David R. Choffnes

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RESEARCH INTERESTS

Computer networking, distributed systems, mobile computing, Internet measurement, privacy, transparency, performance, reliability, and security.

EDUCATION

06/2010 **Doctor of Philosophy** in Computer Science
Northwestern University, Evanston, Illinois
Thesis: *Service-Level Network Event Detection from Edge Systems*
Advisor: Fabián E. Bustamante

12/2006 **Master of Science** in Computer Science
Northwestern University, Evanston, Illinois
Advisor: Fabián E. Bustamante

05/2002 **Bachelor of Arts** in Physics and French, awarded *magna cum laude*
Amherst College, Amherst, Massachusetts

PROFESSIONAL EXPERIENCE

09/2013 – Present **Assistant Professor**
College of Computer and Information Science, Northeastern University, Boston, Mass.

06/2010 – 08/2013 **Post-Doctoral Scholar (NSF/CRA Computing Innovations Fellow)**
University of Washington, Department of CSE, Seattle, Washington
Mentors: Tom Anderson and Arvind Krishnamurthy

06/2009 – 09/2009 **Research Intern**
AT&T Labs – Research, Florham Park, New Jersey

06/2007 – 09/2007 **Research Intern**
IBM T. J. Watson Research Lab, Hawthorne, New York

08/2004 – 06/2010 **Research Assistant and Teaching Assistant**
Computer Science Department, Northwestern University, Evanston, Illinois

08/2002 – 07/2004 **Editor and author**
Deitel & Associates, Maynard, Massachusetts

ADVISING

Ph.D. Students

08/2014 – 2017 Arash Molavi Kakhki (co-advised with Alan Mislove), now works at ThousandEyes
08/2014 – Present Jingjing Ren (Northeastern)
08/2015 – Present Fangfan Li (Northeastern)
08/2017 – Present Hira Javaid (Northeastern)

Ph.D. Committees

Fall 2018 Jingjing Ren (Northeastern, main advisor)
Fall 2017 Jaijin Cao (Northeastern, committee member)
Spring 2017 Arash Molavi Kakhki (Northeastern, main advisor)
Fall 2016 Yabing Liu (Northeastern, committee member), currently at Twitter

Fall 2016 Liang Zhang (Northeastern, committee member), currently at Google
Spring 2015 Aldo Cassola (Northeastern, committee member), currently Professor at Universidad San Francisco de Quito (Ecuador)

M.S. Committees

Spring 2015 Pan Qin (Northeastern)

Bachelors

Spring 2014 George Honkai Sun (Northeastern visiting student), now PhD student at Brown University

Interns and Co-ops

01/2017 – 07/2017 Kirill Voloshin (Northeastern University, co-op)
01/2017 – 07/2017 Tariq Sachleben (Northeastern University, co-op)
01/2016 – 07/2016 Christophe Leung (Northeastern University, co-op)
06/2012 – 09/2012 Nick Martindell (University of Washington), now at Google
06/2012 – 09/2012 Shen Wang (University of Washington), now at Amazon
06/2012 – 09/2012 Adrian Sham (University of Washington), now at Amazon
06/2011 – 09/2011 Amy Tang (UC Berkeley), now at Facebook
06/2010 – 06/2011 Colin Scott (University of Washington), now at MSR India
06/2010 – 06/2011 Mary Pimenova (University of Washington), now at Facebook
06/2010 – 09/2010 Justine Sherry (University of Washington), now Assistant Professor at CMU

TEACHING

S14–S15,S16–S17 CS 4700/CS 5700, Fundamentals of Computer Networks
F15 CS 7780, Special Topics in Networks (Distributed Systems)

TEXTBOOKS

[1] Harvey Deitel, Paul Deitel, David Choffnes, and Chriti Kelsey. *Simply C++ : An Application-Driven Tutorial Approach*. Prentice Hall, 2005.

[2] Harvey Deitel, Paul Deitel, and David Choffnes. *Operating Systems*. Prentice Hall, Third edition, 2004.

REFEREED JOURNAL PUBLICATIONS

[1] Jing'an Xue, David Choffnes, and Jilong Wang. CDNs meet CN: An empirical study of CDN deployments in China. In *IEEE Access*, volume 5, December 2017.

[2] Ashwin Rao, Arash Molavi Kakhki, Abbas Razaghpanah, Anke Li, David Choffnes, Arnaud Legout, Alan Mislove, and Phillipa Gill. Meddle: Enabling transparency and control for mobile internet traffic. *Journal of Technology Science (JoTS)*, October 2015.

[3] Arnau Gavalda, David Choffnes, John Otto, Mario Sanchez, Fabian Bustamante, Luis A. N. Amaral, Jordi Duch, and Roger Guimera. Impact of heterogeneity and socio-economic factors on massive decentralized sharing ecosystems. *Proceedings of the National Academy of Sciences (PNAS)*, October 2014.

[4] Mario A. Sánchez, John S. Otto, Zachary S. Bischof, David R. Choffnes, Fabian E. Bustamante, Balachander Krishnamurthy, and Walter Willinger. A measurement experimentation platform at the internet's edge. *IEEE/ACM Trans. Netw.*, 23(6):1944–1958, 2015.

[5] Kai Chen, David R. Choffnes, Rahul Potharaju, Yan Chen, Fabian E. Bustamante, Dan Pei, and Yao Zhao. Where the sidewalk ends: Extending the internet AS graph using traceroutes from P2P users. *IEEE Trans. Computers*, 63(4):1021–1036, 2014.

[6] Ao-Jan Su, David R. Choffnes, Aleksandar Kuzmanovic, and Fabián E. Bustamante. Drafting behind akamai: inferring network conditions based on CDN redirections. *IEEE/ACM Trans. Netw.*, 17(6):1752–1765, 2009.

[7] David R. Choffnes, Mark Astley, and Michael J. Ward. Migration policies for multi-core fair-share scheduling. *Operating Systems Review*, 42(1):92–93, 2008.

REFEREED CONFERENCE PUBLICATIONS

[1] John P. Rula, Fabian E. Bustamante, James Newman, Arash Molavi Khaki, and David Choffnes. Mile high WiFi: A first look at in-flight Internet connectivity. In *Proc. of WWW*, 2018.

[2] Jingjing Ren, Martina Lindorfer, Daniel Dubois, Ashwin Rao, David R. Choffnes, and Narseo Vallina-Rodriguez. Bug fixes, improvements, ... and privacy leaks - a longitudinal study of PII leaks across Android app versions. In *Proc. of NDSS*, 2018.

[3] Jingjing Ren, Martina Lindorfer, Daniel Dubois, Ashwin Rao, David R. Choffnes, and Narseo Vallina-Rodriguez. Samuel jero and endadul hoque and david choffnes and alan mislove and cristina nita-rotaru. In *Proc. of NDSS*, 2018.

[4] Arash Molavi Kakhki, Samuel Jero, David Choffnes, Alan Mislove, and Cristina Nita-Rotaru. Taking a long look at QUIC: An approach for rigorous evaluation of rapidly evolving transport protocols. In *Proc. of IMC*, 2017.

[5] Fangfan Li, Abbas Razaghpanah, Arash Molavi Kakhki, Arian Akhavan Niaki, David Choffnes, Phillipa Gill, and Alan Mislove. lib·erate, (n): A library for exposing (traffic-classification) rules and avoiding them efficiently. In *Proc. of IMC*, 2017.

[6] Taejoong Chung, Roland Rijswijk-Deij, David Choffnes, Alan Mislove, Christo Wilson, Dave Levin, and Bruce M. Maggs. Understanding the role of registrars in DNSSEC deployment. In *Proc. of IMC*, 2017.

[7] Brian Goodchild, Yi-Ching Chiu, Haonan Lu, Rob Hansen, Matt Calder, David Choffnes, Wyatt Lloyd, Matthew Luckie, and Ethan Katz-Bassett. The record route option is an option! In *Proc. of IMC*, 2017.

[8] Taejoong Chung, Roland van Rijswijk-Deij, Balakrishnan Chandrasekaran, David Choffnes, Dave Levin, Bruce M. Maggs, Alan Mislove, and Christo Wilson. A longitudinal, end-to-end view of the DNSSEC ecosystem. In *Proc. of USENIX Security*, 2017.

[9] James Larisch, David Choffnes, Dave Levin, Bruce M. Maggs, Alan Mislove, and Christo Wilson. MegaCRL: a scalable system for pushing all TLS revocations to browsers. In *Proc. of IEEE S&P*, 2017.

[10] Stevens Le Blond, Cédric Gilbert, Utkarsh Upadhyay, Manuel Gomez Rodriguez, and David Choffnes. A broad view of the ecosystem of socially engineered exploit documents. In *Proc. of NDSS*, 2017.

[11] Fangfan Li, Arash Molavi Kakhki, David Choffnes, Phillipa Gill, and Alan Mislove. Classifiers unclassified: An efficient approach to revealing ip-traffic classification rules. In *Proc. of IMC*, 2016.

[12] Christophe Leung, Jingjing Ren, David Choffnes, and Christo Wilson. Should you use the app for that? comparing the privacy implications of web- and app-based online services. In *Proc. of IMC*, 2016.

[13] Taejoong Chung, David Choffnes, and Alan Mislove. Tunneling for transparency: A large-scale analysis of end-to-end violations in the internet. In *Proc. of IMC*, 2016.

[14] Rijurekha Sen, Hasnain Ali Pirzada, Amreesh Phokeer, Zaid Ahmed Farooq, Satadal Sengupta, David Choffnes, and Krishna P. Gummadi. Inspecting the free bridge across the digital divide: Assessing the quality of facebook's free basics service. In *Proc. of IMC*, 2016.

[15] Taejoong Chung, Yabing Liu, David Choffnes, Dave Levin, Bruce Maggs, Alan Mislove, and Christo Wilson. Measuring and applying invalid ssl certificates: The silent majority. In *Proc. of IMC*, 2016.

[16] Frank Cangialosi, Taejoong Chung, David Choffnes, Dave Levin, Bruce M. Maggs, Alan Mislove, and Christo Wilson. Measurement and analysis of private key sharing in the ssl ecosystem. In *Proc. of CCS*, 2016.

[17] Jingjing Ren, Ashwin Rao, Martina Lindorfer, Arnaud Legout, and David R. Choffnes. ReCon: Revealing and controlling privacy leaks in mobile network traffic. In *Proc. of ACM MobiSys*, 2016.

[18] Arash Molavi Kakhki, Abbas Razaghpanah, Anke Li, Hyungjoon Koo, Rajesh Golani, David R. Choffnes, Phillipa Gill, and Alan Mislove. Identifying traffic differentiation in mobile networks. In *Proc. of IMC*, pages 239–251, 2015.

[19] Yabing Liu, Will Tome, Liang Zhang, David R. Choffnes, Dave Levin, Bruce M. Maggs, Alan Mislove, Aaron Schulman, and Christo Wilson. An end-to-end measurement of certificate revocation in the web's PKI. In *Proc. of IMC*, pages 183–196, 2015.

[20] Ruwaifa Anwar, Haseeb Niaz, David R. Choffnes, Ítalo S. Cunha, Phillipa Gill, and Ethan Katz-Bassett. Investigating interdomain routing policies in the wild. In *Proc. of IMC*, pages 71–77, 2015.

[21] Stevens Le Blond, David R. Choffnes, William Caldwell, Peter Druschel, and Nicholas Merritt. Herd: A scalable, traffic analysis resistant anonymity network for voip systems. In *Proc. of ACM SIGCOMM*, pages 639–652, 2015.

[22] Ashkan Nikravesh, Hongyi Yao, Shichang Xu, David R. Choffnes, and Zhuoqing Morley Mao. Mobilyzer: An open platform for controllable mobile network measurements. In *Proc. of ACM MobiSys*, pages 389–404, 2015.

[23] Xing Xu, Yurong Jiang, Tobias Flach, Ethan Katz-Bassett, David R. Choffnes, and Ramesh Govindan. Investigating transparent web proxies in cellular networks. In *Passive and Active Measurement (PAM) Conference*, pages 262–276, 2015.

[24] Liang Zhang, David R. Choffnes, Dave Levin, Tudor Dumitras, Alan Mislove, Aaron Schulman, and Christo Wilson. Analysis of SSL certificate reissues and revocations in the wake of heartbleed. In *Proc. of IMC*, pages 489–502, 2014.

[25] Kyriakos Zarifis, Tobias Flach, Srikanth Nori, David R. Choffnes, Ramesh Govindan, Ethan Katz-Bassett, Zhuoqing Morley Mao, and Matt Welsh. Diagnosing path inflation of mobile client traffic. In *Passive and Active Measurement (PAM) Conference*, pages 23–33, 2014.

[26] Ashkan Nikravesh, David R. Choffnes, Ethan Katz-Bassett, Zhuoqing Morley Mao, and Matt Welsh. Mobile network performance from user devices: A longitudinal, multidimensional analysis. In *Passive and Active Measurement (PAM) Conference*, pages 12–22, 2014.

[27] Umar Javed, Ítalo Cunha, David R. Choffnes, Ethan Katz-Bassett, Thomas E. Anderson, and Arvind Krishnamurthy. Poiroot: investigating the root cause of interdomain path changes. In *Proc. of ACM SIGCOMM*, pages 183–194, 2013.

[28] Stevens Le Blond, David R. Choffnes, Wenxuan Zhou, Peter Druschel, Hitesh Ballani, and Paul Francis. Towards efficient traffic-analysis resistant anonymity networks. In *Proc. of ACM SIGCOMM*, pages 303–314, 2013.

[29] Mario A. Sánchez, John S. Otto, Zachary S. Bischof, David R. Choffnes, Fabián E. Bustamante, Balachander Krishnamurthy, and Walter Willinger. Dasu: Pushing experiments to the internet's edge. In *definition*, pages 487–499, 2013.

[30] Ethan Katz-Bassett, Colin Scott, David R. Choffnes, Ítalo Cunha, Vytautas Valancius, Nick Feamster, Harsha V. Madhyastha, Thomas E. Anderson, and Arvind Krishnamurthy. LIFEGUARD: practical repair of persistent route failures. In *Proc. of ACM SIGCOMM*, pages 395–406, 2012.

[31] John S. Otto, Mario A. Sánchez, David R. Choffnes, Fabián E. Bustamante, and Georgos Siganos. On blind mice and the elephant: understanding the network impact of a large distributed system. In *Proc. of ACM SIGCOMM*, pages 110–121, 2011.

[32] David R. Choffnes, Fabián E. Bustamante, and Zihui Ge. Crowdsourcing service-level network event monitoring. In *Proc. of ACM SIGCOMM*, pages 387–398, 2010.

[33] Kai Chen, David R. Choffnes, Rahul Potharaju, Yan Chen, Fabian E. Bustamante, Dan Pei, and Yao Zhao. Where the sidewalk ends: extending the internet as graph using traceroutes from P2P users. In *Proc. of ACM CoNEXT*, pages 217–228, 2009.

[34] David R. Choffnes and Fabian E. Bustamante. On the effectiveness of measurement reuse for performance-based detouring. In *Proc. of IEEE INFOCOM*, pages 693–701, 2009.

[35] David R. Choffnes and Fabián E. Bustamante. Taming the torrent: a practical approach to reducing cross-isp traffic in peer-to-peer systems. In *Proc. of ACM SIGCOMM*, pages 363–374, 2008.

[36] Ao-Jan Su, David R. Choffnes, Fabián E. Bustamante, and Aleksandar Kuzmanovic. Relative network positioning via CDN redirections. In *Proc. of ICDCS*, pages 377–386, 2008.

[37] Ao-Jan Su, David R. Choffnes, Aleksandar Kuzmanovic, and Fabián E. Bustamante. Drafting behind akamai (travelocity-based detouring). In *Proc. of ACM SIGCOMM*, pages 435–446, 2006.

REFEREED WORKSHOP AND OTHER SHORT PUBLICATIONS

[1] David Choffnes. A case for personal virtual networks. In *Proc. of HotNets*, 2016.

[2] Fan Zhou, Kaushik Chowdhury, and David Choffnes. Janus: Network and application-aware multi-TCP optimization engine. In *INFOCOM Poster Session*, 2016.

[3] Arash Molavi Kakhki, Fangfan Li David R. Choffnes, Alan Mislove, and Ethan Katz-Bassett. Bingeon under the microscope: Understanding T-Mobile's zero-rating implementation. In *SIGCOMM Internet-QoE Workshop*, 2016.

[4] John P. Rula, Fabian E. Bustamante, and David R. Choffnes. When IPs fly: A case for redefining airline communication. In *Proc. of HotMobile*, pages 9–14, 2016.

[5] Ashwin Rao, Justine Sherry, Arnaud Legout, Walid Dabbout, Arvind Krishnamurthy, and David Choffnes. Meddle: Middleboxes for increased transparency and control of mobile traffic. In *Proc. of CoNEXT 2012 Student Workshop*, 2012.

[6] Ethan Katz-Bassett, David R. Choffnes, Ítalo Cunha, Colin Scott, Thomas E. Anderson, and Arvind Krishnamurthy. Machiavellian routing: improving internet availability with BGP poisoning. In *Proc. of HotNets*, page 11, 2011.

[7] Xiao Sophia Wang, David Choffnes, Patrick Gage Kelley, Ben Greenstein, and David Wetherall. Measuring and predicting web login safety. In *Proc. of ACM SIGCOMM Workshop on Measurements Up the STack (W-MUST)*, 2011.

[8] Zachary S. Bischof, John S. Otto, Mario A. Sanchez, John P. Rula, David R. Choffnes, and Fabián E. Bustamante. Crowdsourcing isp characterization to the network edge. In *Proc. of ACM SIGCOMM Workshop on Measurements Up the STack (W-MUST)*, 2011.

[9] David Wetherall, David R. Choffnes, Ben Greenstein, Seungyeop Han, Peter Hornyack, Jaeyeon Jung, Stuart E. Schechter, and Xiao Sophia Wang. Privacy revelations for web and mobile apps. In *Proc. of HotOS*, 2011.

[10] David R. Choffnes and Fabian E. Bustamante. Pitfalls for testbed evaluations of internet systems. *Computer Communication Review*, 40(2):43–50, 2010.

[11] David R. Choffnes, Jordi Duch, R. Dean Malmgren, Roger Guimerà, Fabián E. Bustamante, and Luis A. Nunes Amaral. Strange bedfellows: community identification in bittorrent. In *Proc. of IPTPS*, page 13, 2010.

[12] David R. Choffnes, Mario A. Sánchez, and Fabian E. Bustamante. Network positioning from the edge - an empirical study of the effectiveness of network positioning in P2P systems. In *Proc. of IEEE INFOCOM*, pages 291–295, 2010.

[13] David Choffnes and Fabián E. Bustamante. Exploiting emergent behavior for inter-vehicle communication. In *Proc. of Hot Topics in Autonomic Computing (HotAC)*, June 2007.

[14] David R. Choffnes and Fabián E. Bustamante. An integrated mobility and traffic model for vehicular wireless networks. In *Proc. Workshop on Vehicular Ad Hoc Networks (VANET)*, pages 69–78, 2005.

INVITED TALKS

Empirical Evaluation of Deployed DPI Middleboxes and Their Implications for Policymakers

2018 Massachusetts State Senate Special Committee on Net Neutrality and Consumer Protection

2017 Federal Communication Commission

Exposing and Evading Middlebox Policies

2017 AIMS Workshop, CAIDA/UCSD

ReCon: Improving Transparency and Control for Privacy Leaks from Mobile Devices

2017 BITAG, Federal Trade Commission PrivacyCon, Dagstuhl Seminar on Web Transparency and Online Privacy, University of Toronto, Wellesley College, Amherst College

2016 Harvard University, Mozilla Privacy Lab, Concordia University

2015 Data Transparency Lab Conference (MIT)

Using the Middle to Meddle with Mobile

2016 Tufts University

2015 Harvard University, Worcester Polytechnic Institute, HUJI Networking Summer

Reverse Traceroute: Update on Public Availability

2016 AIMS Workshop, CAIDA/UCSD

Herd: A Scalable, Traffic Analysis Resistant Anonymity Network for VoIP Systems

2015 Israeli Networking Day (Haifa, IL)

Can you ping me now? Understanding Mobile Performance

2013 Dagstuhl Seminar on Critical Internet Infrastructure

Improving Transparency and Control in Mobile Networks

2013 IIT Bombay, MSR (Redmond and Beijing), Northeastern University, Tsinghusa University, Peking University

Improving Internet Reliabilty and Performance

2013 UC Riverside, UBC, UC Irvine, Waterloo, University of Toronto, University College London, MPI-SWS, Northeastern University, UCLA

Internet Path Diagnosis and Repair

2012 MPI-SWS, Telefonica Research

LIFEGUARD: Practical Repair of Persistent Route Failures

2011 UW Affiliates Day, CAIDA

Crowdsouring Network Event Detection

2010 Boston University, Georgetown University, AT&T Labs– Research, University of Washington, Microsoft Research

Using the Crowd to Monitor the Cloud

2009 McGill University, Harvard University

Designing Distributed Systems to Ensure Sustainable Yield in the Internet

2008 Amherst College

INVITED WORKSHOPS AND PANELS

2018 *Witness providing testimony for the Massachusetts State Senate Special Committee on Net Neutrality and Consumer Protection*

2017 *Moderator for panel at Data Transparency Lab Conference*

2017 *Dagstuhl Seminar on Online Privacy and Web Transparency*

2017 *FTC PrivacyCon*

2015 *Proposal Review Panel*, NSF

2014–2016 *Data Transparency Lab Conference*, speaker

2015 *NSF/FCC Quality of Experience Workshop*, participant

2015 *NSF/CRA Workshop on Extensible Distributed Systems*, participant

2014 *Data Transparency Lab kickoff event*, participant

2014 *NSF Workshop on Mobile Community Measurement Infrastructure*, co-chair

2013 *Dagstuhl Seminar on Critical Internet Infrastructure*

POSTERS

2016 *Janus: Network and Application-aware Multi-TCP Optimization Engine*, INFOCOM 2016

2015 *Mobilyzer: Mobile Network Measurement Made Easy*, MobiSys'15

2015 *Context-Triggered Mobile Network Measurement*, MobiSys'15 (awarded best demo)

2014 *Identifying traffic differentiation by mobile providers*, SIGCOMM'14 (runner-up for best poster)

2014 *Identifying traffic differentiation by mobile providers*, AIMS'14

OTHER PRODUCTS

2017 Director of Technology for the *Harvest* documentary film, which appeared at the Aspen Film Festival, Toronto HotDocs Film Festival, Seattle International Film Festival, BAM Cinemafest, and Rooftop Films Summer Series. The film focuses on information gathered from my ReCon project.

HONORS AND AWARDS

2018 QUIC paper (IMC 2017) selected for the IRTF's Applied Networking Research Prize

2017 IEEE Cybersecurity Award for Innovation

2017 USENIX Security Distinguished Paper Award

2010-2012 NSF/CRA Computing Innovations Fellowship

2010 EECS Outstanding Dissertation Award, Northwestern University

2008-2009 Terminal Year Cabell Fellowship, Northwestern University

2005 Honorable Mention, NSF Graduate Research Fellowship

2004 Cabell Fellowship, Northwestern University

2002 *Magna cum laude*, Amherst College

SERVICE TO THE DISCIPLINE/PROFESSION

Associate Editor

2015–2017 SIGCOMM Computing Communications Review

General Chair

2018 Internet Measurement Workshop

Organization Committee

2017 CoNEXT: Travel Grant Co-Chair

2016 IMC: Works-In-Progress Chair

2016 CoNEXT: Workshop Co-Chair

Program Committee Co-Chair

2016–2018 Internet-QoE Workshop (co-located with SIGCOMM (2016-2017), ICDCS (2018))
2016 MobiData Workshop (co-located with MobiSys)
2015 All Things Cellular (co-located with SIGCOMM)

Program Committee Member

2018 Network and Distributed System Security Symposium (NDSS)
2014, 2016, 2017 ACM Internet Measurement Conference (IMC)
2017 ACM Special Interest Group on Data Communication (SIGCOMM)
2014, 2017 International Conference on Mobile Systems, Applications, and Services (MobiSys) [External PC for 2017]
2014–2017 ACM Conference on Emerging Networking Experiments and Technologies (CoNEXT)
2017 USENIX Network Systems Design & Implementation (NSDI)
2016–2017 Data Transparency Lab (DTL) Grant Program
2015, 2016 International Workshop on Traffic Monitoring and Analysis (TMA)
2015 ACM/IEEE Symposium on Architectures for Networking and Communications Systems (ANCS)
2012, 2013 Passive and Active Measurement Conference (PAM)

Poster Committee Chair

2014 Conference of the ACM Special Interest Group on Data Communication (SIGCOMM)

Workshop Committee Member

2013 Conference on Emerging Networking Experiments and Technologies (CoNEXT) Student Workshop
2011 SIGCOMM Workshop on Measurements "Up the Stack" (W-MUST)
2011 ACM MM '11 "Media transport and sharing"

Poster/Demo Committee Member

2013 Conference of the ACM Special Interest Group on Data Communication (SIGCOMM)

FUNDING

Data Transparency Lab

2015, 2018 DTL Grantee, *ReCon: Improving Transparency and Control of PII in Mobile Network Traffic.* Unrestricted gift. Primary Investigator, joint with Alan Mislove and Christo Wilson. $55K initially, $20K followup in 2018.

Comcast Innovation Fund

2017 *Revealing and Controlling Privacy Leaks in Network Traffic.* Unrestricted gift. $70K.

ARCEP

2017 *Partnership for auditing net neutrality violations.* Contract. $29K.

Department of Homeland Security Science & Technology

2017–2020 *Revealing and Controlling Privacy Leaks in Network Traffic.* Sole PI. $650K.

Google

2017 Google Research Award, *Monitoring and diagnosis of Internet QoE.* Unrestricted gift. Joint with Renata Teixeira (Inria). $62K (31K to NEU).
2015 Google Research Award, *Identifying Traffic Differentiation in Mobile Networks.* Unrestricted gift. $56K.

National Science Foundation

09/2018 – 08/2023 CNS-1750253, *CAREER: Personal Virtual Networks.* Sole PI. $513K.
10/2016 – 09/2019 CNS-1617728, *NeTS: Small: A Principled Approach to Enabling Policy Transparency for Mobile Networks.* co-PI, with Alan Mislove (Northeastern). $299K.
09/2016 – 08/2019 SaTC-1618955, *TWC: Small: Enabling Practical Traffic Analysis Resistance for Anonymous Communication Systems.* Sole PI. $499K.

07/2016 – 06/2020 SaTC-1564143, *TWC: Medium: Collaborative Research: Measuring and Improving the Management of Today's PKI.* co-Primary Investigator, joint with Alan Mislove, Chirsto Wilson (Northeastern), Dave Levin, and Tudor Dumitras (UMD). $1.2M (total), $600K (Northeastern).

01/2015 – 01/2017 CNS-1405871: *CI-New: Collaborative Research: An Open Platform for Internet Routing Experimentation.* Primary Investigator, joint with Ethan Katz-Bassett (USC) and Nick Feamster (Princeton).$1M (total), $360K (Northeastern)

09/2013 – 09/2016 CNS-1318396, *NeTS: Small: Automated Diagnosis and Root Cause Analysis of Internet Problems.* Co-Primary Investigator, joint with Arvind Krishnamurthy (University of Washington). $499K (total), $131K (Northeastern)

Raytheon

2014 Raytheon Coporation, *Large-Scale Attacks in Multi-Level Interdependent Networks: Emerging Threats, Mitigation, and Recovery.* Grant/contract. $100K shared with Guevara Noubir, Alan Mislove, Edmund Yeh, Ravi Sundaram.

Verizon

2017 *Cellular video performance measurements.* Grant/contract. $55K shared with Alan Mislove.

Amazon.com

2014 Amazon Web Services in Education Research Grants (3). $25K (in total).

SOFTWARE ARTIFACTS

Meddle Platform for providing users with transparency and control over the network traffic generated by their mobile devices.
Today's mobile systems are closed, locked-down systems that provide users and researchers with little visibility into how devices and apps use the mobile network, and almost no control over the network traffic they generate. Meddle seeks to address this by using VPNs to tunnel all mobile network traffic to a server where we can use software middlebox techniques to filter, modify and/or block it. This allows users to regain control over network traffic and provides researchers visibility into performance, privacy and reliability issues in mobile networks. See also, Differentiation Detector and ReCon.
`http://www.meddle.mobi`
`http://dd.meddle.mobi`
`https://recon.meddle.mobi`

ReCon
Revealing and controlling privacy leaks from mobile and IoT devices.
The mobile and IoT devices that surround our everyday lives enable great new technologies, but also come a great risks to our online privacy and security. In this project, we use machine learning and network traffic analysis to reliably infer when a user's personally identifiable information is exposed to other parties on the Internet. We further allow users to customize how such information is shared (or blocked) in the future. `https://recon.meddle.mobi` `https://moniotrlab.ccs.neu.edu`

Differentiation Detector (now called Wehe)
Identifying net neutrality violations and empowering average users to audit their providers. Differentiation is the practice of giving different Internet service to different applications. For example, an ISP may give worse performance to YouTube (leading to rebuffering and lower quality video), but allow Netflix to stream video at full resolution without rebuffering events. This is generally considered a violation of network neutrality. We developed techniques to reliably identify when an ISP selectively gives different performance for different apps, and embedded this technology in iOS and Android apps that have seen more than 100,000 downloads. We are making our data available to consumers, regulators, and any other interested parties. In

addition, we have developed strategies to evade such differentiation and continue to undertake research to more comprehensively avoid network interference. http://dd.meddle.mobi

Mobilyzer System for measuring Internet performance from mobile devices.
Mobilyzer is an open source library for measuring network performance on mobile platforms. You can measure your network's throughput and latency, as well as other useful network metrics. Mobilyzer also supports background measurements, server-scheduled measurements, and push-based measurements. The data is collected either anonymously or from your selected account, which allows you to see your own data. The user credentials collected are not shared outside of this site, and any data used in research projects in universities are anonymized before use.
http://www.mobilyzer-project.mobi/

Herd Practical, anonymous voice over IP (VOIP).
In the face of strong adversaries with widespread surveillance, existing privacy tools fail to provide the required anonymity or performance for interactive communication (e.g., VoIP). In this work, we are building a VoIP system that resists traffic analysis under a strong adversarial model, without sacrificing performance. We will be releasing the tool, along with source code, shortly.
https://anonymity.ccs.neu.edu/

SSL/PKI Security Understanding the security of the currently deployed public key infrastructure.
Central to the secure operation of a public key infrastructure (PKI) is the ability to revoke certificates. While much of users' security rests on this process taking place quickly, in practice, revocation typically requires a human to decide to reissue a new certificate and revoke the old one. Thus, having a proper understanding of how often systems administrators reissue and revoke certificates is crucial to understanding the integrity of a PKI. We are currently investigating how certificates are revoked, how these revocations are enforced by client software (browsers), what are the security implications of existing practices, and how we can improve the state of the art.
https://www.sslresearch.org/

Piigeon Extension for Firefox that reveals Web login safety before you submit your password.
Piigeon is a Firefox extension that records whether websites protect your username and password when you sign in. For most sites, the cursor will change, telling you whether your login is encrypted or if it could instead be intercepted. Over time a report of your password safety is created. Created by Xiao (Sophia) Wang.
http://piigeon.org/

Dasu An extension to the popular Vuze/Azureus BitTorrent client. Dasu is a dual-objective system providing ISP characterization (including the detection of network interference) and supporting Internet measurement experimentation.
Over 100,100 users as of December 2014.
http://www.aqualab.cs.northwestern.edu/projects/Dasu.html

SwarmScreen An extension to the popular Vuze/Azureus BitTorrent client to make it difficult to classify users' downloading behavior by looking at his/her connection patterns.
http://www.aqualab.cs.northwestern.edu/projects/SwarmScreen.html

NEWS A system for Network Early Warning System built by taking advantage of the natural P2P traffic. NEWS is implemented as plugin/extension for the BitTorrent Azureus client.
Over 56,000 users as of December 2014.
http://www.aqualab.cs.northwestern.edu/projects/NEWS.html

SideStep/DraFTP The SideStep service reuses CDN information to locate quality overlay paths in the Internet with minimum overhead. We also implemented DraFTP, and open-source FTP suite that uses SideStep to improve download performance.
http://www.aqualab.cs.northwestern.edu/projects/SideStep.html

Ono A plugin/extension for the Azureus client that implements our proposed CDN-based positioning for peer selection in the popular BitTorrent system.
Over 1,480,000 users as of December 2014.
`http://www.aqualab.cs.northwestern.edu/projects/Ono.html`

STRAW An integrated mobility and traffic model for Vehicular Ad-Hoc Networks (VANETs); STRAW is written for the JiST/SWANS discrete-event simulator.
`http://www.aqualab.cs.northwestern.edu/projects/STRAW.html`

SWANS++ An extension to the Jist/SWANS Discrete-event Simulator, including new/re-implementation of well-known protocols, mobility models and a steering/visualization tool.
`http://aqualab.cs.northwestern.edu/projects/swansplus2.html`

Ceratias Real-time visualization tool for the JiST/SWANS simulation platform. Also enables interaction with and online modification of the ongoing simulation, and can be detached/re-attached dynamically for performance.
`http://sourceforge.net/projects/straw/`

SELECTED PRESS COVERAGE

11/2017 Article about my teams net neutrality research appeared on the PBS Newshour website, CBS News website, among others. I was also interviewed by The Takeaway (NY Times / PRI production) on a segment that aired nationally on November 21st.

10/2017 Article about ReCon appeared in Northeastern Magazine.

9/2017 Article about my team's net neutrality research appeared in The Conversation, San Francisco Chronicle, the Daily Caller, among others.

8/2017 Article about our DHS-funded ReCon project on IAPP.

7/2017 Article featuring ReCon, *What Happens When You Tell the Internet You're Pregnant*, appeared in Jezebel.

6/2017 I was interviewed about ReCon and privacy leaks from an MBTA app for an NBC News Boston television story.

5/2017 ReCon was featured in an article that appeared in Fast Company.

3/2017 ReCon was mentioned in the Danish news site Version2.

2/2017 Our ReCon project was mentioned in a Boston Globe article about mobile privacy.

6/2016 Our work revealing potential net neutrality violations from T-Mobile's Binge On service was covered by BostonInno, Consumer Affairs, TechDirt, Fierce Wireless, and others.

11/2015 The ReCon project, which reveals and controls how personal information is leaked from mobile devices, was covered by the Boston Globe, Northeastern News, Christian Science Monitor, New Scientist, Science Codex, NBC News, MSN News, El Mundo, Le Matin, among others.

10/28/2015 Our work on understanding the poor state of support for certificate revocation in the Web's PKI covered by UMD.

10/6/2014 Work on understanding BitTorrent communication patterns (with NWU, Rovira i Virgili University and others) was mentioned in Science Magazine.

10/25/2013 Work on privacy (with Stevens Le Blond of MPI) was mentioned in the MIT Technology Review.

4/9/2009 Slashdot: Privacy In BitTorrent By Hiding In the Crowd.

11/25/2008 Slashdot article: "News for Nerds" on NEWS.

11/24/2008 Chronicle of Higher Education: Researchers Create 'Neighborhood Watch' System to Detect Network Problems.

5/6/2008 Ars Technica article on Ono.

5/4/2008 Slashdot article on Ono.