

Rachee Singh

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Employment

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

Honors and Awards

Google Research Award, 2026
Inaugural Moonshot cohort of the Laude Institute, 2026
Winner of the Corning Outstanding paper award at OFC 2026
NERSC Education Allocation Award, 2026
NSF Award #2435852, **Efficient Collective Communication for Distributed ML**, 2025
Cisco Research Award, 2025
NERSC Education Allocation Award, 2025
NSF ACCESS Education Allocation Award, 2025
The 2030 Project: A Climate Initiative Grant from Atkinson Center for Sustainability, 2024
NSF Award #2444537, **Chip-to-chip photonic connectivity**, 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^2 Women, 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

Names of Cornell students who were my advisees at the time of paper publication are in italics.

1. λ_λ : a programming language for photonic switches
 Vaibhav Mehta, *Arjun Devraj*, Bill Owens, Justin Hsu, Rachee Singh
ACM Special Interest Group on Data Communications (SIGCOMM 2026).
2. TVCache: A Tool-Value Cache for Post-Training LLM Agents
 Abhishek Vijaya Kumar, Bhaskar Kataria, Byungsoo Oh, Emaad Manzoor, Rachee Singh
Forty-Third International Conference on Machine Learning (ICML, 2026).
3. Reconfigurable Torus Fabrics for Multi-tenant ML
 Abhishek Vijaya Kumar, Eric Ding, *Arjun Devraj*, Darius Bunandar, Rachee Singh
ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ACM ASPLOS, 2026).
4. In-Network Analog AllReduce for ML with Programmable Integrated Photonics
Arjun Devraj, Bill Owens, Daniel Perez Lopez, Rachee Singh
*Optical Fiber Communications Conference (OFC 2026)*¹. (Oral and “top-scored” paper)
Winner of the Corning Outstanding Paper Award at OFC 2026.
5. What Obstructed Skies Teach Us about Satellite Internet
 Bhaskar Kataria, Hammas Bin Tanveer, Rishab Nithyanand, Rachee Singh
New Ideas in Networked Systems (NINeS 2026).
6. HEDGE: Traffic Engineering with Probabilistic Link Capacities
Arjun Devraj, Bill Owens, Umesh Krishnaswamy, Ying Zhang, Rachee Singh
USENIX Symposium on Networked Systems Design and Implementation (NSDI 2026).
7. Learning to Tune Optical WANs: Field Deployment of a Learned Noise Model
 Bhaskar Kataria, Howard Hua, Bill Owens, Andrea D’Amico, Rachee Singh
USENIX Symposium on Networked Systems Design and Implementation (NSDI 2026).
8. FlashMoE: Fast Distributed MoE in a Single Kernel
 Jonathan Aimuyo, Byungsoo Oh, Rachee Singh
Conference on Neural Information Processing Systems (NeurIPS, 2025).
9. Photonic Rails in ML Datacenters
 Eric Ding, Chuhan Ouyang, Rachee Singh
Twenty-Fourth ACM Workshop on Hot Topics in Networks (HotNets 2025).
10. Software Managed Networks via Coarsening
 Pradeep Dogga, Rachee Singh, Suman Nath, Ravi Netravali, Jens Palsberg, George Varghese
Twenty-Fourth ACM Workshop on Hot Topics in Networks (HotNets 2025).

¹Flagship conference in optical communications.

11. The Reality of Chasing Shannon’s Limit in Optical Wide-Area Networks
Arjun Deoraj, Bill Owens, [Rachee Singh](#)
ACM Internet Measurement Conference (ACM IMC, 2025)
12. 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 Systems (ACM ASPLOS, 2025).
13. Chip-to-chip photonic connectivity in multi-accelerator servers for ML
Abhishek Vijaya Kumar, Arjun Deoraj, Darius Bunandar, [Rachee Singh](#)
Optical Fiber Communications Conference (OFC 2025) (Oral paper)
14. PipSwitch: A Circuit Switch Using Programmable Integrated Photonics
Eric Ding, [Rachee Singh](#)
Optical Fiber Communications Conference (OFC 2025).
15. 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).
16. A case for server-scale photonic connectivity
Abhishek Vijaya Kumar, Arjun Deoraj, Darius Bunandar, [Rachee Singh](#)
Twenty-Third ACM Workshop on Hot Topics in Networks (HotNets 2024).
17. 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).
18. 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).
19. 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).
20. 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.
21. 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).
22. 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).

23. Traffic engineering: from ISP to cloud wide-area networks
[Rachee Singh](#), Nikolaj Bjorner, Umesh Krishnaswamy
ACM SIGCOMM Symposium on SDN Research (SOSR 2022).
24. 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).
25. 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](#)
26. PredictRoute: a path prediction toolkit
[Rachee Singh](#), David Tench, Phillipa Gill, Andrew McGregor
ACM Special Interest Group for Computer Systems Performance Evaluation (SIGMETRICS, 2021).
27. 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).
28. 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](#)
29. 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](#)
30. 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).
31. Characterizing the deployment and performance of multi-CDNs
[Rachee Singh](#), Arun Dunna, Phillipa Gill
ACM Internet Measurement Conference (IMC 2018).
32. 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](#)
33. 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).
34. 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).

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

Granted 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 backhuls 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

Funding Agency	Proposal	PI Role	Duration	Total Amount	PI Singh's Amount
NSF	RAISE: Chip-to-chip photonic connectivity in multi-accelerator servers for ML	Solo-PI	2024–2027	\$1,000,000	\$1,000,000
SRC and DARPA	ACE Center for Evolvable Computing, SRC JUMP 2.0 Center	Co-PI	2025–2027	≈\$40,000,000	≈\$800,000
NSF	Small Core: EC2ML: Efficient Collective Communication for Distributed ML in the Cloud	Lead-PI	2025–2028	\$525,000	\$470,000

Selected Talks

Seminar talks: IBM Research (2025), Meta (2025), 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.

Research Group

Postdoctoral Researchers

Jinkun Lin, PhD from NYU (Fall 2025 –)

Cornell Graduate Students

Abhishek Vijaya Kumar (PhD Candidate, Spring 2023 – Spring 2026)

Supported by the 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 the Cornell Graduate Fellowship

Byungsoo Oh (PhD Student, Fall 2024 –)

Supported by the LinkedIn Fellowship

Bhaskar Kataria (PhD Student, Fall 2024 –)

Lindsey Bowen (PhD Student, Fall 2025 –)

Supported by the Cornell Graduate Fellowship and Dean's Scholar Award

Jonathan Aimuyo (MS Student, 2023 – 2025) → PhD at Stanford, NSF GRFP

MS Thesis Committee: Rachee Singh (Chair), Chris De Sa, Giulia Guidi

Jamal Hashim (MS Student, Spring 2026 –)

Rei Meguro (MEng Student, Spring 2026)

Swathi Murali (MEng Student, Spring 2026 –)

Howard Hua (MEng Student, Fall 2024) → Jump Trading

Chuhan Ouyang (MEng Student, Spring 2025) → Jump Trading

Kenneth Cula (MEng Student, Fall 2024) → ATT

Andrii Lermolaiev (Spring 2024) → Microsoft

Anika Cave (MEng Student, Spring 2024)
Jennifer Lawless (MEng Student, Spring 2024)

Cornell Undergraduate Students

Nicole Qiu (Fall 2025)
Barry Lyu (Summer 2025) → PhD at UMich
Veronica Starchenko (Spring 2025) → MEng at Cornell
Kenneth Cula (Summer 2023) → ATT
Aaron Beiderman (Summer 2023) → Coreweave
Yunus Mohammed (Spring 2023) → Microsoft

Other Students

Hammas Tanveer (2023–2024) (PhD Student at University of Iowa → SpaceX)
Zhiying Xu (2022–2023) (PhD Student at Harvard University → AWS)
Aashaka Shah (2022–2023) (PhD student at UT Austin → Microsoft Research, Redmond)

Teaching

I have taught the following courses at Cornell University as the solo instructor:

1. Spring 2026, CS 4450/5456: Introduction to Computer Networks
[Course Webpage](#), Enrollment Total: 195
2. Fall 2025, CS 5470, Systems for Large-Scale ML
[Course Webpage](#), Enrollment Total: 76
3. Spring 2025, CS6458, Systems for Programmable Optical Interconnects
[Course Webpage](#), Enrollment Total: 14
4. Fall 2024, CS 4450/5456: Introduction to Computer Networks
[Course Webpage](#), Enrollment Total: 160 (100 undergraduates, 60 masters)
5. Spring 2024, CS 4450/5456: Introduction to Computer Networks
[Course Webpage](#), Enrollment Total: 208 (149 undergraduates, 59 masters)
6. Fall 2023, CS6458, Systems for Programmable Optical Interconnects
[Course Webpage](#), Enrollment Total: 8 (6 PhD, 1 masters, 1 undergraduate)
7. Spring 2023, CS 4450/5456: Introduction to Computer Networks
[Course Webpage](#), Enrollment Total: 95 (64 undergraduate and 31 masters)

Department Service

Cornell CS PhD admissions committee, 2025
CS Teaching professor hiring committee, 2024
CS Lunch and Learn seminar, Spring 2024

Cornell CS PhD admissions committee, 2024
New building furnishing planning committee, 2023
Co-organizer of TA training sessions, 2023
Cornell CS PhD admissions committee, 2023

Service

Program Committee, USENIX NSDI 2027
Program Committee, New Ideas in Networked Systems, 2026
Program Committee, ACM HotNets 2025
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

Last updated: May 12, 2026