Teaching Statement
Arpit Gupta

As a graduate student, I have had the privilege to contribute to *eight* courses and mentor *five* graduate students. These experiences have strengthened my resolve to pursue a career in academia where I would have the privilege to not only teach but also advise undergraduate and graduate students.

As a faculty, I am looking forward to opportunities for teaching introductory courses including *computer networks*, *cybersecurity*, and *big-data systems* at the undergraduate and graduate levels. I am also interested in developing interdisciplinary graduate courses that combine the areas of networking, security, and data science.

Lectures. I have given multiple lectures for the undergraduate (Computer Networks [2]) and graduate (Advanced Computer Networks [3]) classes at Princeton. In my lectures, I take great care to excite students about the material and help them discover new interests. 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. Unlike other fields, networking continues to evolve at a relatively rapid pace. Thus, an excellent lecture in networking should go beyond textbooks and discuss recent research advancements, showing students how the field is growing and how they can make an impact of their own.

Course Development. I have also contributed to the development of two new courses: *Software-Defined Networking* (SDN) and *Securing Cyberspace with Big Data* [4] at Georgia Tech with Nick Feamster and at Princeton University with Walter Willinger, respectively. The SDN course was offered both in-class [6] and online [5]. The online version, offered over Coursera in Summer 2014 and 2015, drew tens of thousands of students.

Programming Assignments. Given the panoply of careers that students embark upon after graduation, it is crucial to help them develop transferable problem-solving skills. I believe programming assignments are the right medium to hone such skills. I have contributed to the design of multiple programming assignments for the networking courses at Princeton and Georgia Tech.

I try translating cutting-edge research into programming assignments. This approach not only exposes students to latest developments in the area but also enhances the quality of the research itself. For example, my experience designing programming assignments for the *SDX* [10] and the *Sonata* [11] projects forced me to make the programming interface for these systems more intuitive and easy-to-use.

Mentoring. I was privileged to have the opportunity to mentor five graduate students on specific projects. I supervised Robert MacDavid with Jennifer Rexford on the iSDX [8] and PathSets [9] projects. I mentored Rüdiger Birkner from ETH Zürich with Laurent Vanbever and Nick Feamster on the *iSDX* [8], *SIDR* [1], and *Sonata* [7] projects. I am currently mentoring Rob Harrison with Jennifer Rexford on the Sonata [7] project, Bridger Hahn with Nick Feamster on the IoT security project, and David Liu with Nick Feamster and Mike Freedman on co-designing machine learning and query planning algorithms. I have also mentored many junior students: Hooman Mohajeri, Disney Yan Lam, and Laura Roberts; at Princeton.

As a mentor, I try to help students discover their own interests, help them identify problems where they can capitalize on their strengths, and develop a taste for research. For example, with Robert MacDavid (background in theory) and Rüdiger Birkner (background in systems), I worked on the design of the encoding algorithm and the design and implementation of a production-quality prototype, respectively for the *iSDX* project [8]. Giving them a well-defined problem, tailored to their strengths, boosted their confidence to do research and make an impact. For example, Robert applied the techniques we developed for the *iSDX* project to more general settings beyond Internet Exchange Points and that project ultimately won the **best paper** award at ACM SOSR 2017 [9].

I will encourage my students to interact with developers and operators working "in the trenches" to learn about real-world problems. To facilitate this, I will help them find industrial internships, especially during the early years of their graduate studies; and attend operational meet-ups and conferences, *e.g.*, North American network operator group (NANOG) meetings. Among the gamut of operational problems, I will provide constructive feedback to my students helping them to refine their ideas and identify impactful problems that require a more principled solution.

References

[1] R. Birkner, A. Gupta, N. Feamster, and L. Vanbever. SDX-Based Flexibility or Internet Correctness?: Pick Two! In *ACM Symposium on SDN Research (SOSR)*, 2017.

[2] COS 461: Computer Networks, Princeton University, Spring 2016. `https://www.cs.princeton.edu/courses/archive/spring16/cos461/`.

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

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

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

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

[7] A. Gupta, R. Harrison, A. Pawar, R. Birkner, M. Canini, N. Feamster, J. Rexford, and W. Willinger. Sonata: Query-Driven Network Telemetry. *arXiv preprint arXiv:1705.01049*, 2017.

[8] A. Gupta, R. MacDavid, R. Birkner, M. Canini, N. Feamster, J. Rexford, and L. Vanbever. An Industrial-Scale Software Defined Internet Exchange Point. In *USENIX NSDI*, 2016.

[9] R. MacDavid, R. Birkner, O. Rottenstreich, A. Gupta, N. Feamster, and J. Rexford. Concise Encoding of Flow Attributes in SDN Switches. In *ACM Symposium on SDN Research (SOSR)*, 2017.

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

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