

Arpit Gupta

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

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

Adviser: Nick Feamster

Committee: Nick Feamster, Jennifer Rexford, Walter Willinger, Marshini Chetty, Kyle Jamieson
Flexible and Scalable Systems for Network Management

Received an *honorable mention* for impactful work on Software Defined Internet Exchange Point design and implementation in the **2018 ACM SIGCOMM Doctoral Dissertation Awards**. The doctoral dissertation award recognizes excellent thesis research by doctoral candidates in the field of computer networking and data communication. 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 2016 **Princeton University**, *M.A.*, Computer Science.

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

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

Awards

2018 Honorable Mention, SIGCOMM Dissertation Award

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 (declined)

2010 College of Engineering Fellowship, North Carolina State University

Professional Experience

Fall 2019– **University of California, Santa Barbara**, *Assistant Professor*, Santa Barbara, CA.

Summer 2018– **Columbia University**, *Postdoctoral Research Scientist*, New York, NY.

Mentor: Ethan Katz-Bassett

Explored the design and implementation of systems that can detect, diagnose, and resolve various network events at (1) cloud providers, and (2) Internet service providers with minimal human intervention.

2015–2018 **Princeton University**, *Research Assistant*, Princeton, NJ.

Mentors: Nick Feamster and Jennifer Rexford

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

- 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 [11].
- 2011–2012 **NC State University**, *Research Assistant*, Raleigh, NC.
Mentor: Injong Rhee
Developed *WiFox* [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 Dukkhipati
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. In *ACM SIGCOMM*, 2018.
- [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.
100 citations till Apr 2019 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.
313 citations till Apr 2019 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.
59 citations till Apr 2019 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.
- 77 citations till Apr 2019 based on Google Scholar.

Presentations

Making the "Net" Work: Flexible and Scalable Systems for Network Management
Universities: Texas A&M University (02/18), UC Santa Barbara (02/18), Northeastern University (03/18), University of Virginia (03/18), University of Minnesota (04/18), University of Toronto (04/18)

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

Program Committee Chair

2019 ACM SIGCOMM Workshop on Network Meets AI & ML (NetAI)

Organizing Committee Chair

2019 NSF Workshop on Measurements for Self-driving Networks, Princeton

Program Committee Member

2020 USENIX Networked System Design and Implementation (NSDI)

2019 ACM Conference on Emerging Networking Experiments and Technologies (CoNEXT)

2019 ACM SIGCOMM Symposium on SDN Research (SOSR)

2018 ACM SIGCOMM Workshop on Self-Driving Networks

Organizing Committee Member

2020 Student Research Competition, ACM SIGCOMM, New York, NY

2018 NSF Workshop on Self-driving Networks, Princeton

Panelist

2016 GENI Network Innovators Community Event 2016

2016 CITP Conference on Global Internet Interconnection

External Reviewer

2019 Privacy Enhancing Technologies Symposium (PETS)

2017 ACM SIGCOMM

2016 IEEE International Conference on Network Protocol (ICNP)

2014 USENIX Networked System Design and Implementation (NSDI)

Journal Reviewer

IEEE/ACM Transactions on: Networking (TNET), Mobile Computing (TMC), Network Science and Engineering (TNSE), Computer Networks Journal (COMNET), Photonic Network Communications (PNET) Journal of Network and Computer Applications (JNAC), Cloud Computing, Special Issue: Middleware and Middlecloud (CCMSI), International Journal of Network Management (IJNM)

Teaching

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 Advanced Computer Networks (COS 561), Princeton University

Mentoring

- Spring 2019 – * Rohan Bhatia, IIT Roorkee, B.Tech
- Spring 2019 – * Samagra Sharma, IIT Roorkee, B.Tech.
- Fall 2018 – * Todd Arnold, Columbia University, Ph.D.
- Fall 2018 – * Ege Gurmericliler, Columbia University, Ph.D.
- 2016 – 2018 Rob Harrison, Princeton University, Ph.D.
- 2015 – 2017 Rüdiger Birkner, ETH Zurich, M.S.
- 2015 – 2016 Robert MacDavid, Princeton University, M.S.