

Nick Feamster

Professor
Department of Computer Science
Princeton University
35 Olden Street
Princeton, NJ 08540

feamster@cs.princeton.edu
<http://www.cs.princeton.edu/~feamster/>
<http://connectionmanagement.org/>
<http://noise-lab.net/>

Education

Degree	Year	University	Field
Ph.D.	2005	Massachusetts Institute of Technology Cambridge, MA <i>Dissertation:</i> Proactive Techniques for Correct and Predictable Internet Routing <i>Sprolws Honorable Mention for best MIT Ph.D. dissertation in Computer Science</i> <i>Advisor:</i> Hari Balakrishnan Minor in Game Theory	Computer Science
M.Eng.	2001	Massachusetts Institute of Technology Cambridge, MA <i>Dissertation:</i> Adaptive Delivery of Real-Time Streaming Video <i>Advisor:</i> Hari Balakrishnan <i>William A. Martin Memorial Thesis Award</i> (MIT M.Eng. thesis award)	Computer Science
S.B.	2000	Massachusetts Institute of Technology Cambridge, MA	Electrical Engineering and Computer Science

Research Interests

My research focuses on networked computer systems, with a strong emphasis on network architecture and protocol design; network security, management, and measurement; routing; and anti-censorship techniques. The primary goal of my research is to help network operators run their networks better, and to enable users of these networks (both public and private) to experience high availability and good end-to-end performance. I have a strong interest in tackling practical problems using a “first principles” approach, designing systems based on these principles, and implementing and deploying these systems in practice.

Employment History

Title	Organization	Years
Professor	Princeton University	January 2015–Present
Professor	Georgia Institute of Technology	March 2014–December 2014
Associate Professor	Georgia Institute of Technology	March 2011–March 2014
Assistant Professor	Georgia Institute of Technology	2006–2011
Postdoctoral Research Staff	Princeton University	Fall 2005
Research Assistant	Massachusetts Institute of Technology	2000–2005
Intern/Consultant	AT&T Labs–Research	2001–2005
Technical Associate	Bell Laboratories	1999
Intern	Hewlett-Packard Laboratories	1999
Technical Staff	LookSmart, Ltd.	1997

Honors and Awards

National Awards

- NSF Presidential Early Career Award for Scientists and Engineers (PECASE)
- Technology Review Top Innovators Under 35
- Alfred P. Sloan Fellowship
- NSF CAREER Award
- IBM Faculty Award

University Awards

- John P. Imlay Distinguished Lecture, Georgia Tech
- Hesburgh Teaching Fellow
- Georgia Tech College of Computing Outstanding Junior Faculty Research Award
- Georgia Tech Sigma Xi Young Faculty Award
- Georgia Tech Sigma Xi Best Undergraduate Research Advisor

Paper and Publication Awards

- ACM SIGCOMM Community Award, ACM SIGCOMM Internet Measurement Conference
- Best Paper, Passive and Active Measurement Conference
- Best Student Paper, ACM SIGCOMM
- Best Paper, USENIX Symposium on Networked Systems Design and Implementation
- Best Student Paper, 11th USENIX Security Symposium
- Best Student Paper, 10th USENIX Security Symposium
- PRSA Bronze Anvil Award for Wall Street Journal Editorial Article

Thesis Awards

- George M. Sprowls honorable mention for best Ph.D. thesis in computer science, MIT
- MIT William A. Martin Memorial Thesis Award for Best EECS Masters Thesis

Other Honors

- Panelist for NSF/Discover Magazine Special Issue on The New Internet
- U.S. National Academy of Engineering Frontiers of Engineering Symposium
- U.S. National Academy of Science Kavli Frontiers of Science Symposium

Publications

Theses

- [1] Nick Feamster. *Proactive Techniques for Correct and Predictable Internet Routing*. PhD thesis, Massachusetts Institute of Technology, February 2006. Winner of the MIT George M. Sprowls Honorable Mention for Best MIT Ph.D. Dissertation in Computer Science.
- [2] Nick Feamster. Adaptive delivery of real-time streaming video. Master's thesis, Massachusetts Institute of Technology, May 2001. Winner of the MIT EECS William A. Martin Memorial Thesis Award.

Journal Publications

- [3] Nick Feamster, Jennifer Rexford, and Ellen Zegura. The Road to SDN. *ACM Queue*, 11(12):20, December 2013.
- [4] Sam Burnett and Nick Feamster. Making Sense of Internet Censorship: A New Frontier for Internet Measurement. *ACM SIGCOMM Computer Communications Review*, 43(3), July 2013.
- [5] Hyojoon Kim and Nick Feamster. Improving network management with software defined networking. *Communications Magazine, IEEE*, 51(2):114–119, 2013.
- [6] Mohammed Mukarram bin Tariq, Vytutas Valancius, Kaushik Bhandakar, Amgad Zeitoun, Nick Feamster, and Mostafa Ammar. Answering "What-If" Deployment and Configuration Questions with WISE: Techniques and Deployment Experience. *IEEE/ACM Transactions on Networking*, January 2013.
- [7] Srikanth Sundaresan, Walter de Donato, Nick Feamster, Renata Teixeira, Sam Crawford, and Antonio Pescapè. Measuring home broadband performance. *Communications of the ACM*, 55(9), September 2012.
- [8] Srikanth Sundaresan, Nazanin Magharei, Nick Feamster, and Renata Teixeira. Accelerating last-mile web performance with popularity-based prefetching. *ACM SIGCOMM Computer Communication Review*, 42(4):303–304, 2012.
- [9] Marshini Chetty and Nick Feamster. Refactoring Network Infrastructure to Improve Manageability: A Case Study of Home Networking. *ACM SIGCOMM Computer Communications Review*, 42(3), July 2012.
- [10] Murtaza Motiwala, Amogh Dhamdhere, and Nick Feamster. Towards a Cost Model for Network Traffic. *ACM SIGCOMM Computer Communications Review*, 42(1), January 2012.
- [11] Nick Feamster and Jennifer Rexford. Getting Students' Hands Dirty With Clean-Slate Networking. *ACM SIGCOMM Computer Communications Review*, December 2011.
- [12] Nick Feamster, Lixin Gao, and Jennifer Rexford. A Survey of Virtual LAN Usage in Campus Networks. *IEEE Communications*, 49(7), July 2011.
- [13] T. Koponen, S. Shenker, H. Balakrishnan, N. Feamster, I. Ganichev, A. Ghodsi, P. B. Godfrey, N. McKeown, G. Parulkar, B. Raghavan, J. Rexford, S. Arianfar, and D. Kuptsov. Architecting for Innovation. *ACM SIGCOMM Computer Communications Review*, 43(1), July 2011.
- [14] Ken Calvert, W. Keith Edwards, Nick Feamster, Rebecca Grinter, Ye Deng, and Xuzi Zhou. Instrumenting Home Networks. *ACM SIGCOMM Computer Communications Review*, 41(1), January 2011.
- [15] Bilal Anwer and Nick Feamster. Building a fast, virtualized data plane with programmable hardware. *ACM SIGCOMM Computer Communication Review*, April 2010.
- [16] Nick Feamster, Ramesh Johari, and Hari Balakrishnan. Stable Policy Routing with Provider Independence. *IEEE/ACM Transactions on Networking*, December 2007.

- [17] Nick Feamster and Jennifer Rexford. Network-Wide Prediction of BGP Routes. *IEEE/ACM Transactions on Networking*, June 2007.
- [18] Nick Feamster, Jaeyeon Jung, and Hari Balakrishnan. An Empirical Study of “Bogon” Route Advertisements. *ACM Computer Communications Review*, 35(1):63–70, November 2004.
- [19] Nick Feamster, Jay Borkenhagen, and Jennifer Rexford. Guidelines for Interdomain Traffic Engineering. *ACM Computer Communications Review*, 33(5):19–30, October 2003.

Books and Book Chapters

- [20] Anirudh Ramachandran, Nick Feamster, and David Dagon. *Botnet Detection: Countering the Largest Security Threat*. Springer, 2008. *Chapter*: Revealing Botnet Membership with DNSBL Counterintelligence.

Conference Publications

- [21] Hyojoon Kim, Arpit Gupta, Muhammad Shahbaz, Joshua Reich, Nick Feamster, and Russ Clark. Kinetic: Verifiable Dynamic Network Control. In *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, Oakland, CA, May 2015.
Acceptance rate: 19%
- [22] Marshini Chetty, Hyojoon Kim, Srikanth Sundaresan, Sam Burnett, Nick Feamster, and Keith Edwards. uCap: An Internet Data Management Tool for the Home. In *ACM Conference on Human Factors in Computing Systems (CHI)*, Seoul, Korea, April 2015.
Acceptance rate: 23%
- [23] Srikanth Sundaresan, Nick Feamster, and Renata Teixeira. Measuring the Performance of User Traffic in Home Wireless Networks. In *Passive and Active Measurement Conference (PAM)*, New York, NY, March 2015.
Acceptance rate: 27%
- [24] Josiah Chavula, Hussein Suleman, and Nick Feamster. Quantifying the Effects of Circuitous Routes on the Latency of Intra-Africa Internet Traffic: A Study of Research and Education Networks. In *6th International Conference on e-Infrastructure and e-Services for Developing Countries (Africomm)*, Kampala, Uganda, November 2014.
- [25] Abhinav Narain, Nick Feamster, and Alex C. Snoeren. Deniable Liaisons. In *SIGSAC Conference on Computer and Communications Security (CCS)*, pages 525–536, 2014.
Acceptance rate: 19%
- [26] Ben Jones, Tzu-Wen Lee, Nick Feamster, and Phillipa Gill. Automated Detection and Fingerprinting of Censorship Block Pages. In *ACM SIGCOMM Internet Measurement Conference (IMC)*, pages 299–304, Vancouver, British Columbia, Canada, October 2014.
Acceptance rate: 22%
- [27] Arpit Gupta, Muhammad Shahbaz, Laurent Vanbever, Hyojoon Kim, Russ Clark, Nick Feamster, Jennifer Rexford, and Scott Shenker. SDX: A Software Defined Internet Exchange. Chicago, IL, 2014.
Acceptance rate: 19%
- [28] Srikanth Sundaresan, Sam Burnett, Nick Feamster, and Walter De Donato. BISmark: A Testbed for Deploying Measurements and Applications in Broadband Access Networks. Philadelphia, PA, June 2014.
Acceptance rate: 15%
- [29] Arpit Gupta, Matt Calder, Nick Feamster, Marshini Chetty, Enrico Calandro, and Ethan Katz-Bassett. Peering at the Internets Frontier: A First Look at ISP Interconnectivity in Africa. In *Proc. Passive and Active Measurement Conference*, Los Angeles, CA, March 2014.
Acceptance rate: 31%

- [30] Xinyu Xing, Wei Meng, Dan Doozan, Nick Feamster, Wenke Lee, and Alex Snoeren. Exposing Inconsistent Web Search Results with Bobble. In *Proc. Passive and Active Measurement Conference*, Los Angeles, CA, March 2014.
Acceptance rate: 31%
- [31] Marshini Chetty, Srikanth Sundaresan, Sachit Muckaden, Nick Feamster, and Enrico Calandro. Measuring Broadband Performance in South Africa. In *4th ACM DEV (Symposium on Computing for Development)*, Cape Town, South Africa, December 2013.
Acceptance rate: 33%
- [32] Yogesh Mundada, Anirudh Ramachandran, and Nick Feamster. SilverLine: Preventing Data Leaks from Cloud-Based Web Applications. In *Annual Computer Security Applications Conference (AC-SAC)*, New Orleans, LA, December 2013.
Acceptance rate: 19%
- [33] Shuang Hao, Matthew Thomas, Vern Paxson, Nick Feamster, Christian Kreibich, Chris Grier, and Scott Hollenbeck. Understanding the domain registration behavior of spammers. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Barcelona, Spain, October 2013.
Acceptance rate: 23%
- [34] Sarthak Grover, Mi Seon Park, Srikanth Sundaresan, Sam Burnett, Hyojoon Kim, and Nick Feamster. Peeking behind the nat: An empirical study of home networks. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Barcelona, Spain, October 2013.
Acceptance rate: 23%
- [35] Srikanth Sundaresan, Nick Feamster, Renata Teixeira, and Nazanin Magharei. Measuring and mitigating web performance bottlenecks in broadband access networks. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Barcelona, Spain, October 2013.
Acceptance rate: 23%
- [36] Xinyu Xing, Wei Ming, Dan Doozan, Alex Snoeren, Nick Feamster, and Wenke Lee. Take this personally: Pollution attacks on personalized services. In *Proc. 22th USENIX Security Symposium*, Washington, DC, August 2013.
Acceptance rate: 16%
- [37] Vytas Valancius, Bharath Ravi, Nick Feamster, and Alex C Snoeren. Quantifying the benefits of joint content and network routing. In *Proc. ACM SIGMETRICS*, Pittsburgh, PA, June 2013.
Acceptance rate: 11%
- [38] Cristian Lumezanu and Nick Feamster. Measuring common spam on email and Twitter. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Boston, Massachusetts, November 2012.
Acceptance rate: 24%
- [39] Ethan Katz-Bassett, Colin Scott, David Choffnes, Italo Cunha, Vytas Valancius, Nick Feamster, Harsha Madhyastha, T. Anderson, and A. Krishnamurthy. LIFEGUARD: Practical Repair of Persistent Route Failures. In *Proc. ACM SIGCOMM*, Helsinki, Finland, August 2012.
Acceptance rate: 14%
- [40] Cristian Lumezanu and Nick Feamster. #bias: Measuring Propagandistic Behavior on Twitter. In *International Conference on Weblogs and Social Media (ICWSM)*, Dublin, Ireland, June 2012.
Acceptance rate: 20%
- [41] Maria Konte and Nick Feamster. Re-wiring Activity of Malicious Networks. In *Proc. Passive and Active Measurement Conference*, Vienna, Austria, March 2012.
Acceptance rate: 30%
- [42] Hyojoon Kim and Theophilus Benson and Aditya Akella and Nick Feamster. Understanding the Evolution of Network Configuration: A Tale of Two Campuses. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Berlin, Germany, November 2011.
Acceptance rate: 19%

- [43] Shuang Hao, Nick Feamster, and Ramakant Pandrangi. Monitoring the Initial DNS Behavior of Spammers. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Berlin, Germany, November 2011.
Acceptance rate: 19%
- [44] Vytautas Valancius, Cristian Lumezanu, Nick Feamster, Ramesh Johari, and Vijay Vazirani. How Many Tiers? Pricing in the Internet Transit Market. In *Proc. ACM SIGCOMM*, Toronto, Ontario, Canada, August 2011.
Acceptance rate: 14%
- [45] Nick Feamster Renata Teixeira Sam Crawford Antonio Pescape Srikanth Sundaresan, Walter de Donato. Broadband Internet Performance: A View From the Gateway. In *Proc. ACM SIGCOMM*, Toronto, Ontario, Canada, August 2011.
Acceptance rate: 14%
- [46] Anirudh Ramachandran, Anirban Dasgupta, Nick Feamster, and Kilian Weinberger. Spam or Ham? Characterizing and Detecting Fraudulent "Not Spam" Reports in Web Mail Systems. In *8th Annual Collaboration, Electronic messaging, Anti-Abuse and Spam Conference (CEAS 2011)*, Perth, Australia, September 2011.
- [47] Bilal Anwer, Murtaza Motiwala, Mukarram bin Tariq, and Nick Feamster. SwitchBlade: A Platform for Rapid Deployment of Network Protocols on Programmable Hardware. In *Proc. ACM SIGCOMM*, New Delhi, India, August 2010.
Acceptance rate: 12%
- [48] Sam Burnett, Nick Feamster, and Santosh Vempala. Chipping Away at Censorship Firewalls with Collage. In *Proc. 19th USENIX Security Symposium*, Washington, DC, August 2010.
Acceptance rate: 15%
- [49] Manos Antonakakis and Roberto Perdisci and David Dagon and Wenke Lee and Nick Feamster. Building a Dynamic Reputation System for DNS. In *Proc. 19th USENIX Security Symposium*, Washington, DC, August 2010.
Acceptance rate: 15%
- [50] Vytautas Valancius, Nick Feamster, Jennifer Rexford, and Akihiro Nakao. Wide-Area Routing for Distributed Services. In *Proc. USENIX Annual Technical Conference*, Boston, MA, June 2010.
Acceptance rate: 17%
- [51] Roberto Perdisci, Wenke Lee, and Nick Feamster. Behavioral Clustering of HTTP-Based Malware. In *Proc. 7th ACM/USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, San Jose, CA, April 2010.
Acceptance rate: 16%
- [52] Mohammed Mukarram bin Tariq, Murtaza Motiwala, Nick Feamster, and Mostafa Ammar. Detecting General Network Neutrality Violations with Causal Inference. In *4th International Conference on emerging Networking EXperiments and Technologies (CoNEXT)*, Rome, Italy, December 2009.
Acceptance rate: 17%
- [53] Mohammed Mukarram bin Tariq, Ahmed Mansy, Nick Feamster, and Mostafa Ammar. Measuring VLAN-Induced Sharing on a Campus Network. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Chicago, Illinois, October 2009.
Acceptance rate: 22%
- [54] Italo Cunha, Renata Teixeira, Nick Feamster, and Christophe Diot. Techniques for Fast and Accurate Network Tomography. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Chicago, Illinois, October 2009.
Acceptance rate: 22%

- [55] Shuang Hao, Nadeem Syed, Nick Feamster, Alexander Gray, and Sven Krasser. Detecting Spammers with SNARE: Spatio-temporal Network-level Automatic Reputation Engine. In *Proc. 18th USENIX Security Symposium*, Montreal, Quebec, Canada, August 2009.
Acceptance rate: 15%
- [56] Maria Konte, Nick Feamster, and Jaeyeon Jung. Dynamics of Online Scam Infrastructure. In *Proc. Passive and Active Measurement Conference*, Seoul, Korea, March 2009.
*Acceptance rate: 20% **Best paper award.***
- [57] Anirudh Ramachandran, Srinivasan Seetharaman, Nick Feamster, and Vijay Vazirani. Fast Monitoring of Traffic Subpopulations. In *Proc. ACM SIGCOMM Internet Measurement Conference*, Vouliagmeni, Greece, October 2008.
Acceptance rate: 17%
- [58] Murtaza Motiwala, Megan Elmore, Nick Feamster, and Santosh Vempala. Path Splicing. In *Proc. ACM SIGCOMM*, Seattle, WA, August 2008.
Acceptance rate: 12%
- [59] Mohammed Mukarram bin Tariq, Amgad Zeitoun, Nick Feamster, and Mostafa Ammar. Answering What-If Deployment and Configuration Questions with WISE. In *Proc. ACM SIGCOMM*, Seattle, WA, August 2008.
Acceptance rate: 12%
- [60] David Andersen, Hari Balakrishnan, Nick Feamster, and Scott Shenker. Accountable Internet Protocol (AIP). In *Proc. ACM SIGCOMM*, Seattle, WA, August 2008.
Acceptance rate: 12%
- [61] Nick Feamster and Alexander Gray. Can Great Research Be Taught? Independent Research with Cross-Disciplinary Thinking and Broader Impact. In *ACM SIGCSE Technical Symposium on Computer Science Education (SIGCSE)*, Portland, OR, March 2008.
- [62] Anirudh Ramachandran, Nick Feamster, and Santosh Vempala. Filtering Spam with Behavioral Blacklisting. In *Proc. 14th ACM Conference on Computer and Communications Security (CCS)*, Alexandria, VA, October 2007.
Acceptance rate: 24%
- [63] Manas Khadilkar, Nick Feamster, Russ Clark, and Matt Sanders. Usage-Based DHCP Lease Time Optimization. In *Proc. ACM SIGCOMM Internet Measurement Conference*, San Diego, CA, October 2007.
Acceptance rate: 24%
- [64] Yiyi Huang, Nick Feamster, Anukool Lakhina, and Jim Xu. Exposing Routing Problems with Network-Wide analysis. In *Proc. ACM SIGMETRICS*, San Diego, CA, June 2007.
Acceptance rate: 17%
- [65] Feng Wang, Nick Feamster, and Lixin Gao. Measuring the contributions of routing dynamics to prolonged end-to-end internet path failures. In *Proc. IEEE Conference on Global Communications (GlobeCom)*, Washington, DC, November 2007.
Acceptance rate: 40%
- [66] Christopher P. Lee, Keshav Attrey, Carlos Caballero, Nick Feamster, Milena Mihail, and John A. Copeland. MobCast: Overlay Architecture for Seamless IP Mobility using Scalable Anycast Proxies. In *IEEE Wireless Communications and Networking Conference*, Hong Kong, March 2007.
Acceptance rate: 47%
- [67] Anirudh Ramachandran and Nick Feamster. Understanding the Network-Level Behavior of Spammers. In *Proc. ACM SIGCOMM*, Pisa, Italy, August 2006. An earlier version appeared as Georgia Tech TR GT-CSS-2006-001.
*Acceptance rate: 12% **Best student paper award.***

- [68] Andy Bavier, Nick Feamster, Mark Huang, Larry Peterson, and Jennifer Rexford. In VINI Veritas: Realistic and controlled network experimentation. In *Proc. ACM SIGCOMM*, Pisa, Italy, August 2006.
Acceptance rate: 12%
- [69] Nick Feamster and Hari Balakrishnan. Correctness Properties for Internet Routing. In *Forty-third Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, September 2005.
- [70] Nick Feamster, Ramesh Johari, and Hari Balakrishnan. The Implications of Autonomy for Stable Policy Routing. In *Proc. ACM SIGCOMM*, pages 25–36, Philadelphia, PA, August 2005.
Acceptance rate: 11%
- [71] Michael Freedman, Mythili Vutukuru, Nick Feamster, and Hari Balakrishnan. Geographic Locality of IP Prefixes. In *Proc. ACM SIGCOMM Internet Measurement Conference*, New Orleans, LA, October 2005.
Acceptance rate: 24%
- [72] Nick Feamster and Hari Balakrishnan. Detecting BGP Configuration Faults with Static Analysis. In *Proc. 2nd Symposium on Networked Systems Design and Implementation (NSDI)*, pages 43–56, Boston, MA, May 2005.
Acceptance rate: 22% Best paper award.
- [73] Matthew Caesar, Don Caldwell, Nick Feamster, Jennifer Rexford, Aman Shaikh, and Kobus van der Merwe. Design and Implementation of a Routing Control Platform. In *Proc. 2nd Symposium on Networked Systems Design and Implementation (NSDI)*, pages 15–28, Boston, MA, May 2005.
Acceptance rate: 22%
- [74] Nick Feamster, Zhuoqing Morley Mao, and Jennifer Rexford. BorderGuard: Detecting Cold Potatoes from Peers. In *Proc. ACM SIGCOMM Internet Measurement Conference*, pages 213–218, Taormina, Sicily, Italy, October 2004.
Acceptance rate: 25%
- [75] Nick Feamster, Jared Winick, and Jennifer Rexford. A Model of BGP Routing for Network Engineering. In *Proc. ACM SIGMETRICS*, pages 331–342, New York, NY, June 2004.
Acceptance rate: 12%
- [76] Nick Feamster, David Andersen, Hari Balakrishnan, and M. Frans Kaashoek. Measuring the Effects of Internet Path Faults on Reactive Routing. In *Proc. ACM SIGMETRICS*, pages 126–137, San Diego, CA, June 2003.
Acceptance rate: 12%
- [77] Nick Feamster, Magdalena Balazinska, Greg Harfst, Hari Balakrishnan, and David Karger. Infranet: Circumventing Web censorship and surveillance. In *Proc. 11th USENIX Security Symposium*, San Francisco, CA, August 2002.
Acceptance rate: 17% Best student paper award.
- [78] Kevin Fu, Emil Sit, Kendra Smith, and Nick Feamster. Dos and don'ts of client authentication on the Web. In *Proc. 10th USENIX Security Symposium*, Washington, DC, August 2001.
Acceptance rate: 28% Best student paper award.
- [79] Susie Wee, John Apostolopoulos, and Nick Feamster. Field-to-frame transcoding with temporal and spatial downsampling. In *IEEE International Conference on Image Processing*, October 1999.
Acceptance rate: 45%
- [80] Nick Feamster and Susie Wee. An MPEG-2 to H.263 transcoder. In *SPIE Voice, Video, and Data Communications Conference*, Boston, MA, September 1999.

Workshop Publications

- [81] Brandon Schlinker, Kyriakos Zarifis, Italo Cunha, Nick Feamster, and Ethan Katz-Bassett. PEERING: An AS for Us. In *SIGCOMM Workshop on Hot Topics in Networks (HotNets)*, Los Angeles, CA, 2014.
- [82] Sean Donovan and Nick Feamster. Intentional Network Monitoring: Finding the Needle without Capturing the Haystack. In *SIGCOMM Workshop on Hot Topics in Networks (HotNets)*, Los Angeles, CA, 2014.
- [83] Ben Jones, Sam Burnett, Nick Feamster, Sathya Gunasekaran, Sean Donovan, Sarthak Grover, Sathya, and Karim Habak. Facade: High-Throughput, Deniable Censorship Circumvention Using Web Search. *USENIX Workshop on Free and Open Communications on the Internet (FOCI)*, page 115, 2014.
- [84] Nick Feamster. Hidden Sources of Internet Latency. In *ISOC Workshop on Reducing Internet Latency*, London, England, September 2013.
- [85] Marshini Chetty, Enrico Calandro, and Nick Feamster. Latency Effects on Broadband Performance in South Africa . In *ISOC Workshop on Reducing Internet Latency*, London, England, September 2013.
- [86] B. Anwer, T. Benson, N. Feamster, D. Levin, and J. Rexford. A Slick Control Plane for Network Middleboxes. In *Open Network Summit*, Santa Clara, CA, April 2013.
Acceptance rate: 23%
- [87] N. Feamster, D. Levin, J. Rexford, S. Shenker, R. Clark, and J. Bailey. SDX: A Software Defined Internet Exchange. In *Open Network Summit*, Santa Clara, CA, April 2013.
Acceptance rate: 23%
- [88] Andreas Voellmy, Hyojoon Kim, and Nick Feamster. Procera: A Language for High-Level Reactive Network Control. In *ACM SIGCOMM Workshop on Hot Topics in Software Defined Networking (HotSDN)*, Helsinki, Finland, August 2012.
- [89] Jake Martin and Nick Feamster. User-driven dynamic prioritization in the home. In *ACM SIGCOMM Workshop on Measurements Up the Stack (W-MUST)*, Helsinki, Finland, August 2012.
- [90] Srikanth Sundaresan, Nick Feamster, Renata Teixeira, Anthony Tang, W. Keith Edwards, Rebecca Grinter, Marshini Chetty, and Walter de Donato. Helping Users Shop for ISPs with Internet Nutrition Labels. In *ACM SIGCOMM Workshop on Home Networking (HomeNets)*, Toronto, Ontario, Canada, August 2011.
- [91] Nick Feamster and Jennifer Rexford. Getting Students’ Hands Dirty With Clean-Slate Networking. In *SIGCOMM Workshop on Network Education (NetEd)*, Toronto, Ontario, Canada, August 2011.
- [92] Yogesh Mundada, Anirudh Ramachandran, and Nick Feamster. SilverLine: Data and Network Isolation for Cloud Services. In *3rd USENIX Workshop on Hot Topics in Cloud Computing (HotCloud ’11)*, June 2011.
- [93] Bilal Anwer, Ankur Nayak, Nick Feamster, and Ling Liu. Network I/O Fairness in Virtual Machines. In *ACM SIGCOMM Workshop on Virtualized Infrastructure, Services, and Architectures (VISA)*, New Delhi, India, September 2010.
- [94] Nick Feamster. Outsourcing Home Network Security. In *ACM SIGCOMM Workshop on Home Networking (HomeNets)*, New Delhi, India, September 2010.
- [95] Ken Calvert, W. Keith Edwards, Nick Feamster, Rebecca Grinter, Ye Deng, and Xuzi Zhou. Instrumenting Home Networks. In *ACM SIGCOMM Workshop on Home Networking (HomeNets)*, New Delhi, India, September 2010.

- [96] Bilal Anwer and Nick Feamster. Building a Fast, Virtualized Data Plane with Programmable Hardware. In *ACM SIGCOMM Workshop on Virtualized Infrastructure, Services, and Architectures (VISA)*, Barcelona, Spain, August 2009.
- [97] Ankur Nayak, Alex Reimers, Russ Clark, and Nick Feamster. Resonance: Dynamic Access Control for Enterprise Networks. In *ACM SIGCOMM Workshop on Research in Enterprise Networks (WREN)*, Barcelona, Spain, August 2009.
- [98] Sapan Bhatia, Murtaza Motiwala, Wolfgang Muehlbauer, Yogesh Mundada, Vytautas Valancius, Andy Bavior, Nick Feamster, Larry Peterson, and Jennifer Rexford. Trellis: A Platform for Building Flexible, Fast Virtual Networks on Commodity Hardware. In *3rd International Workshop on Real Overlays & Distributed Systems*, December 2008.
- [99] Vytautas Valancius, Nick Feamster, Ramesh Johari, and Vijay Vazirani. MINT: A Market for Internet Transit. In *ACM SIGCOMM CoNext Workshop on Re-Architecting the Internet*, December 2009.
- [100] Mohammed Mukarram bin Tariq, Murtaza Motiwala, and Nick Feamster. NANO: Network Access Neutrality Observatory. In *Proc. 7th ACM Workshop on Hot Topics in Networks (Hotnets-VII)*, Calgary, Alberta, Canada, October 2008.
Acceptance rate: 20%
- [101] S. Yardi, N. Feamster, and A. Bruckman. Photo-Based Authentication Using Social Networks. In *Proc. ACM SIGCOMM Workshop on Online Social Networks*, Seattle, WA, August 2008.
- [102] Anirudh Ramachandran and Nick Feamster. Authenticated Out-of-Band Communication over Social Links. In *Proc. ACM SIGCOMM Workshop on Online Social Networks*, Seattle, WA, August 2008.
- [103] Murtaza Motiwala, Nick Feamster, and Santosh Vempala. Path Splicing: Reliable Connectivity with Rapid Recovery. In *Proc. 6th ACM Workshop on Hot Topics in Networks (Hotnets-VI)*, Atlanta, GA, November 2007.
Acceptance rate: 18%
- [104] David G. Andersen, Hari Balakrishnan, Nick Feamster, and Scott Shenker. Holding the Internet Accountable. In *Proc. 6th ACM Workshop on Hot Topics in Networks (Hotnets-VI)*, Atlanta, GA, November 2007.
Acceptance rate: 18%
- [105] Anirudh Ramachandran, Atish das Sarma, and Nick Feamster. BitStore: An Incentive-Compatible Solution for Blocked Downloads in Bittorrent. In *ACM Joint Workshop on The Economics of Networked Systems and Incentive-Based Computing (NetEcon)*, San Diego, CA, June 2007.
- [106] Anirudh Ramachandran, Nick Feamster, and David Dagon. Revealing Botnet Membership with DNSBL Counter-Intelligence. In *2nd USENIX Workshop on Steps to Reducing Unwanted Traffic on the Internet (SRUTI)*, San Jose, CA, July 2006.
- [107] Anirudh Ramachandran, David Dagon, and Nick Feamster. Can DNSBLs Keep Up with Bots? In *3rd Conference on Email and Anti-Spam (CEAS)*, Mountain View, CA, July 2006.
- [108] Nick Feamster, Hari Balakrishnan, and Jennifer Rexford. Some foundational problems in interdomain routing. In *Proc. 3rd ACM Workshop on Hot Topics in Networks (Hotnets-III)*, San Diego, CA, November 2004.
- [109] Nick Feamster, Hari Balakrishnan, Jennifer Rexford, Aman Shaikh, and Kobus van der Merwe. The Case for Separating Routing from Routers. In *ACM SIGCOMM Workshop on Future Directions in Network Architecture*, pages 5–12, Portland, OR, September 2004.
- [110] Nick Feamster and Roger Dingledine. Location diversity in anonymity networks. In *ACM Workshop on Privacy in the Electronic Society*, Washington, DC, October 2004.

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- [112] Nick Feamster. Practical Verification Techniques for Wide-Area Routing. In *Proc. 2nd ACM Workshop on Hot Topics in Networks (Hotnets-II)*, pages 87–92, Cambridge, MA, November 2003.
- [113] Nick Feamster and Hari Balakrishnan. Towards a Logic for Wide-Area Internet Routing. In *ACM SIGCOMM Workshop on Future Directions in Network Architecture*, pages 289–300, Karlsruhe, Germany, August 2003.
- [114] David G. Andersen, Nick Feamster, Steve Bauer, and Hari Balakrishnan. Topology inference from BGP routing dynamics. In *Proc. ACM SIGCOMM Internet Measurement Workshop*, Marseille, France, November 2002.
Acceptance rate: 42%
- [115] Nick Feamster and Hari Balakrishnan. Packet loss recovery for streaming video. In *Proc. 12th International Packet Video Workshop (PV 2002)*, Pittsburgh, PA, April 2002.
- [116] Nick Feamster, Deepak Bansal, and Hari Balakrishnan. On the interactions between congestion control and layered quality adaptation for streaming video. In *11th International Packet Video Workshop*, Kyongju, Korea, May 2001.

Software

My research group regularly releases software and makes a practice of releasing source code with most published papers. As a supplement to the descriptions below, my research group’s Github page is available at: <http://github.com/gtnoise/>.

Ongoing and Maintained Software

- *Project BISmark: An Application Platform for Home Networks*. Project BISmark (Broadband Internet Service Benchmark) is a platform for developing network management applications for home networks. The BISmark firmware is based on OpenWrt, an open-source operating system for home routers. Currently, BISmark includes a suite of passive and active network measurements that allows a home Internet user to continuously monitor various performance metrics, such as upstream and downstream throughput, latency, and packet loss. As of Spring 2013, BISmark is deployed in nearly 300 homes around the world in more than 20 countries. We are currently working both to expand the deployment and to extend the capabilities of the platform, to allow other researchers to use the platform for their own measurements.
See <http://projectbismark.net> for details.
- *MySpeedTest: A Tool for Mobile Performance Measurement*. Building on the success of BISmark, my students Sachit Muckaden, Abhishek Jain, and I have developed a tool to measure performance from mobile cellular handsets. The application collects a variety of data, including latency and throughput measurements to a variety of servers around the world, hosted by Measurement Lab. The application is now deployed on more than 4,000 handsets in over 130 countries. Some of the most significant deployments are in developing countries, and we are currently collaborating with ResearchICTAfrica, a policy organization in Africa, to study the performance of both fixed and mobile broadband across the continent. Software is available at <http://goo.gl/28tx3>.
- *Bobble: Bursting Online Filter Bubbles*. With students Xinyu Xing, Dan Doozan and colleague Wenke Lee, I have designed and developed Bobble, a Chrome extension that allows users to see how their Web searches appear from different vantage points. The filter bubble is a concept developed by Internet activist Eli Pariser in his book to describe a phenomenon in which websites use algorithms to predict what information a user may like to see based on the user’s location, search history, etc. As a result, a website may only show information which agrees with the user’s past viewpoints. A typical example is Google’s personalized search results. To “pop” the bubbles created by Google search (also called de-personalization), our research group in the Georgia Tech Information Security Center is conducting ground-breaking research and developing software, Filter Bubble. Filter Bubble is a chrome extension that uses hundreds of nodes to distribute a user’s Google search queries world wide each time

the user performs a Google search. Using Filter Bubble, a user can easily see differences between his and others' Google search returns. The plugin has been installed by more than 100 users around the world and is available at <http://bobble.gtisc.gatech.edu/>.

- *Appu: Measuring Online Privacy Footprints.* With so many web applications and sites in the current time, it's hard for a user to keep track of where does her personal information reside. With Appu, we aim to make this job easier for the end user. Appu keeps track of personal information such as passwords, username, birthdate, address, credit card numbers, and social security number so that a user can find out all sites that store a particular bit of personal information. In the current beta release, Appu downloads personal information from sites where you have account and also tries to prevent password reuse across websites by warning users about it. Software is available at <http://appu.gtnoise.net/>
- *Transit Portal.* We developed software for the NSF-Sponsored GENI Project Office that (1) adds facilities and functions to the VINI testbed to enable experiments to carry traffic from real users; and (2) increases the experimental use of the VINI testbed by providing a familiar experiment management facility. The deliverables for this project all comprise software for supporting external connectivity and flexible, facile experimentation on the GENI testbed. The primary deliverables are a BGP session multiplexer—a router based on the Quagga software routing suite, software support for virtual tunnel and node creation, and integration of the above functionality with clearinghouse services developed as part of the ProtoGENI project.
See <http://tp.gtnoise.net/>.

This project contributes to GENI design and prototyping through BGP mux development integration with ISPs; tunnel and topology establishment and management; ProtoGENI clearinghouse integration; and support for isolation and resource swapout. With researchers at Princeton, we have also built VINI, a large distributed testbed for specifying virtual network topologies and experimenting with routing protocols and architectures in a controlled, realistic emulation environment. See <http://vini-veritas.net/> for details.

- *Campus-Wide OpenFlow Deployment: Access and Information Flow Control for Enterprise Networks.* Resonance is a system for controlling access and information flow in an enterprise network. Network operators currently use access control systems that are coarse-grained (i.e., it is difficult to apply specialized policy to individual users) and static (i.e., it is difficult to quickly change the extent of a user's access). Towards fixing these problems, we have developed a system that allows network operators to program network policy using a controller that is distinct from the switch itself and can be programmed to implement network-wide policy. We have implemented and deployed this system in an operational network that spans two buildings on the Georgia Tech campus; the network sees regular use, and a deployment in Georgia Tech dormitories or the wireless network is planned for the near future. We first demonstrated the function of this network at the 7th GENI Engineering Conference in March 2010, and recently demonstrated a version on Resonance that facilitates various home network management tasks at the 2011 Open Network Summit. See <http://groups.geni.net/geni/wiki/BGPMux> for details.
- *rcc: router configuration checker.* Static configuration analysis tool for Border Gateway Protocol (BGP) routing configurations. Downloaded by over 100 network operators and many large, nationwide backbone ISPs around the world. See <http://gtnoise.net/rcc/> for details.

Older Projects

- *NANO: Network Access Neutrality Observatory.* The Network Access Neutrality Observatory (NANO) is a system to help users determine whether their traffic is being discriminated against by an access ISP. In contrast to existing systems for detecting network neutrality violations, NANO makes no assumptions about the mechanism for discrimination or the services that the ISP might be discriminated against. NANO has been released in collaboration with Google as part of the Measurement Lab project. A preliminary version of the software was released to a small group of users in March 2009 for testing; a complete release is available for download at: <http://gtnoise.net/nano/>.
- *Infranet.* System for circumventing Web censorship firewalls (e.g., those in China, Saudia Arabia, etc.). Available on Sourceforge. Featured in articles in *Technology Review*, *New Scientist*, and *Slashdot*. See <http://nms.lcs.mit.edu/projects/infranet/>.
- *The Datapositionary.* Originally the "MIT BGP Monitor", the Datapositionary is growing to support multiple data feeds (e.g., spam, end-to-end measurement probes, traceroutes, Abilene data, etc.). Currently used by researchers at

Georgia Tech, Carnegie Mellon, University of Michigan, Princeton, MIT. See <http://www.datapositionary.net/> for details.

- *Secure BGP Implementation*. Implementation of S-BGP in the Quagga software router. Our implementation was considered by Randy Bush and Geoff Huston for their project to develop a certificate infrastructure for secure routing protocols.
- *SR-RTP*. Transport protocol for selective retransmission of packets in an MPEG video stream. Incorporated into “Oxygen TV” for MIT Project Oxygen. Some ideas incorporated into the OpenDivX video transport protocol.

Research Proposals and Grants

- [1] **A Software Defined Internet Exchange**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), J. Rexford, S. Shenker
Amount: \$500,000 for 3 years.
Awarded: August 2014
- [2] **Studying and Improving the Performance of Access Networks**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), A. Snoeren
Amount: \$281,364 for 3 years.
Awarded: August 2014
- [3] **EPICA: Empowering People to Overcome Information Controls and Attacks**
Sponsor: National Science Foundation
Investigator(s): W. Lee (PI), N. Feamster, H. Klein, M. Bailey, M. Chetty
Amount: \$750,000 for 4 years.
Awarded: August 2014
- [4] **An Open Platform for Internet Routing Experiments**
Sponsor: National Science Foundation
Investigator(s): N. Feamster, E. Katz-Bassett, D. Choffnes (PI)
Amount: \$361,617 for 3 years.
Awarded: August 2014
- [5] **An Open Observatory for the Internet’s Last Mile**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), S. Banerjee, J. Cappos
Amount: \$399,879 for 3 years.
Awarded: June 2014
- [6] **Improving the Performance and Security of Home Networks with Programmable Home Routers**
Sponsor: Comcast
Investigator(s): N. Feamster (PI)
Amount: \$65,000 for 1 year
Awarded: September 2013
- [7] **Demand Characterization and Management for Access Networks**
Sponsor: Cisco Systems
Investigator(s): N. Feamster (PI) and R. Johari
Amount: \$99,766 for 1 year
Awarded: April 2013
- [8] **Personal Information Fusion with In Situ Sensing Infrastructure**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI)
Amount: \$75,000 for 1 year.
Awarded: July 2012

- [9] **Characterizing and Exposing Bias in Social and Mainstream Media**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI)
Amount: \$175,000 for 1 year.
Awarded: July 2012
- [10] **I-Corps: Helping Users and ISPs Manage Home Networks with BISmark**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI)
Amount: \$50,000 for 1 year.
Awarded: June 2012
- [11] **Optimizing Network Support for Cloud Services: From Short-Term Measurements to Long-Term Planning**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), J. Rexford
Amount: \$574,996.00 for 4 years.
Awarded: April 2012
- [12] **Facilitating Free and Open Access to Information on the Internet**
Sponsor: National Science Foundation
Investigator(s): R. Dingedine, N. Feamster (PI), E. Felten, M. Freedman, H. Klein, W. Lee
Amount: \$1,500,000 for 4 years
Awarded: March 2011
- [13] **Measurement Infrastructure for Home Networks**
Sponsor: National Science Foundation
Investigator(s): K. Calvert, W.K. Edwards, N. Feamster (PI), R. Grinter
Amount: \$1,200,000 for 4 years
Awarded: February 2011
- [14] **Monitoring Free and Open Access to Information on the Internet**
Sponsor: Google Focus Grant
Investigator(s): N. Feamster and W. Lee
Amount: \$1,500,000 for 3 years
Awarded: February 2011
- [15] **GENI OpenFlow Campus Buildout**
Sponsor: GENI Project Office
Investigator(s): N. Feamster (PI), Russ Clark
Amount: \$64,675 for 1 year
Awarded: October 2010
- [16] **Architecting for Innovation**
Sponsor: National Science Foundation
Investigator(s): H. Balakrishnan, N. Feamster, B. Godfrey, N. McKeown, J. Rexford, S. Shenker (PI)
Amount: \$200,000 for 1 year
Awarded: September 2010
- [17] **Aster*x: Load-Balancing Web Traffic over Wide-Area Networks**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), Russ Clark
Amount: \$75,000 for 1 year
Awarded: August 2010
- [18] **Network-Wide Configuration Testing and Synthesis**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), A. Akella
Amount: \$500,000 for 3 years
Awarded: June 2010

- [19] **MEDITA - Multi-layer Enterprise-wide Dynamic Information-flow Tracking & Assurance**
Sponsor: National Science Foundation
Investigator(s): N. Feamster, A. Orso (PI), M. Prvulovic
Amount: \$900,000 for 3 years
Awarded: March 2010
- [20] **Campus Network Access and Admission Control with Openflow**
Sponsor: National Science Foundation
Investigator(s): N. Feamster (PI), R. Clark
Amount: \$300,000 for 3 years
Awarded: January 2010
- [21] **Studying DNS Traffic Patterns**
Sponsor: Verisign
Investigator(s): N. Feamster
Amount: \$30,000 for 1 year
Awarded: November 2009
- [22] **CIFellowship for Cristian Lumezanu**
Sponsor: National Science Foundation
Investigator(s): C. Lumezanu, N. Feamster (PI)
Amount: \$140,000 for 1 year
Awarded: November 2009
- [23] **Military Network Protocol**
Sponsor: DARPA Subcontract
Investigator(s): N. Feamster
Amount: \$37,000 for 1 year
Awarded: November 2009
- [24] **Botnet Attribution and Removal: From Axioms to Theories to Practice**
Sponsor: Office of Naval Research
Investigator(s): W. Lee (PI), D. Dagon, J. Giffin, N. Feamster, K. Shin, F. Jahanian, M. Bailey, J. Mitchell, G. Vigna, C. Kruegel
Amount: \$7,500,000 for 5 years
Awarded: August 2009
- [25] **Taint-based Information Tracking in Networked Systems**
Sponsor: National Science Foundation Trusted Computing Program
Investigator(s): N. Feamster
Amount: \$450,000 for 3 years
Awarded: August 2009
- [26] **Towards a Market for Internet Connectivity**
Sponsor: Office of Naval Research
Investigator(s): N. Feamster (PI), R. Johari, V. Vazirani
Amount: \$350,000 for 1 year
Awarded: March 2009
- [27] **Bringing Experimenters and External Connectivity to GENI**
Sponsor: GENI Project Office
Investigator(s): N. Feamster
Amount: \$320,000 for 3 years
Awarded: September 2008
- [28] **Routing Without Recomputation**
Sponsor: Cisco Systems
Investigator(s): N. Feamster

Amount: \$96,019 for 1 year
Awarded: September 2008

[29] **CLEANSE: Cross-Layer Large-Scale Efficient Analysis of Network Activities to Secure the Internet**

Sponsor: National Science Foundation Cybertrust Program
Investigator(s): W. Lee (PI), N. Feamster and others
Amount: \$1,200,000 for 5 years
Awarded: September 2008

[30] **Virtual Center for Network and Security Data**

Sponsor: Department of Homeland Security
Investigator(s): N. Feamster
Amount: \$48,000 for 2 years
Awarded: March 2008

[31] **Sloan Research Fellowship**

Sponsor: Alfred P. Sloan Foundation
Investigator(s): N. Feamster
Amount: \$45,000 for 2 years
Awarded: February 2008

[32] **Enabling Security and Network Management Research for Future Networks**

Sponsor: National Science Foundation CRI-IAD Program
Investigator(s): N. Feamster (PI), Z. Mao, W. Lee
Amount: \$397,426 for 3 years
Awarded: February 2008

[33] **SMITE: Scalable Monitoring in the Extreme**

Sponsor: DARPA BAA 07-52: Scalable Network Monitoring
Investigator(s): N. Feamster (PI), W. Lee
Amount: \$250,000 for 2 years
Awarded: January 2008

[34] **Countering Botnets: Anomaly-Based Detection, Comprehensive Analysis, and Efficient Mitigation**

Sponsor: Department of Homeland Security BAA07-09
Investigator(s): W. Lee (PI), N. Feamster, J. Giffin
Amount: \$1,050,730 for 2 years
Awarded: January 2008

[35] **Spam Filtering Research**

Sponsor: IBM Faculty Award
Investigator(s): N. Feamster
Amount: \$ 7,500 (unrestricted gift)
Awarded: June 2007

[36] **SCAN: Statistical Collaborative Analysis of Networks**

Sponsor: National Science Foundation NeTS-NBD Program
Investigator(s): N. Feamster (PI), A. Gray, J. Hellerstein, C. Guestrin
Amount: \$ 95,000 for 3 years.
Awarded: June 2007

[37] **Towards an Accountable Internet Architecture**

Sponsor: National Science Foundation CyberTrust Program (Team Proposal)
Investigator(s): D. Andersen, H. Balakrishnan, N. Feamster (PI), S. Shenker
Amount: \$ 300,000 for 3 years.
Awarded: May 2007

- [38] **Fish4Phish: Fishing for Phishing in a Large Pond**
 Sponsor: AT&T Labs—Research
 Investigator(s): N. Feamster (PI), O. Spatscheck, K. van der Merwe
 Amount: *Funding for summer intern.*
 Awarded: *February 2007*
- [39] **Improving Network Operations with a View from the Edge.**
 Sponsor: National Science Foundation CAREER Program
 Investigator(s): N. Feamster (PI)
 Amount: *\$400,000 for 5 years.*
 Awarded: *January 2007*
- [40] **Equipment Donation for Network Operations Research**
 Sponsor: Intel Corporation
 Investigator(s): N. Feamster
 Amount: *\$30,000*
 Awarded: *October 2006*
- [41] **CABO: Concurrent Architectures are Better than One**
 Sponsor: National Science Foundation NeTS-FIND Program
 Investigator(s): N. Feamster (PI), L. Gao, J. Rexford
 Amount: *\$ 300,000 for 4 years*
 Awarded: *June 2006*
- [42] **Verification and Modeling of Wide-Area Internet Routing**
 Sponsor: Cisco Systems University Research Program
 Investigator(s): N. Feamster and H. Balakrishnan (PI)
 Amount: *\$ 95,500 for 1 year.*
 Awarded: *June 2004*

Service

Organizing Roles

- Program Committee Co-Chair, USENIX Symposium on Networked Systems Design and Implementation (NSDI): 2013
- Poster and Demo Committee Co-Chair, ACM SIGCOMM: 2009, 2013
- Founder and Chair, USENIX Workshop on Free and Open Communication on the Internet: 2011
- Program Committee Co-Chair, CoNext Student Workshop: 2006
- Co-organizer, Boston Freedom in Online Communications (BFOC) Day: 2013
- Panel Organizer, IEEE Computer and Communications Workshop (CCW): 2011
- Program Committee Co-Chair, ACM SIGCOMM Workshop on Hot Topics in Software Defined Networking (HotSDN): 2012
- Editor, IEEE Journal on Network and Systems Management
- Co-Organizer, DIMACS Workshop Series on Internet Security: 2007
- Organizer, Workshop on Internet Routing Evolution and Design: 2006
- Program Committee Co-Chair, ACM/USENIX Workshop on Networks meet Databases (NetDB): 2007
- Program Committee Co-Chair, Workshop on the Economics of Networked Systems (NetEcon): 2006

Program Committees

- IEEE Symposium on Security and Privacy: 2006, 2010, 2011, 2012, 2013
- ACM Conference on Computer and Communication Security (CCS): 2008, 2011
- ISOC Network and Distributed Security Symposium (NDSS): 2011, 2014

- ACM SIGCOMM: 2008, 2013
- ACM/USENIX Symposium on Networked Systems Design and Implementation (NSDI): 2009, 2012, 2015
- USENIX Technical Conference: 2007, 2009
- ACM SIGCOMM Internet Measurement Conference: 2006, 2008, 2012, 2013
- CoNext: 2006, 2007, 2014
- ACM SIGMETRICS: 2008, 2009, 2010
- Research Conference on Communication, Information and Internet Policy (TPRC): 2014, 2015
- ACM SIGCOMM Workshop on Hot Topics in Networking (HotNets): 2012
- USENIX Workshop on Free and Open Communications on the Internet (FOCI): 2012–2015
- USENIX Workshop on Hot Topics in Security (HotSec): 2012
- First Workshop on Systems and Infrastructure for the Digital Home (HomeSys): 2012
- ACM SIGCOMM Workshop on Medical Communication (MedCOMM): 2012
- ACM SIGCOMM COMSNETS: 2012
- ACM SIGCOMM Workshop on Home Networks (HomeNets): 2011
- Program Committee USENIX Workshop on Large-Scale Exploits and Emergent Threats: 2009, 2010, 2011
- ACM SIGCOMM Poster and Demo Session: 2011
- ACM SIGCOMM Workshop on Internet Network Management: 2006, 2007, 2008, 2009, 2010
- USENIX Workshop on Hot Topics in Management of Internet, Cloud, and Enterprise Networks and Services (HotICE): 2011
- ACM SIGCOMM Workshop on Virtualized Infrastructure Systems and Architectures (VISA): 2010
- ACM SIGCOMM Workshop on Programmable Routers for Extensible Services of Tomorrow (PRESTO): 2008, 2009
- USENIX International Workshop on Real Overlays & Distributed Systems: 2008
- ACM SIGCOMM Workshop on Economics of Networked Systems (NetEcon): 2008
- International World Wide Web Conference (Security/Privacy Track): 2008
- IEEE LAN/MAN Workshop: 2008
- ACM SIGCOMM Student Poster Session: 2007
- ACM SIGMETRICS Workshop on Mining Internet Data (MineNet): 2007
- Conference on Email and Anti-Spam (CEAS): 2007
- USENIX Workshop on Steps to Reduce Unwanted Traffic on the Internet (SRUTI): 2007
- International World Wide Web Conference (Security/Privacy Track): 2007
- North American Network Operators Group (NANOG): 2006–2009
- IEEE Infocom Student Poster Session: 2006
- IEEE International Conference on Internet Surveillance and Protection: 2006

External reviewer for *IEEE/ACM Transactions on Networking*, *SIGCOMM* (2002, 2003, 2004, 2006, 2007), *SOSP* (2001, 2003), *Infocom* (2004, 2006), *HotNets* (2003), *HotOS* (2001), *USENIX Security Symposium* (2002), *ACM Computer Communication Review*, *IEEE Network Magazine*, *IEEE Journal on Selected Areas in Communications*, *Image Communication* (EURASIP), *ASPLOS* (2004), *MobiSys* (2004), *USENIX* (2005, 2006), *NSDI* (2005, 2006), *IPTPS* (2005), *Workshop on Privacy Enhancing Technologies* (2006).

Teaching

Courses

Term	Year	Course Number & Title	Number of Students	Comments
Fall	2014	CS 4270/8803 Software Defined Networking	30	New Course
Fall	2014	OMS CS 6250 Computer Networking	223	Online MS
Fall	2013	CS 7001 Introduction to Graduate Studies	51	
Spring	2014	CS 6250 Computer Networking	50	
Spring	2014	OMS CS 6250 Computer Networking	300	Online MS
Fall	2013	CS 8001 Software Defined Networking	15	Flipped classroom
Fall	2013	CS 7001 Introduction to Graduate Studies	36	10k Blog Readers/Month
Summer	2013	Software Defined Networking (Coursera)	50,000+	First SDN Course
Spring	2013	CS 3251 Computer Networking	82	
Fall	2012	CMSC 330 Programming Languages (Univ. of Maryland)	100	
Fall	2011	CS 6250 Computer Networking	51	
Fall	2011	CS 4235 Computer Security	44	
Fall	2010	CS 6250 Computer Networking	92	
Spring	2010	CS 3251 Computer Networking I	53	
Spring	2010	CS 8803 NGN Next Generation Networking	50	New Course
Fall	2009	CS 7001 Introduction to Graduate Studies	39	
Spring	2009	CS 6262 Network Security	45	Updated Syllabus
Fall	2008	CS 4251 Computer Networking II	16	
Fall	2008	CS 7001 Introduction to Graduate Studies	44	
Spring	2008	CS 4251 Computer Networking II	14	New Syllabus
Fall	2007	CS 7001 Introduction to Graduate Studies	53	
Spring	2007	CS 7260 Internetworking Protocols and Architectures	29	
Fall	2006	CS 7001 Introduction to Graduate Studies	74	New Syllabus
Fall	2006	CS 8001 Networking Research Seminar	30	New Syllabus
Fall	2006	CS 1100 Freshman Leap Seminar	15	
Spring	2006	CS 7260 Internetworking Protocols and Architectures	27	New Syllabus

Other Highlights:

- Created the first-ever course on Software Defined Networking (SDN), and delivered it on Coursera to over 50,000 enrolled students
- Tutorial on network measurement at African Network Operators Group (AfNOG) in Summer 2013.
- Guest lecture on Internet censorship in Georgia Tech CS 4001 in October 2011.
- Tutorial on software-defined networking at African Network Operators Group (AfNOG) in Summer 2011.
- Tutorials on BGP Multiplexer at GENI Experimenters Workshop and GENI Engineering Conference in Summer 2010.
- Tutorial on network security at African Network Operators Group (AfNOG) in Summer 2010.
- Tutorial on Internet routing at Simposio Brasileiro de Redes de Computadores (SBRC) in Summer 2008.
- Lecture for DIMACS Tutorial on Next-Generation Internet Routing Algorithms in August 2007.
- Guest lecture for CS 6250 (Advanced Computer Networks) in Fall 2007.
- Guest lecture for CS 3251 (Computer Networks I) in Fall 2006.
- Multiple guest lectures for CS 4251 (Computer Networks II) in Spring 2006.
- Guest lecture for MIT Course 6.829 (Computer Networking) in Fall 2005.

Curriculum Development

Coursera and Online Masters Program Development: I have developed an online Coursera course for the topic of Software Defined Networking (SDN), an emerging topic in computer networking that is reshaping how networks are

defined. In the course, students learn about the history of SDN and develop hands-on experience with tools to develop technologies and applications for SDN. The course had approximately 50,00 students enrolled, and had about 4,000 students actively participating on the forums and in lectures. Nearly 1,000 students successfully completed the programming assignments for the course, qualifying as a pass “with distinction”. The course reviewed extremely favorably from students, as we have documented here: <http://goo.gl/So7Uis>. Additionally, the success of the course was covered on many technical forums, including the Mininet blog (<http://goo.gl/ZqfL1N>), the Packet Pushers blog (<http://goo.gl/okzd44>), and the sFlow blog (<http://goo.gl/qSMCq0>). Based on its overwhelming success, the course will be offered again in May 2014.

Georgia Tech Online Masters Program: I served on the committee to develop a Master of Science in Computer Science degree based on Massive Open Online Course (MOOC) offerings and took an active role in ensuring the creation of the online degree at Georgia Tech. As of October 2013, I am currently working with Udacity and Georgia Tech to create the first online graduate course in computer networking, which will launch in January 2014 and become an integral part of the Georgia Tech online degree program.

CS 7001 Introduction to Graduate Studies: With Professor Alex Gray, I have developed a new course syllabus and structure to CS 7001 around the larger goal of introducing new students to *how to do great research* as soon as their first term at Georgia Tech. In contrast with previous terms, where CS 7001 consisted of faculty “advertisements” for their research and projects consisted of short “mini-projects” where little research could be accomplished in a short time span of 3 weeks, we have improved the syllabus by bringing in faculty members to talk about research philosophy, exciting new directions, etc. We have also given the students the option to do a research project that is a term-long project in conjunction with CS 8903; our goal is to give students the flexibility to select meaningful research problems based on their research assistantships while helping them learn the skills required for writing papers, finding and evaluating research ideas, and performing other tasks associated with doing great research. Alex Gray and I wrote a conference paper on our development of this course, which appeared at *ACM SIGCSE 2008*. We have developed a website for the course, greatresearch.org, which makes the material generally available for use at other universities and by other researchers. **The website and blog have more than 25,000 views since its launch in mid-August 2013, and it has been receiving about 10,000 views every month.**

CS 6250 Graduate Computer Networking: In Fall 2011, I redesigned the graduate computer networking course to focus more on current technologies and hands-on assignments. Conventional networking courses treat today’s protocols and mechanisms as fixed artifacts, rather than as part of a continually evolving system. To prepare students to think critically about Internet architecture, Jennifer Rexford and I created a graduate networking course that combines “clean slate” networking research with hands-on experience in analyzing, building, and extending real networks. My goal was to prepare students to create and explore new architectural ideas, while teaching them the platforms and tools needed to evaluate their designs in practice. The course, with offerings at both Georgia Tech and Princeton, focuses on network management as a concrete way to explore different ways to split functionality across the end hosts, network elements, and management systems. I have refined the course in Fall 2011 to include more hands-on assignments and refactored the course around networking problems in different types of networks: transit networks, home networks, content hosting networks, and mobile and wireless networks. **Our work on the course received the best paper at the ACM SIGCOMM Workshop on Networking Education (NetEd) in 2011.**

College of Computing Research Day and Seminar Series: In addition to the course itself, to fulfill some of the functions of the former 7001 course, Alex Gray and I financed and organized a college-wide seminar series and research day in Fall 2009 and again in Spring 2011. Throughout the term, faculty speakers from across the college gave one-hour talks about their research; we raised money from Yahoo to support this event. The research day brings together students and faculty from around the college to see talks, demonstrations, and posters from around the college to exchange ideas.

CS 8803 Next-Generation Networking: I developed a new graduate course that gives students practical experience with a variety of tools for next-generation networking, ranging from the Click software router to the OpenFlow switch framework. The course also teaches students about the state of the art in networking research—students read papers about research and industry trends and do a course project that incorporates aspects of these new technologies. This course relates to the larger nationwide effort on Global Environment for Network Innovations (GENI), which is building infrastructure for researchers to provide the next generation of networking protocols and technologies.

Ph.D. Students

Graduated

- **Shuang Hao.** *Fall 2007 - Fall 2014.*
Publications: [33], [43], [55]
First job: Postdoc at UC Santa Barbara.
- **Sam Burnett.** *Fall 2008 - Spring 2014.*
Publications: [48], [34]
First job: Google.
- **Srikanth Sundaresan.** *Fall 2008 - Spring 2014.*
Publications: [35], [7], [45], [90]
First job: Research Scientist at ICSI.
- **Vytautas Valancius.** *Summer 2007 - Spring 2012.*
Publications: [37], [39], [44], [50], [99], [98]
First job: Google.
- **Murtaza Motiwala.** *Fall 2006 - Spring 2012.*
Publications: [10], [58], [103]
First job: Google.
- **Anirudh Ramachandran.** *Spring 2006 - Spring 2011.*
Publications: [20], [46] [62], [67], [102], [105], [106], [107]
First job: Founded Nouvou, security startup (sold). Now at Deutsche Telekom Labs.
- **Mukarram Bin Tariq.** *Spring 2007 - Spring 2010.*
Publications: [59], [53], [52], [100], [6]
First job: Google.

Graduating in 2015

- **Hyojoon Kim.** *Fall 2009 - Summer 2015 (Expected).*
Publications: [34], [42]
- **Bilal Anwer.** *Fall 2008 - Fall 2015 (Expected).*
Publications: [15], [47], [93], [96]
- **Maria Konte.** *Fall 2007 - Summer 2015 (Expected).*
Publications: [41], [56]
- **Yogesh Mundada.** *Fall 2007 - Summer 2015 (Expected).*
Publications: [32], [92]

Current

- **Arpit Gupta.** *Fall 2013 - Present.*
Publications: [29]
- **Ben Jones.** *Fall 2013 - Present*
- **Sean Donovan.** *Fall 2013 - Present*
- **Swati Roy.** *Fall 2013 - Present*
- **Sarthak Grover.** *Fall 2012 - Present.*
Publications: [34]
- **Muhammad Shahbaz.** *Fall 2012 - Present*
- **Abhinav Narain.** *Fall 2011 - Present*
- **Xinyu Xing.** *Fall 2011 - Present.*
Publications: [30], [36]

References

Prof. Hari Balakrishnan
MIT Computer Science & AI Lab
32 Vassar Street, 32G-940
Cambridge, MA 02139
(617) 253-8713
hari@csail.mit.edu

Prof. Vern Paxson
University of California, Berkeley
Department of Computer Science
737 Soda Hall
Berkeley, CA 94709
(510) 643-4209
vern@cs.berkeley.edu

Prof. Stefan Savage
Department of Computer Science and Engineering
EBU3B 3106
University of California, San Diego
La Jolla, CA 92093
(858) 822-4895
savage@cs.ucsd.edu

Prof. Scott Shenker
University of California, Berkeley
415 Soda Hall
Berkeley, CA 94709
(510) 643-3043
shenker@eecs.berkeley.edu

Prof. Nick McKeown
Stanford University
Department of Computer Science and Engineering
Gates 340
Stanford, CA 94305
(650) 723-3623
nickm@stanford.edu