

## RESEARCH INTERESTS

Networks, measurement, and security. Large-scale traffic analysis and data mining as applied to real-world networking, security, and systems problems.

## EDUCATION

**Massachusetts Institute of Technology** Cambridge, MA  
Ph.D in Electrical Engineering and Computer Science, Jun 2008.

**Massachusetts Institute of Technology** Cambridge, MA  
MS in Electrical Engineering and Computer Science, Sept 2004.

**Georgia Institute of Technology** Atlanta, GA  
BS in Computer Engineering, Dec 1996.  
*Magna Cum Laude*

## PROFESSIONAL EXPERIENCE

**Naval Postgraduate School** Jul. 2016 – Present  
*Associate Professor, Computer Science* Monterey, CA  
Principal investigator for  $\approx$ \$2M total funding from NSF, DHS, and industry sponsors. Lead and set research vision within the Center for Measurement and Analysis of Network Data (<https://www.cmand.org>) lab. Manage lab personnel, including graduate students, research associates, and staff. Advise Master's and Ph.D theses. Serve as CS department research chair.

**Technische Universität Berlin** Oct. 2017 – Aug. 2018  
*Visiting Researcher, Inet* Berlin, DE  
Sabbatical with the Internet Network Architecture group at TUB, focused on studying inter-domain routing security and vulnerabilities.

**Naval Postgraduate School** Sep. 2009 – Jun. 2016  
*Assistant Professor, Computer Science* Monterey, CA  
Conducted applied research with a concentration on large-scale network measurement, architecture, and security. Developed and taught network, security, architecture, and systems courses.

**BBN Technologies** Jul. 2008 – Sep. 2009  
*Network Scientist* Cambridge, MA  
Contributed to the development of a next-generation disruption tolerant network (DTN) platform for DARPA, including intelligent content routing in challenged contexts and DTN service discovery. Implemented time-dilation to emulate large networks and wireless channels on a virtual machine.

**Massachusetts Institute of Technology** Sep. 2002 – Jun. 2008  
*Research Assistant* Cambridge, MA  
Developed and led large-scale Internet neutrality, IP spoofing, and e-mail measurement efforts that were published, used by regulatory bodies, and covered by media. Dissertation examines architectural principles for network learning as applied to routing and security problems.

**MCI, Advanced Internet Technology** Jul. 1998 – Jul. 2002  
*Senior Engineer* Ashburn, VA  
Responsible for the measurement infrastructure of several large, international, mission-critical networks including UUNET IP and MCI Frame Relay. Used flow data from custom-developed high-speed passive optical monitors to analyze traffic for peering decisions and traffic engineering. Engineered and supported the NSF sponsored vBNS R&E backbone.

**Georgia Institute of Technology***Network Support Specialist***Jan. 1997 – Jul. 1998**

Atlanta, GA

Maintained the Georgia Tech campus backbone network routers and switches supporting ~18,000 end-nodes. Responsible for engineering of the regional R&E GigaPOP network of which Georgia Tech was the central hub. Administered critical campus UNIX clusters and servers for students and faculty. Deployed a comprehensive Network Operations Center including fault management, configuration management and performance analysis elements.

## TEACHING EXPERIENCE

**Naval Postgraduate School***Associate Professor***Fall 2009 – Present**

Monterey, CA

Taught, revamped, and updated CS3502 (Computer Networks), CS4550 (Computer Networks II), CS4538 (Wireless Security). Created and developed CS4558 (Network Traffic Analysis) to meet student and institution demand. Across approximately 15 terms of teaching, received an average instructor rating of 4.8/5.0 from students. Recognized in 2011, 2013, 2015, and 2017 with NPS Teaching Excellence Award. Advised  $\approx 30$  Master's and Ph.D theses; co-authored refereed publications with  $\approx 15$  thesis students at competitive peer-reviewed venues.

**Naval Postgraduate School***STEM Mentor***Fall 2013 – Present**

Monterey, CA

Mentor local Monterey-area high-school and community-college students, especially under-represented groups, through the NPS STEM internship program. Students gain real-world experience and exposure to CS by participating in my group's research projects.

**Massachusetts Institute of Technology***Teaching Assistant***Fall 2004, Fall 2006**

Cambridge, MA

TA for graduate-level computer networks course. Created and taught selected lectures, led weekly recitations. Wrote and graded tests and homework; assisted students with course projects.

**University of Ghana***Visiting Lecturer***Summer 2005**

Accra, Ghana

Taught and designed an intensive eight-week, eight-hour per-day curriculum on object oriented programming for ~100 Ghanaian college students using fewer than 30 computers.

## REFEREED PUBLICATIONS

1. Erik C. Rye and **Robert Beverly**. Sundials in the Shade: An Internet-wide Perspective on ICMP Timestamps. In *Proceedings of the Passive and Active Network Measurement Conference (PAM)*, March 2019. Acceptance rate: 20/75 (27%)
2. **Robert Beverly**, Ramakrishnan Durairajan, David Plonka, and Justin P. Rohrer. In the IP of the Beholder: Strategies for Active IPv6 Topology Discovery. In *Proceedings of the ACM SIGCOMM Internet Measurement Conference (IMC)*, November 2018. Acceptance rate: 43/174 (24%)
3. Florian Streibelt, Franziska Lichtblau, **Robert Beverly**, Anja Feldmann, Cristel Pelsser, Georgios Smaragdakis, and Randy Bush. BGP Communities: Even more Worms in the Routing Can. In *Proceedings of the ACM SIGCOMM Internet Measurement Conference (IMC)*, November 2018. Acceptance rate: 43/174 (24%)
4. Matthew Luckie and **Robert Beverly**. The Impact of Router Outages on the AS-level Internet. In *Proceedings of ACM SIGCOMM*, August 2017. Acceptance rate: 36/250 (14%)
5. Mark Allman, **Robert Beverly**, and Brian Trammell. Principles for measurability in protocol design. *SIGCOMM Comput. Commun. Rev.*, 47(2):2–12, May 2017
6. Jeremy Martin, Erik C. Rye, and **Robert Beverly**. Decomposition of MAC Address Structure for Granular Device Inference. In *Proceedings of the 32nd Annual Computer Security Applications Conference (ACSAC)*, December 2016. Acceptance rate: 48/210 (23%)

7. **Robert Beverly**. Yarrp'ing the Internet: Randomized High-Speed Active Topology Discovery. In *Proceedings of the ACM SIGCOMM Internet Measurement Conference (IMC)*, November 2016. Acceptance rate: 46/182 (25%)
8. Erik C. Rye, Justin P. Rohrer, and **Robert Beverly**. Revisiting AS-Level Graph Reduction. In *Proceedings of the Eighth IEEE International Workshop on Network Science for Communication Networks (NetSciCom)*, April 2016. Acceptance rate: 6/25 (24%)
9. Matthew Luckie, **Robert Beverly**, Tiange Wu, Mark Allman, and kc claffy. Resilience of Deployed TCP to Blind Attacks. In *Proceedings of the ACM SIGCOMM Internet Measurement Conference (IMC)*, October 2015. Acceptance rate: 44/169 (26%)
10. **Robert Beverly**, Matthew Luckie, Lorenza Mosley, and kc claffy. Measuring and Characterizing IPv6 Router Availability. In *Proceedings of the 16th Conference on Passive and Active Network Measurement (PAM)*, March 2015. Acceptance rate: 27/100 (27%)
11. **Robert Beverly** and Arthur Berger. Server Siblings: Identifying Shared IPv4/IPv6 Infrastructure via Active Fingerprinting. In *Proceedings of the 16th Conference on Passive and Active Network Measurement (PAM)*, March 2015. Acceptance rate: 27/100 (27%)
12. Lance Alt, **Robert Beverly**, and Alberto Dainotti. Uncovering Network Tar pits with Degreaser. In *Proceedings of the 30th Annual Computer Security Applications Conference (ACSAC)*, pages 156–165, 2014. Acceptance rate: 47/236 (19%)
13. Ryan Craven, **Robert Beverly**, and Mark Allman. A Middlebox-cooperative TCP for a Non End-to-end Internet. In *Proceedings of ACM SIGCOMM*, pages 151–162, August 2014. Acceptance rate: 45/237 (19%)
14. Guillermo Baltra, **Robert Beverly**, and Geoffrey G. Xie. Ingress Point Spreading: A New Primitive for Adaptive Active Network Mapping. In *Proceedings of the 15th Conference on Passive and Active Network Measurement (PAM)*, volume 8362, pages 56–66, March 2014. Acceptance rate: 24/76 (32%)
15. Matthew Luckie, **Robert Beverly**, William Brinkmeyer, and kc claffy. Speedtrap: Internet-Scale IPv6 Alias Resolution. In *Proceedings of the ACM SIGCOMM Internet Measurement Conference (IMC)*, pages 119–126, 2013. Acceptance rate: 42/178 (24%)
16. Arthur Berger, Nicholas Weaver, **Robert Beverly**, and Larry Campbell. Internet Nameserver IPv4 and IPv6 Address Relationships. In *Proceedings of the ACM SIGCOMM Internet Measurement Conference (IMC)*, pages 91–104, 2013. Acceptance rate: 42/178 (24%)
17. Samuel Trassare, **Robert Beverly**, and David Alderson. A technique for network topology deception. In *Military Communications Conference (MILCOM)*, pages 1795–1800, November 2013
18. Jeremy Martin, Danny Rhame, **Robert Beverly**, and John McEachen. Correlating GSM and 802.11 Hardware Identifiers. In *Military Communications Conference (MILCOM)*, pages 1398–1403, November 2013
19. **Robert Beverly**, William Brinkmeyer, Matthew Luckie, and Justin P. Rohrer. IPv6 Alias Resolution via Induced Fragmentation. In *Proceedings of the 14th Conference on Passive and Active Network Measurement (PAM)*, volume 7799, pages 155–165, March 2013. Acceptance rate: 24/74 (32%)
20. **Robert Beverly** and Mark Allman. Findings and implications from data mining the IMC review process. *SIGCOMM Comput. Commun. Rev.*, 43(1):22–29, January 2013
21. Georgios Kakavelakis, **Robert Beverly**, and Joel Young. Auto-learning of SMTP TCP Transport-Layer Features for Spam and Abusive Message Detection. In *Proceedings of the 25th USENIX Large Installation Systems Administration Conference (LISA)*, December 2011. Acceptance rate: 29/62 (47%)
22. Steven Bauer, **Robert Beverly**, and Arthur Berger. Measuring the state of ECN readiness in servers, clients, and routers. In *Proceedings of the ACM SIGCOMM Internet measurement conference (IMC)*, pages 171–180, 2011. Acceptance rate: 42/220 (19%)

23. Scott Huchton, Geoffrey G. Xie, and **Robert Beverly**. Building and evaluating a k-resilient mobile distributed file system resistant to device compromise. In *Military Communications Conference (MILCOM)*, pages 1315–1320, November 2011
24. **Robert Beverly**, Simson Garfinkel, and Greg Cardwell. Forensic carving of network packets and associated data structures. *Digital Investigation*, 8(1):S78 – S89, 2011. DFRWS. Acceptance rate: 14/62 (23%)
25. Neil C Rowe, Simson L Garfinkel, **Robert Beverly**, and Panayotis Yannakogeorgos. Challenges in monitoring cyberarms compliance. *International Journal of Cyber Warfare and Terrorism (IJCWT)*, 1(2):35–48, 2011
26. Zachary N. J. Peterson, Mark Gondree, and **Robert Beverly**. A position paper on data sovereignty: The importance of geolocating data in the cloud. In *Proceedings of the 3rd USENIX workshop on Hot Topics in Cloud Computing*, June 2011. Acceptance rate: 23/72 (32%)
27. **Robert Beverly**, Arthur Berger, and Geoffrey G. Xie. Primitives for active Internet topology mapping: toward high-frequency characterization. In *Proceedings of the ACM 10th annual conference on Internet measurement (IMC)*, pages 165–171, 2010. Acceptance rate: 47/211 (22%)
28. Rob Jansen and **Robert Beverly**. Toward anonymity in Delay Tolerant Networks: Threshold Pivot Scheme. In *Military Communications Conference (MILCOM)*, pages 587–592, November 2010
29. **Robert Beverly**, Arthur Berger, Young Hyun, and kc claffy. Understanding the efficacy of deployed Internet source address validation filtering. In *Proceedings of the 9th ACM SIGCOMM conference on Internet measurement conference (IMC)*, pages 356–369, 2009. Acceptance rate: 41/183 (22%)
30. **Robert Beverly**. A human factors approach to spam filtering. In *Proceedings of the Sixth Conference on Email and Anti-Spam (CEAS)*, July 2009
31. **Robert Beverly** and Karen Sollins. An Internet protocol address clustering algorithm. In *Proceedings of the USENIX Third conference on Tackling computer systems problems with machine learning techniques, SysML'08*, pages 5–5, 2008
32. **Robert Beverly** and Karen Sollins. Exploiting transport-level characteristics of spam. In *Proceedings of the Fifth Conference on Email and Anti-Spam (CEAS)*, August 2008
33. **Robert Beverly**, Steven Bauer, and Arthur Berger. The Internet is not a big truck: toward quantifying network neutrality. In *Proceedings of the 8th Conference on Passive and Active Network Measurement (PAM)*, pages 135–144, 2007. Acceptance rate: 21/80 (26%)
34. **Robert Beverly** and Mike Afergan. Machine learning for efficient neighbor selection in unstructured p2p networks. In *Proceedings of the 2nd USENIX workshop on Tackling computer systems problems with machine learning techniques*, pages 1:1–1:6, 2007
35. **Robert Beverly**, Karen Sollins, and Arthur Berger. SVM learning of IP address structure for latency prediction. In *Proceedings of the 2006 SIGCOMM workshop on Mining network data, MineNet '06*, pages 299–304, 2006
36. Steven Bauer, Peyman Faratin, and **Robert Beverly**. Assessing the assumptions underlying mechanism design for the internet. In *Proceedings of ACM Economics of Networked Systems (NetEcon)*, June 2006
37. **Robert Beverly** and Steven Bauer. The spoofer project: inferring the extent of source address filtering on the internet. In *Proceedings of the USENIX Steps to Reducing Unwanted Traffic on the Internet Workshop (SRUTI)*, 2005. Acceptance rate: 13/35 (37%)
38. Mike Afergan and **Robert Beverly**. The state of the email address. *SIGCOMM Comput. Commun. Rev.*, 35:29–36, January 2005
39. **Robert Beverly**. A Robust Classifier for Passive TCP/IP Fingerprinting. In *Passive and Active Network Measurement (PAM)*, volume 3015 of *Lecture Notes in Computer Science*, pages 158–167. 2004. Acceptance rate: 30/174 (17%)

40. **Robert Beverly**. RTG: A Scalable SNMP Statistics Architecture for Service Providers. In *Proceedings of the 16th USENIX Large Installation Systems Administration Conference (LISA)*, pages 167–174, November 2002

#### OTHER PUBLICATIONS

1. Justin P. Rohrer, Blake LaFever, and **Robert Beverly**. Empirical Study of Router IPv6 Interface Address Distributions. *IEEE Internet Computing*, August 2016
2. **Robert Beverly** and Lance Alt. On the potential for mining unstructured public data to aid network intelligence. In *ACSAC (Poster)*, December 2014
3. **Robert Beverly**, Ryan Koga, and kc claffy. Initial longitudinal analysis of IP source spoofing capability on the Internet, July 2013. ISOC Whitepaper
4. Ryan Craven, Kristina Foster, and **Robert Beverly**. Adversarial TCP: An Offensive TCP Stack to Penalize Abusive Connectivity. In *USENIX LISA (Poster)*, December 2011
5. Le Nolan, **Robert Beverly**, and Joel Young. New approaches to characterizing scam-hosting connectivity. In *USENIX Security (Poster)*, August 2011
6. kc claffy, Emile Aben, Jordan Auge, **Robert Beverly**, Fabian Bustamante, Benoit Donnet, Timur Friedman, Marina Fomenkov, Peter Haga, Matthew Luckie, and Yuval Shavitt. The 2nd workshop on active Internet measurements (AIMS-2) report. *ACM SIGCOMM Comput. Commun. Rev.*, 40:53–58, 2010
7. kc claffy, Marina Fomenkov, Ethan Katz-Bassett, **Robert Beverly**, Beverly A. Cox, and Matthew Luckie. The workshop on active internet measurements (aims) report. *SIGCOMM Comput. Commun. Rev.*, 39:32–36, October 2009
8. **Robert Beverly** and Steven Bauer. Tracefilter: A tool for locating network source address validation filters. In *USENIX Security (Poster)*, August 2007
9. **Robert Beverly**. Robust clustering techniques in bioinformatics (18.417), December 2004. <http://ocw.mit.edu/courses/mathematics/18-417-introduction-to-computational-molecular-biology-fall-2004/projects/>
10. **Robert Beverly**. MS-SQL slammer/sapphire traffic analysis, January 2003. <http://rbeverly.net/research/slammer/>
11. R. Beverly and k. claffy. Wide-Area Multicast Traffic Characterization. In *IEEE Network*, Jan/Feb 2003.
12. R. Beverly, G. Miller, and K. Thompson. Multicast Performance Measurement on a High-Performance IP Backbone. In *Computer Communications.*, 24, pages 461-472, Mar. 2001.

#### PATENTS

1. “Unsolicited message communication characteristics,” US Patent 8,195,754. Jun 2012.
2. “Method for generating packet loss report by a data coordinator in a multicast data transmission,” US Patent 6,732,182. May 2000.

#### SERVICE

1. Program Committee Co-Chair: PAM 2018
2. Program Committee: ACM IMC 2018, ACM IMC 2017, ACM IMC 2015, PAM 2015-2016, DFRWS 2012-2017, ACM IMC 2010, IEEE NGNI 2010-2011, CEAS 2009.
3. General Chair: ACM SOSR 2016.
4. Forensics Challenge Chair: DFRWS 2016.
5. General Chair: ACM Hotnets 2010.
6. Program Review: NSF ACI/OAC, NSF CNS/NeTS/SaTC 2008-2018, GENI 2008-2009.

7. External Reviewer: IEEE ToIT 2016, IEEE Privacy and Security 2010-2012, IEEE ToN 2008-2015, ACM CCR 2008-2014, SECON 2009, ACM TISSEC 2008, USENIX SysML 2007, IEEE TDSC 2006, IEEE TPDS 2006, IEEE Sarnoff 2007, MIT CSW 2005-2006.

#### AWARDS

1. IETF Applied Networking Research Prize, 2019
2. ACM Best of CCR, 2017
3. John Jay Schieffelin Award for Teaching Excellence, 2017
4. ACM IMC Best Paper, 2015
5. John Jay Schieffelin Award for Teaching Excellence, Top 5%, 2015
6. PAM Best Paper Finalist, 2013
7. John Jay Schieffelin Award for Teaching Excellence, Top 5%, 2013
8. John Jay Schieffelin Award for Teaching Excellence, Top 5%, 2011
9. IEEE ComSoc Fred W. Ellersick Prize for Best Paper, 2011
10. DFRWS Best Paper, 2011
11. USENIX LISA Best Paper, 2002

#### FUNDING

1. Co-Principal Investigator, “A Distributed Platform for High-Speed Active Network Topology Discovery,” from Laboratory for Telecommunication Science (LTS), 2017-2018.
2. Co-Principal Investigator, “NeTS: User-Centric Network Measurement,” from National Science Foundation (NSF), 2013-2016. Co-PI: M. Allman (UC Berkeley/ICSI).
3. Principal Investigator, “Understanding the Resilience of Active Internet Measurements to Deception,” from Laboratory for Telecommunication Science (LTS), 2015-2016.
4. Principal Investigator, “High-Frequency Active Internet Topology Mapping,” from Department of Homeland Security (DHS), 2012-2015.
5. Principal Investigator, “SDCI Sec: Transport-Layer Abusive Traffic Detection and Mitigation,” from National Science Foundation (NSF), 2011-2014.
6. Co-Principal Investigator, “NeTS: Exploring the Evolution of IPv6: Topology, Performance, and Traffic,” from National Science Foundation (NSF), 2011-2014. Co-PI: K. Claffy (UC San Diego/CAIDA).
7. Principal Investigator, “TCP Countermeasures for the Misconfiguration Adversary,” from Space and Naval Warfare Systems Command (SPAWAR), 2013.
8. Principal Investigator, “Transport-Layer Abusive Traffic Detection and Mitigation,” from Cisco University Research Grant, 2011.