

Research Interests

As a systems researcher, I design and build flexible, scalable, and deployable systems that solve real-world problems at the intersection of networking, security, and analytics.

Education

Summer 2018 **Princeton University**, *Ph.D.*, Computer Science.

(Expected) Advisor: Nick Feamster

Making the ‘Net’ Work!

Modern network management needs to provide operators with better ways to: (1) monitor what is going on in their networks; and (2) take real-time reactive actions based on this information, to improve reliability, performance, and security of the networks and the services that run on them. My dissertation research focuses on enabling better information gathering, and more flexible control with limited compute and storage resources in the network. More specifically, it focuses on: (1) the abstractions that allow operators to express flexible programs for monitoring and control; (2) the algorithms and data structures that make the best use of limited compute and storage resources; and (3) the deployable systems that glue high-level abstractions to the low-level algorithms.

Spring 2013 **NC State University**, *M.S.*, Computer Science.

Spring 2009 **Indian Institute of Technology, Roorkee**, *B.Tech.*, Electronics & Comm..

Awards

2017 Dagstuhl Seminar invitee, “The Critical Internet Infrastructure Revisited”

2017 Best Paper Award winner, ACM SOSR

2017 Facebook Fellowship finalist

2016 Community Award winner, USENIX NSDI

2016 Best of the Rest invitee, USENIX ATC

2016 Juniper/Comcast SDN Throwdown winner

2015 Facebook Fellowship finalist

2013 Internet-2 Innovation Award winner

2013 Meissner Fellowship, Purdue University

2010 College of Engineering Fellowship, North Carolina State University

Professional Experience

2015–Present **Princeton University**, *Research Assistant*, Princeton, NJ.

Mentors: Nick Feamster and Jennifer Rexford

Designed and implemented: a network streaming telemetry system, *Sonata* [10, 1, 8]; and an industrial-scale software-defined Internet exchange platform, *iSDX* [3, 2, 9, 7].

Summer 2016 **Microsoft Research**, *Research Intern*, Redmond, WA.

Mentors: Ratul Mahajan and Monia Ghobadi

Explored the design of a wide-area network controller, *Roshan*, that configures both the optical (physical) and the network layer to make optimal use of limited available resources under failures.

- 2013–2014 **Georgia Tech**, *Research Assistant*, Princeton, NJ.
Mentor: Nick Feamster
Designed and built a software-defined Internet exchange platform, *SDX* [5], helped with the design and implementation of an event based network management tool, *Kinetic* [4]. Also, analysed multiple active and passive measurement datasets to model ISP interconnectivity in developing regions [12].
- 2011–2012 **NC State University**, *Research Assistant*, Raleigh, NC.
Mentor: Injong Rhee
Developed *WiFiFox* [6], that solves the problem of WiFi performance degradation for large audience environments. This technology has been licensed out to Intel.
- Summer 2011 **Google**, *Software Engineering Intern*, Mountain View, CA.
Mentor: Nandita Dukkupati
Worked on quantifying the effect of TCP timeouts on Google’s search traffic. Instrumented the TCP stack for Google’s front end servers to collect the data required for this measurement study.
- Spring 2010 **Indian Institute of Science**, *Project Assistant*, Bangalore, India.
Mentor: Anurag Kumar
Designed and implemented a WiFi AP based scheduling algorithm ensuring fairness to clients with disparate link qualities.

Publications

Conferences

- [1] **Arpit Gupta**, Rob Harrison, Ankita Pawar, Marco Canini, Nick Feamster, Jennifer Rexford, and Walter Willinger. Sonata: Query-Driven Network Telemetry. *Under Submission*.
- [2] Robert MacDavid, Rüdiger Birkner, Ori Rottenstreich, **Arpit Gupta**, Nick Feamster, and Jennifer Rexford. Concise Encoding of Flow Attributes in SDN Switches. In *ACM Symposium on SDN Research (SOSR)*, 2017.
Best Paper Award (1 out of 77).
- [3] **Arpit Gupta**, Robert MacDavid, Rüdiger Birkner, Marco Canini, Nick Feamster, Jennifer Rexford, and Laurent Vanbever. An Industrial-Scale Software Defined Internet Exchange Point. In *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, 2016.
Community Award (1 out of 255).
- [4] Hyojoon Kim, Joshua Reich, **Arpit Gupta**, Muhammad Shahbaz, Nick Feamster, and Russ Clark. Kinetic: Verifiable Dynamic Network Control. In *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, 2015.
60 citations till Nov 2017 based on Google Scholar.
- [5] **Arpit Gupta**, Laurent Vanbever, Muhammad Shahbaz, Sean Patrick Donovan, Brandon Schlinker, Nick Feamster, Jennifer Rexford, Scott Shenker, Russ Clark, and Ethan Katz-Bassett. SDX: A Software Defined Internet Exchange. In *ACM SIGCOMM*, 2014.
210 citations till Nov 2017 based on Google Scholar.
- [6] **Arpit Gupta**, Jeongki Min, and Injong Rhee. Wifox: Scaling wifi performance for large audience environments. In *ACM Conference on Emerging Networking Experiments and Technologies (CoNEXT)*, 2012.
50 citations till Nov 2017 based on Google Scholar.

Workshops & Short Papers

- [7] Rob Harrison, Qizhe Cai, **Arpit Gupta**, and Jennifer Rexford. Network-Wide Heavy Hitter Detection with Commodity Switches. In *ACM Symposium on SDN Research (SOSR)*, 2018.

- [8] Rüdiger Birkner, **Arpit Gupta**, Nick Feamster, and Laurent Vanbever. SDX-Based Flexibility or Internet Correctness?: Pick Two! In *ACM Symposium on SDN Research (SOSR)*, 2017.
- [9] **Arpit Gupta**, Rüdiger Birkner, Marco Canini, Nick Feamster, Chris Mac-Stoker, and Walter Willinger. Network Monitoring as a Streaming Analytics Problem. In *ACM Workshop on Hot Topics in Networks (HotNets)*, 2016.
- [10] **Arpit Gupta**, Nick Feamster, and Laurent Vanbever. Authorizing Network Control at Software Defined Internet Exchange Points. In *ACM Symposium on SDN Research (SOSR)*, 2016.
- [11] **Arpit Gupta**, Matt Calder, Nick Feamster, Marshini Chetty, Enrico Calandro, and Ethan Katz-Bassett. Peering at the Internet's Frontier: A First Look at ISP Interconnectivity in Africa. In *Passive and Active Network Measurement (PAM)*, 2014.

55 citations till Nov 2017 based on Google Scholar.

Presentations

Sonata: Query-Driven Streaming Network Telemetry

Conferences: ACM HotNets (11/16), NANOG 70 (05/17), P4 Workshop (05/17)

Industry: Comcast (12/16), NIKSUN Inc. (06/17), AT&T (10/17)

Universities: New England Networking & Systems Day, Boston University (10/16)

iSDX: An Industrial-Scale Software Defined IXP

Conferences: USENIX NSDI (03/16), USENIX ATC (06/16), GENI Network Innovators Community Event (12/16)

Industry: AT&T (10/15), Project Endeavour (10/15), Corsa (11/15), CloudRouter (01/16), Open Networking Foundation Webinar (04/16), Appfest (05/16)

Universities: Networked Systems Laboratory, USC (08/15))

Authorizing Network Control at Software Defined IXPs

Conferences: ACM SOSR (03/16)

Industry: Verisign Inc. (08/15)

SDX: A Software Defined Internet Exchange

Conferences: ACM SIGCOMM (08/14), GENI Engineering Conference 20 (06/14), NANOG 59 (10/13), OpenIX Summit (04/15))

Industry: Facebook Inc. (08/14), Microsoft (08/14)

Universities: NetSeminar, Stanford University (10/14)

Peering at the Internet's Frontier

Conferences: Workshop on Passive and Active Measurements (03/14)

WiFox: Scaling WiFi Performance for Large Audience

Conferences: ACM SIGCOMM CoNEXT (12/12)

Universities: Duke University (10/12), UNC Chapel Hill (10/12)

Professional Activities

External Reviewer

NSDI 2014, ICNP 2016, SIGCOMM 2017, IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, Computer Networks, Network Management

Program Committee

320 Sherrerd Hall – Princeton, NJ

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Workshop on Self-Driving Networks, SIGCOMM 2018

Panelist

GENI Network Innovators Community Event 2016, CITP Conference on Global Internet Interconnection 2016

Teaching and Mentoring Experience

Teaching Assistant

- Spring 2016 Computer Networks (COS 461), Princeton University
- Summer 2013 Computer Organization & Assembly Language, (CSC 236), NC State University
- Fall 2012 Internet Protocols (CSC 573), NC State University

Course Development

- Spring 2016 Securing Cyberspace with Big Data (COS 598E), Princeton University
- Summer 2015 Software Defined Networking, Coursera
- Fall 2014 Software Defined Networking (CS 4270), Georgia Tech
- Summer 2014 Software Defined Networking, Coursera

Guest Lecture

- Fall 2017 Computer Networks (COS 561), Princeton University
- Spring 2017 Computer Networks (COS 561), Princeton University

Mentoring

- Fall 2017 – * David Liu, Ph.D.
- Summer 2017 – * Bridger Hahn, M.S.
- Fall 2016 – * Rob Harrison, Ph.D.
- 2015 – 2017 Rüdiger Birkner, M.S.
- 2015 – 2016 Robert MacDavid, M.S.

References

Prof. Jennifer Rexford
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