at all levels and over all mediums.

Among all my teaching experiences, the SDN Coursera course was the most satisfying experience. It provided me with an opportunity to reach out to students of different ages and background that were beyond the reach of conventional education systems. Many of the students were mid-career networking employees honing their programming skills to embrace the changing ecosystem, *i.e.*, shift to automated programmable networking. Being able to contribute to such a massive workforce retraining was an extraordinary experience for me. I have also contributed to the workforce retraining efforts with online seminars on *SDX* and *Sonata* projects.

I am looking forward to opportunities for teaching **operating systems**, **distributed systems**, **computer networks**, **cybersecurity**, and **big-data systems** courses at the undergraduate and graduate levels. I am also interested in developing interdisciplinary graduate courses (with possibly a *MOOC* version) that combine the areas of **networking**, **systems**, **security**, and **data science**.

Advising

I believe an advisors' goal is to help students discover their interests and develop their taste of problems. I take students background and research experience into consideration while helping them identify problems where they can capitalize on their strengths. For example, one of my student, Robert MacDavid,

did an undergraduate thesis in *theory* and the other, Rüdigar Birkner worked as *systems* engineer in the industry for a couple of years. I worked with them to design *attribute-encoding* algorithms and build the production-quality system for the iSDX project respectively. Giving them a well-defined problem, tailored to their strengths, at the beginning boosted their confidence to do research and make an impact. Both these students, enrolled for a Master's program, transferred to Ph.D. programs at their respective institutions. I encouraged Robert to apply the *attribute-encoding* algorithms to more general settings, and it was a very proud moment when this project won the **best-paper** award at SOSR 2017 [7].

I also believe it is imperative for systems researchers to interact with developers, operators, and vendors "in the trenches" to learn about real-world problems and identify the ones that require a more principled solution. For example, my interactions with network operators at NANOG encouraged me to revisit the SDX project and make the platform scale for production networks while satisfying the realistic hardware constraints [6]. I benefited from my mentors' relationship with the industry (*e.g.*, researchers, and operators at Microsoft, Google, AT&T, Comcast, NIKSUN Inc., etc.). I intend to do the same for my students. I will also encourage my students to learn more about the real-world problems with regular site visits and internships.

As there are many interesting problems to solve. Identifying the ones that are interesting and impactful requires training. I believe advisors should play an active role in developing the research taste for their students, training them to identify interesting problems and not waste their time on the dull ones. Both, Nick Feamster and Jennifer Rexford, taught me by providing constructive feedback, encouraging me to refine my ideas iteratively and pursue impactful research problems. I intend to do the same for my students.

I was privileged to get an opportunity to advise many undergraduate and graduate students. I have mentored seven graduate students from Princeton University (Robert MacDavid, Bridger Hahn, David Liu, and Rob Harrison), ETH Zürich (Rüdiger Birkner), Columbia University (Jill Jermyn), and University of Cape Town (Josiah Chavula) on specific projects and many junior students (Hooman Mohajeri, Disney Yan Lam, and Laura Roberts) in general. Personally, I learned a lot from this experience, and it further strengthened my resolve to pursue a career in academia where I get the privilege not only to teach but also mentor bright students.

References

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[2] COS 561: Advanced Computer Networks, Princeton University, Fall 2017. http://www.cs.princeton.edu/courses/archive/fall17/cos561/.

[3] COS 598: Securing Cyberspace with Big Data, Princeton University, Spring 2016. https://registrar.princeton.edu/course-offerings/course_details.xml?courseid=002132&term=1164.

[4] Coursera SDN Course. class.coursera.org/sdn-002/.

[5] CS 4270: Software Defined Networking, Georgia Tech, Fall 2014. http://noise.gatech.edu/classes/cs8803sdn/fall2014/.

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[8] SDX Programming Assignment. https://github.com/PrincetonUniversity/Coursera-SDN/tree/master/assignments/sdn-ixp.

[9] Sonata Programming Assignment. https://github.com/Sonata-Princeton/SONATA-DEV/tree/tutorial/sonata/tutorials/Tutorial-1.