Rachee Singh

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Employment

Assistant Professor of Computer Science, Cornell University, Ithaca, Spring 2023 –

Visiting Faculty at Amazon AWS, Spring 2025 –

Senior Researcher, Office of the CTO, Microsoft Azure for Operators, 2020 – 2023

Researcher, Mobility and Networking, Microsoft Research Redmond, 2019 – 2020

Research Intern, Mobility and Networking, Microsoft Research, Redmond, Summer 2017, 2018

Research Intern, International Computer Science Institute (ICSI), Berkeley, Summer 2016

Software Engineer, Arista Networks, 2012 – 2015

Software Engineering Intern, Arista Networks, Fall 2011

Education

Ph.D., Computer Science, University of Massachusetts, Amherst, 2021.

M.S., Computer Science, University of Massachusetts, Amherst, 2019.

B.E. (Hons.), Computer Science, Birla Institute of Technology and Science, 2012.

Awards and Recognition

Cisco Research Award, 2025

The 2030 Project: A Climate Initiative Grant from Atkinson Center for Sustainability, 2024

Invited to NSF Ideas Lab on Breaking Low Latency, 2024

PCCW Affinito-Stewart Grant, 2024

Amazon Research Award, 2024

Cisco Research Award, 2023

ACM SIGCOMM Doctoral Dissertation Award (Runner-up), 2022

Outstanding Doctoral Dissertation Award by University of Massachusetts, Amherst, 2021

Rising Star in Networking and Communications by N^2Women, 2021

EECS Rising Star by UC Berkeley, 2020

Google PhD Fellowship in Systems and Networking, 2018

Silver medal at ACM Student Research Competition at SIGCOMM, 2016

Peer-reviewed publications

Google Scholar: https://scholar.google.com/citations?user=GKja_-QAAAAJ

1. Aqua: Network-Accelerated Memory Offloading for LLMs in Scale-Up GPU Domains
   Abhishek Vijaya Kumar, Gianni Antichi, Rachee Singh
   ACM International Conference on Architectural Support for Programming Languages and Operating System **(ACM ASPLOS, 2025)**.

2. Chip-to-chip photonic connectivity in multi-accelerator servers for ML
   Abhishek Vijaya Kumar, Arjun Devraj, Darius Bunandar, Rachee Singh
   Optical Fiber Communications Conference **(OFC 2025)**.

3. PipSwitch: A Circuit Switch Using Programmable Integrated Photonics
   Eric Ding, Rachee Singh
   Optical Fiber Communications Conference **(OFC 2025)**.

4. Efficient multi-WAN transport for 5G with OTTER
   Mary Hogan, Yiming Qiu, Gerry Wan, Sharad Agarwal, Ryan Beckett,
   Rachee Singh, Victor Bahl
   USENIX Symposium on Networked Systems Design and Implementation **(NSDI 2025)**.

5. Mitigating effects of wavelength-specific faults in cloud WANs
   Arjun Devraj, Bill Owens, Umesh Krishnaswamy, Ying Zhang, Rachee Singh
   One-shot revision from **USENIX NSDI, 2025**.

6. A case for server-scale photonic connectivity
   Abhishek Vijaya Kumar, Arjun Devraj, Darius Bunandar, Rachee Singh
   Twenty-Third ACM Workshop on Hot Topics in Networks **(HotNets 2024)**.

7. An optical slice of the wide-area network
   Abhishek Vijaya Kumar, Bill Owens, Nikolaj Bjorner, Binbin Guan, Yawei Yin,
   Victor Bahl, Rachee Singh
   USENIX Symposium on Networked Systems Design and Implementation **(NSDI 2024)**.

8. Teal: Learning-Accelerated Optimization of WAN Traffic Engineering
   Zhiying Xu, Francis Y. Yan, Rachee Singh, Justin T. Chiu, Alexander M. Rush, Minlan Yu
   ACM Special Interest Group on Data Communications **(SIGCOMM 2023)**.

9. OneWAN is better than two: Unifying a split wide-area network architecture
   Umesh Krishnaswamy, Rachee Singh, Paul Mattes, Paul-Andre C Bissonette,
   Nikolaj Bjorner, Zahira Nasrin, Sonal Kothari, Prabhakar Reddy, John Abeln,
   Srikanth Kandula, Himanshu Raj, Luis Irun-Briz, Jamie Gaudette, Erica Lan
   USENIX Symposium on Networked Systems Design and Implementation **(NSDI 2023)**.

10. Making Sense of Constellations: Methodology for Understanding Starlink's Scheduling Algorithms
    Hammas Bin Tanveer, Mike Puchol, Rachee Singh, Antonio Bianchi, Rishab Nithyanand
    International Conference on emerging Networking EXperiments and Technologies **ACM CoNEXT 2023**.

11. Glowing in the dark: Uncovering IPv6 address discovery and scanning strategies
    Hammas Bin Tanveer, Rachee Singh, Paul Pearce, Rishab Nithyanand
    USENIX Security Symposium **(USENIX Security 2023)**.

12. 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
    USENIX Symposium on Networked Systems Design and Implementation **(NSDI 2023)**.

13. Traffic engineering: from ISP to cloud wide-area networks
Rachee Singh, Nikolaj Bjorner, Umesh Krishnaswamy
ACM SIGCOMM Symposium on SDN Research **(SOSR 2022)**.

14. Decentralized cloud wide-area network traffic engineering
Umesh Krishnaswamy, Rachee Singh, Nikolaj Bjorner, Himanshu Raj
USENIX Symposium on Networked Systems Design and Implementation **(NSDI 2022)**.

15. 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 **(SIGCOMM 2021)**.
Press coverage: APNIC

16. PredictRoute: a path prediction toolkit
Rachee Singh, David Tench, Phillipa Gill, Andrew McGregor
ACM Special Interest Group for Computer Systems Performance Evaluation **(SIGMETRICS, 2021)**.

17. Cost-effective cloud edge traffic engineering with Cascara
Rachee Singh, Sharad Agarwal, Matt Calder, Victor Bahl
USENIX Symposium on Networked Systems Design and Implementation **(NSDI 2021)**.

18. Surviving switch failures in cloud datacenters
Rachee Singh, Muqeet Mukhtar, Ashay Krishna, Ani Parkhi, Jitendra Padhye, Dave Maltz
ACM SIGCOMM, Computer Communication Review **(CCR 2021)**.
Press coverage: The Next Platform

19. RADWAN: Rate Adaptive Wide Area Network
Rachee Singh, Manya Ghobadi, Klaus-Tycho Foerster, Phillipa Gill, Mark Filer
ACM Special Interest Group on Data Communications **(SIGCOMM 2018)**.
Press Coverage: Microsoft Research Blog

20. Beyond Binary Failures in Networks
Rachee Singh, Manya Ghobadi, Klaus-Tycho Foerster, Phillipa Gill, Mark Filer
ACM, IRTF and ISOC Applied Networking Research Workshop **(ANRW 2018)**.

21. Characterizing the deployment and performance of multi-CDNs
Rachee Singh, Arun Dunna, Phillipa Gill
ACM Internet Measurement Conference **(IMC 2018)**.

22. Run, Walk, Crawl: Towards Dynamic Link Capacities
Rachee Singh, Manya Ghobadi, Klaus-Tycho Foerster, Phillipa Gill, Mark Filer
ACM Hot Topics in Networks **(HotNets 2017)**.
Press Coverage: HotNets-XVI Dialogue, Datacenter World Article

23. 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 **(USENIX Security 2017)**.

24. 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 **(FOCI 2016)**.

25. Identifying and Circumventing the Pitfalls of AS-aware Tor Client Design
Rishab Nithyanand, Rachee Singh, Shinyoung Cho, and Phillipa Gill
ArXiv **2016**.

US Patents

1. US Patent 12114169: Dedicated wide area network slices, *(Granted on 2024/10)*
2. US Patent 11979318: Egress traffic engineering in public clouds with commodity routers on the WAN edge *(Granted on 2024/05)*
3. US Patent 11838789: End-to-end secure communications for privileged 5G network traffic, *(Granted on 2023/12)*
4. US Patent 11831538: Traffic engineering for improved bandwidth allocations, *(Granted on 2023/11)*
5. US Patent 11811646: Decentralized wide-area network traffic engineering, *(Granted on 2023/11)*
6. US Patent 11799731: Representation and orchestration for virtual wide area networks, *(Granted on 2023/10)*
7. US Patent 11750498: Guarantying SLA thru edge cloud path orchestration, *(Granted on 2023/09)*
8. US Patent 11652742: Ghost Routing, *(Granted on 2023/05)*
9. US Patent 11632323: Routing information exchange between separate networks to improve end-to-end network performance for users, *(Granted on 2023/04)*
10. US Patent 11627075: Stitching multiple wide area networks together, *(Granted on 2023/04)*
11. US Patent 11611566: Automatic verification of safety for virtualized networks, *(Granted on 2024/03)*
12. US Patent 11595264: Provisioning edge backhauls for dynamic workloads, *(Granted on 2023/02)*
13. US Patent 11570102: Network diagnostic to control path between partner network and WAN, *(Granted on 2023/01)*
14. US Patent 11563678: Orchestration of overlay paths for wide area network virtualization, *(Granted on 2023/01)*
15. US Patent 11342996: Methods for capacity provisioning in wide area networks using optical by-passing, *(Granted on 2022/05)*

Federal Funding

1. PI, NSF RAISE: Chip-to-chip photonic connectivity in multi-accelerator servers for ML (2024–2027).
PI Singh's funding amount: $1,000,000.

2. Co-PI, ACE Center for Evolvable Computing, SRC JUMP 2.0 Center (2025–2028).
PI Singh's funding amount: $900,000.

Selected Talks

Seminar talks: Cisco AI Inference Infrastructure Summit (2025), MIT (2024), Harvard (2024), Brown (2024), Max Plank Institute (2024), AWS Sagemaker (2024), Cisco Research (2024), Air Force Research Lab (2024), Williams College (2023), Google Networking Research Summit (2023), UC Berkeley (2022), Rice University (2022), UIUC (2022), UT Austin (2022), USC (2022), UW Madison (2022), Brown University (2022), NYU (2022), Cornell Tech (2022), Cornell University (2022), University of Iowa (2021),

Cornell University (2021), University of Cambridge (2021), Google (2021), Facebook (2020), Colorado State University (2018), University of Colorado Boulder (2018).

Conference and workshop presentations: Topic preview on wide-area networks at SIGCOMM 2022, SIGCOMM 2021, SIGMETRICS 2021, NSDI 2021, IMC 2018, SIGCOMM 2018, Applied Networking Research Workshop 2018, HotNets 2017, New England Security Day 2017, FOCI at USENIX Security 2016, New England Security Day 2016, Workshop on Active Internet Measurements CAIDA 2016.

Cornell Graduate Student Advising

Abhishek Vijaya Kumar (PhD Candidate, Spring 2023 –)
Supported by a Linkedin Fellowship
PhD Committee: Rachee Singh (Chair), Adrian Sampson and Bobby Kleinberg

Arjun Devraj (PhD Student, Fall 2023 –)
Supported by the NSF Graduate Research Fellowship
PhD Committee: Rachee Singh (Chair), Chris De Sa and Eva Tardos

Eric Ding (PhD Student, Fall 2024 –)
Supported by Cornell Graduate Fellowship

Byungsoo Oh (PhD Student, Fall 2024 –)

Bhaskar Kataria (PhD Student, Fall 2024 –)

Jonathan Aimuyo (MS Student, Fall 2023 –)
MS Committee: Rachee Singh (Chair), Chris De Sa, Giulia Guidi

Howard Hua (MEng Student, Fall 2024 –)

Kenneth Cula (MEng Student, Fall 2024)

Andrii Lermolaiev (Spring 2024) → Microsoft

Anika Cave (MEng Student, Spring 2024)

Jennifer Lawless (MEng Student, Spring 2024)

Cornell Undergraduate Student Advising

Veronica Starchenko (Spring 2025)

Kenneth Cula (Summer 2023)

Aaron Beiderman (Summer 2023)

Yunus Mohammed (Spring 2023) → Microsoft

Other Student Mentoring

Hammas Tanveer (PhD Student at University of Iowa → SpaceX)

Zhiying Xu (PhD Student at Harvard University → AWS)

Aashaka Shah (PhD student at UT Austin → Microsoft Research, Redmond)

Teaching

1. Spring 2025, CS6458, Systems for Programmable Optical Interconnects
   Course Webpage, Enrollment Total: 14
2. Fall 2024, CS 4450/5456: Introduction to Computer Networks
   Course Webpage, Enrollment Total: 160 (100 undergraduates, 60 masters)
3. Spring 2024, CS 4450/5456: Introduction to Computer Networks
   Course Webpage, Enrollment Total: 208 (149 undergraduates, 59 masters)
4. Fall 2023, CS6458, Systems for Programmable Optical Interconnects
   Course Webpage, Enrollment Total: 8 (6 PhD, 1 masters, 1 undergraduate)
5. Spring 2023, CS 4450/5456: Introduction to Computer Networks
   Course Webpage, Enrollment Total: 95 (64 undergraduate and 31 masters)

Department Service

Systems and Networking, Cornell CS PhD admissions committee, 2025

CS Teaching professor hiring committee, 2024

CS Lunch and Learn seminar, Spring 2024

Systems and Networking, Cornell CS PhD admissions committee, 2024

New building furnishing planning committee, 2023

Co-organizer of TA training sessions, 2023

Systems and Networking, Cornell CS PhD admissions committee, 2023

Service

Program Committee, USENIX NSDI 2026

Session Chair, ACM HotNets 2024

Program Committee, ACM IMC 2025

Session Chair, USENIX NSDI 2024

Program Committee, USENIX NSDI 2025

Program Committee, ACM SIGCOMM 2024

Program Committee, IETF Applied Networking Research Prize 2024

Program Committee, ACM SIGMETRICS 2024

Selection Committee, ACM Doctoral Dissertation Award (India), 2023

Program Committee, ACM ASPLOS 2024

Program Committee, USENIX NSDI 2024

Program Committee, ACM HotNets 2023

Panelist, NeTS Medium, National Science Foundation, 2023

Session Chair, USENIX NSDI 2023

Program Committee, USENIX NSDI 2023

Selection Committee, ACM Doctoral Dissertation Award (India), 2022

Program Committee, ACM Internet Measurement Conference (IMC) Posters 2022

Program Committee, ACM Internet Measurement Conference (IMC) 2022

Program Committee, ACM SIGCOMM 2022

Program Committee, ACM SIGMETRICS 2022

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) 2021

Judge, ACM SIGCOMM Student Research competition (SRC) 2020

Program Committee, ACM SIGCOMM Posters and Demo 2020

Reviewer, ACM SIGCOMM CCR 2020

Reviewer, Intl. Symposium on Research in Attacks, Intrusions and Defenses (RAID) 2019

Reviewer, IEEE/ACM Transactions on Networking (ToN) 2019

Reviewer, ACM Transactions on Web (TWeb) 2018

Reviewer, IEEE ACM Transactions on Networking (ToN) 2018

Outreach

Panelist, EECS Rising Stars at MIT, 2024

Panelist, Student and Early Career Networking Researcher Roundtable, theNetworking Channel, 2023

Panelist, Women in IOT Workshop at University of Florida, 2021

Panelist, Women at Microsoft panel at ACM SIGCOMM, 2021

ACM MobiSys Student Mentor, 2021

Classroom teacher for Introduction to CS, Beulah High School, North Dakota, 2020 – 2021

ACM SIGCOMM Student Mentor, 2020

Mentor, STEM Paths Innovation Network (SPIN), Seattle, 2019 – 2020

Mentor, Women in Engineering and Computing Career Day at UMass Amherst, 2018