

RESEARCH INTERESTS

I study complex **networked systems** to identify and remedy inefficiencies in their cost and performance, enabling today's networks to support next-generation services. Towards this goal, I **build tools to measure** the behavior of networked systems and develop **algorithmic and systems solutions** to fix inefficiencies demonstrated by the empirical evidence. My research is grounded in the **practical reality of operating large-scale networks**.

EDUCATION

2016 — 2021	University of Massachusetts, Amherst <i>Advisor: Prof. Phillipa Gill</i>	<i>Ph.D. in Computer Science</i>
2016 — 2019	University of Massachusetts, Amherst	<i>M.S. in Computer Science</i>
2015 — 2016	Stony Brook University	<i>Ph.D. in Computer Science (transferred)</i>
2008 — 2012	Birla Institute of Technology and Science – Pilani	<i>B.E. (Hons.) in Computer Science</i>

AWARDS AND RECOGNITION

2021	Outstanding Doctoral Dissertation Award by University of Massachusetts, Amherst
2021	Rising Star in Networking and Communications by N^2 Women
2020	EECS Rising Star by UC Berkeley
2018	Google PhD Fellowship in Systems and Networking (\$70,000/year)
2018	Selected for Sheryl Sandberg's Lean In Event at Facebook
2016	Silver medal at ACM Student Research Competition at SIGCOMM

RESEARCH EXPERIENCE

2021 – present	<i>Senior Researcher, Office of the CTO, Azure for Operators, Microsoft, Redmond.</i> Group led by Dr. Victor Bahl.
2019 – 2020	<i>Researcher, Microsoft Research, Redmond.</i> Mobility and Networking group, led by Dr. Victor Bahl.
Summer 2018	<i>Research Intern, Microsoft Research, Redmond.</i> Advised by Dr. Sharad Agarwal and Dr. Victor Bahl.
Summer 2017	<i>Research Intern, Microsoft Research, Redmond.</i> Advised by Prof. Manya Ghobadi.
Summer 2016	<i>Research Intern, International Computer Science Institute (ICSI), Berkeley.</i> Advised by Dr. Sadia Afroz and Prof. Vern Paxson.

INDUSTRY EXPERIENCE

2012 – 2015	<i>Software Engineer, Arista Networks, Bangalore.</i> OSPF for IPv6, link state update (LSA) throttle timers, support for totally stubby NSSA areas. Virtual Routing and Forwarding (VRF) support for OSPFv3.
Summer 2012	<i>Google Summer of Code Intern, CERN, Switzerland</i> Built CERN VMFS's geography-aware DNS infrastructure.
Fall 2011	<i>Software Engineer Intern, Arista Networks, Bangalore.</i> Reduced memory footprint of the Address Resolution Protocol (ARP).

PUBLICATIONS

- NSDI 2022 **Decentralized cloud wide-area network traffic engineering**
Umesh Krishnaswamy, [Rachee Singh](#), Nikolaj Bjorner, Himanshu Raj
USENIX Symposium on Networked Systems Design and Implementation, 2022.
- SIGCOMM 2021 **Cost-effective capacity provisioning in wide-area networks with Shoofly**
[Rachee Singh](#), Nikolaj Bjorner, Sharon Shoham, Yawei Yin,
John Arnold, Jamie Gaudette
ACM Special Interest Group on Data Communications, 2021
- SIGMETRICS 2021 **PredictRoute: a path prediction toolkit**
[Rachee Singh](#), David Tench, Phillipa Gill, Andrew McGregor
ACM SIGMETRICS, 2021.
- NSDI 2021 **Cost-effective cloud edge traffic engineering with Cascara**
[Rachee Singh](#), Sharad Agarwal, Matt Calder, Victor Bahl
USENIX Symposium on Networked Systems Design and Implementation, 2021.
- SIGCOMM CCR 2021 **Surviving switch failures in cloud datacenters**
[Rachee Singh](#), Muqet Mukhtar, Ashay Krishna, Ani Parkhi, Jitendra Padhye, Dave Maltz
ACM SIGCOMM, Computer Communication Review (CCR), 2021
Press Coverage: [The Next Platform](#)
- SIGCOMM 2018 **RADWAN: Rate Adaptive Wide Area Network**
[Rachee Singh](#), Manya Ghobadi, Klaus-Tycho Foerster, Phillipa Gill, Mark Filer
ACM Special Interest Group on Data Communications, 2018
Press Coverage: [MSR Blog](#)
- ANRW 2018 **Beyond Binary Failures in Networks**
[Rachee Singh](#), Manya Ghobadi, Klaus-Tycho Foerster, Phillipa Gill, Mark Filer
ACM, IRTF and ISOC Applied Networking Research Workshop, 2018
- IMC 2018 **Characterizing the deployment and performance of multi-CDNs**
[Rachee Singh](#), Arun Dunna, Phillipa Gill
ACM Internet Measurement Conference, 2018
- HotNets 2017 **Run, Walk, Crawl: Towards Dynamic Link Capacities**
[Rachee Singh](#), Manya Ghobadi, Klaus-Tycho Foerster, Phillipa Gill, Mark Filer
ACM Hot Topics in Networks 2017
Press Coverage: [HotNets-XVI Dialogue](#), [Datacenter World Article](#)
- USENIX Sec 2017 **Characterizing the Nature and Dynamics of Tor Exit Blocking**
[Rachee Singh](#), Rishab Nithyanand, Sadia Afroz, Paul Pearce,
Michael Carl Tschantz, Phillipa Gill, Vern Paxson
USENIX Security Symposium , 2017
- FOCI 2016 **The Politics of Routing: Investigating the Relationship Between AS Connectivity and Internet Freedom**
[Rachee Singh](#), Hyungjoon Koo, Najmehalsadat Miramirkhani, Fahimeh Mirhaj,
Phillipa Gill, Leman Akoglu
USENIX Workshop on Free and Open Communications on the Internet, 2016
- ArXiv** **Holding all the ASes: Identifying and Circumventing the Pitfalls of AS-aware Tor Client Design**
Rishab Nithyanand, [Rachee Singh](#), Shinyoung Cho, and Phillipa Gill

PREPRINTS AND WORK IN PROGRESS

- Under Review **Synthesizing Collective Communication Algorithms for Distributed GPU Networks**
Aashaka Shah, Vijay Chidambaram, Meghan Cowan, Saeed Maleki, Madan Musuvathi,
Todd Mytkowicz, Jacob Nelson, Olli Saarikivi, [Rachee Singh](#)
- Under Review **Glowing in the Dark: Uncovering IPv6 Address Discovery and Scanning Strategies in the Wild**
Hammas Bin Tanveer, [Rachee Singh](#), Paul Pearce, Rishab Nithyanand
- Under Review **Survey on traffic engineering: from ISP to cloud wide-area networks**
[Rachee Singh](#), Nikolaj Bjorner, Umesh Krishnaswamy
- In preparation **Ghost routing the network**
[Rachee Singh](#), Sarah McClure, Ryan Beckett, Wei Bai, Neha Raje,
Karthick Jayaraman, Jitendra Padhye.

ACADEMIC SERVICE

- 2022 **Program Committee**, ACM SIGCOMM
- 2022 **Program Committee**, ACM SIGMETRICS
- 2021 **Judge**, ACM SIGCOMM Student Research competition (SRC)
- 2021 **Program Committee**, ACM/IEEE Symposium on Architectures for Networking and
Communications Systems (ANCS)
- 2021 **Organizer**, Tutorial on traffic engineering in cloud WANs, ACM SIGCOMM
- 2021 **Reviewer**, ACM SIGCOMM CCR
- 2021 **Program Committee**, ACM SIGCOMM Free & Open Communications on the
Internet (FOCI)
- 2021 **Publications Chair**, ACM Internet Measurement Conference (IMC)
- 2021 **Program Committee**, Privacy Enhancing Technologies Symposium (PETS)
- 2021 **Program Committee**, Passive and Active Measurement (PAM)
- 2020 **Judge**, ACM SIGCOMM Student Research competition (SRC)
- 2020 **Program Committee**, ACM SIGCOMM Posters and Demo
- 2020 **Reviewer**, ACM SIGCOMM CCR
- 2019 **Reviewer**, Intl. Symposium on Research in Attacks, Intrusions and Defenses (RAID)
- 2019 **Reviewer**, IEEE/ACM Transactions on Networking (ToN)
- 2018 **Reviewer**, ACM Transactions on Web (TWeb)
- 2018 **Reviewer**, IEEE ACM Transactions on Networking (ToN)

OUTREACH

- 2021 – present Volunteer developer for Malaria No More
- 2021 Panelist, Women in IOT Workshop at University of Florida
- 2021 Panelist, Women at Microsoft panel at ACM SIGCOMM
- 2021 ACM MobiSys Student Mentor
- 2020 – 2021 Classroom teacher for Introduction to CS, Beulah High School, North Dakota
- 2020 ACM SIGCOMM Student Mentor
- 2019 – 2020 Mentor, STEM Paths Innovation Network (SPIN), Seattle
- 2018 Mentor, Women in Engineering and Computing Career Day at UMass Amherst

TALKS AND PRESENTATIONS

- October 2021 Leveraging over-provisioned WANs for next-generation services, **University of Iowa**
- September 2021 Leveraging over-provisioned WANs for next-generation services, **Cornell University**
- August 2021 Cost-effective capacity provisioning in WANs with Shoofly, **SIGCOMM 2021, Remote**
- June 2021 PredictRoute: a network path prediction toolkit, **SIGMETRICS 2021, Remote**
- June 2021 Leveraging over-provisioned WANs for next-generation services,
University of Cambridge, Remote
- May 2021 PredictRoute: a network path prediction toolkit, **Google, Remote**
- April 2021 Cost-effective cloud edge traffic engineering with Cascara, **NSDI 2021**
- February 2020 RADWAN: a rate-adaptive wide-area network, **Facebook, Menlo Park**
- December 2018 RADWAN: a rate-adaptive wide-area network, **Colorado State University, Colorado**
- December 2018 RADWAN: a rate-adaptive wide-area network, **University of Colorado Boulder**
- November 2018 Characterizing the performance of multi-CDNs, **IMC 2018, Boston, MA**
- August 2018 RADWAN: a rate-adaptive wide-area network, **SIGCOMM 2018, Budapest, Hungary**
- July 2018 Characterizing the Nature and Dynamics of Tor Exit Blocking,
Applied Networking Research Workshop 2018, Montreal, Canada
- November 2017 Run, Walk, Crawl: Towards Dynamic Link Capacities, **HotNets 2017, Palo Alto, CA**
- September 2017 Characterizing the Nature and Dynamics of Tor Exit Blocking,
New England Security Day, Northeastern University, Boston, MA
- August 2016 Politics of Routing, **USENIX Security, FOCI, Austin, TX**
- April 2016 Cipollino: A Measurement Driven AS-aware Tor Client,
New England Security Day, Harvard University
- February 2016 Applications for Measurement Data: Improving Anonymity Online,
AIMS, 2016, University of California, San Diego
- September 2012 Building a Cluster with Beanstalkd, **PyCon, Bangalore, India**

TEACHING ASSISTANTSHIPS

- Fall 2015 Introduction to Databases, Stony Brook University
- Spring 2012 Programming Languages and Compilers, BITS Pilani
- Summer 2011 MIT Indian Mobile Initiative, BITS Pilani