Ravi Netravali

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RESEARCH INTERESTS

Computer systems and networks, ML+systems, distributed applications, PL+systems.

EDUCATION

Massachusetts Institute of Technology *February 2015 - September 2018*
Ph.D. in Computer Science
Advisors: Hari Balakrishnan and James Mickens

Massachusetts Institute of Technology *September 2012 - February 2015*
S.M. in Computer Science
Advisor: Hari Balakrishnan

Columbia University *September 2008 - May 2012*
B.S. in Electrical Engineering

EMPLOYMENT

Princeton University
Associate Professor of Computer Science *July 2024 - Present*
Assistant Professor of Computer Science *July 2021 - July 2024*

UCLA
Adjunct Assistant Professor of Computer Science *July 2021 - Present*
Assistant Professor of Computer Science *January 2019 - July 2021*

BreezeML Inc. *April 2022 - Present*
Co-Founder

Reulay Inc. *November 2021 - Present*
Co-Founder

MIT *September 2012 - September 2018*
Graduate Research Assistant

Hewlett-Packard Labs *May 2011 - September 2012*
Research Intern, Networking and Mobility Laboratory

AWARDS AND HONORS

1. ACM SIGCOMM Rising Star Award, *2023*
2. VMWare Early Career Faculty Award, *2023*
3. Howard B. Wentz Junior Faculty Award (Princeton University), *2023*
4. Facebook Research Award, *2021*
5. Sloan Research Fellowship, *2021*

6. NSF CAREER Award, *2020*
7. Google Faculty Research Award, *2020*
8. ACM SoCC Best Paper Award, *2019*
9. IRTF Applied Networking Research Prize, *2018*
10. Qualcomm Innovation Fellowship, *2017*
11. Irwin Jacobs Presidential Fellowship (MIT), *2012*
12. William L. Everitt Student Award of Excellence (Columbia University), *2012*

PROFESSIONAL SERVICE

Leadership

1. Program Committee Chair, ACM SoCC, *2021*
2. Topics Preview Co-Chair, ACM SIGCOMM, *2020*
3. Poster Co-Chair, USENIX NSDI, *2020*

Program Committees

1. USENIX OSDI: *2021, 2022, 2023, 2024, 2025*
2. USENIX NSDI: *2020, 2021, 2023, 2024, 2026*
3. ACM MobiCom: *2021, 2022, 2023*
4. ACM SIGCOMM: *2021*
5. ACM MobiSys: *2021*
6. ACM WWW: *2021*
7. USENIX ATC: *2020*

Funding Panels

1. NSF CISE/CNS: *2020, 2021, 2025*

PUBLICATIONS

Refereed Conference Publications

1. Rui Pan, Zhuang Wang, Zhen Jia, Can Karakus, Luca Zancato, Tri Dao, Yida Wang, Ravi Netravali. "Marconi: Prefix Caching for the Era of Hybrid LLMs," *MLSys 2025*.
2. Neil Agarwal, Rui Pan, Francis Yan, Ravi Netravali. "Tarzan: Passively-Learned Real-Time Rate Control for Video Conferencing," *USENIX NSDI 2025*.
3. Yiru Chen, Xupeng Li, Jeff Tao, Lana Ramjit, Ravi Netravali, Subrata Mitra, Aditya Parameswaran, Javad Ghaderi, Dan Rubenstein, Eugene Wu. "Physical Visualization Design: Decoupling Interface and System Design," *SIGMOD 2025*.
4. Yinwei Dai, Rui Pan, Anand Iyer, Kai Li, Ravi Netravali. "Apparate: Rethinking Early Exits to Tame Latency-Throughput Tensions in ML Serving," *ACM SOSP 2024*.

5. Anand Iyer, Swapnil Gandhi, Mingyu Guan, Yinwei Dai, Rui Pan, Ravi Netravali. "Improving DNN Inference Throughput Using Practical, Per-Input Compute Adaptation," *ACM SOSP 2024*.
6. Mike Wong, Murali Ramanujam, Guha Balakrishnan, Ravi Netravali. "MadEye: Boosting Live Video Analytics Accuracy with Adaptive Camera Configurations," *USENIX NSDI 2024*.
7. Hao Yin, Murali Ramanujam, Joe Schaefer, Stan Adermann, Srihari Narlanka, Perry Lea, Ravi Netravali, Krishna Chintalapudi. "ADR-X: ANN-Assisted Wireless Link Rate Adaptation for Compute-Constrained Embedded Gaming Devices," *USENIX NSDI 2024*.
8. Kevin Hsieh, Mike Wong, Santiago Segarra, Sathiya Kumaran Mani, Ravi Netravali, Srikanth Kandula. "NetVigil: Robust and Low-Cost Anomaly Detection for East-West Data Center Security," *USENIX NSDI 2024*.
9. Ayush Goel, Jingyuan Zhu, Ravi Netravali, Harsha Madhyastha. "Sprinter: Speeding Up High-Fidelity Crawling of the Modern Web," *USENIX NSDI 2024*.
10. Zhuqi Li, Yaxiong Xie, Ravi Netravali, Kyle Jamieson. "Dashlet: Taming Swipe Uncertainty for Robust Short Video Streaming," *USENIX NSDI 2023*.
11. Neil Agarwal and Ravi Netravali. "Boggart: Towards General-Purpose Acceleration of Retrospective Video Analytics," *USENIX NSDI 2023*.
12. Arthi Padmanabhan, Neil Agarwal, Anand Iyer, Ganesh Ananthanarayanan, Yuanchao Shu, Nikolaos Karianakis, Harry Xu, and Ravi Netravali. "GEMEL: Model Merging for Memory-Efficient, Real-Time Video Analytics at the Edge," *USENIX NSDI 2023*.
13. John Thorpe, Pengzhan Zhao, Jonathan Eyolfson, Yifan Qiao, Zhihao Jia, Minjia Zhang, Ravi Netravali, and Harry Xu. "Bamboo: Making Preemptible Instances Resilient for Affordable Training of Large DNNs," *USENIX NSDI 2023*.
14. Mehrdad Khani, Ganesh Ananthanarayanan, Kevin Hsieh, Junchen Jiang, Ravi Netravali, Yuanchao Shu, Mohammad Alizadeh, Victor Bahl. "RECL: Responsive Resource-Efficient Continuous Learning for Video Analytics," *USENIX NSDI 2023*.
15. Chenxi Wang, Yifan Qiao, Haoran Ma, Shi Liu, Yiying Zhang, Wenguang Chen, Ravi Netravali, Miryung Kim, and Harry Xu. "Canvas: Isolated and Adaptive Swapping for Multi-Applications on Remote Memory," *USENIX NSDI 2023*.
16. Jessica Berg, Muhammad Haseeb, Haiming Chen, Yaojia Ju, Anirudh Sivaraman, Ravi Netravali, Srinivas Narayana. "QuEST: Fast, Expressive, and Cheap Analytics for Distributed Traces Using Cloud Storage," *CloudDB 2023*.
17. Michael Wong, Edward Raff, James Holt, Ravi Netravali. "Marvolo: Programmatic Data Augmentation for Deep Malware Detection," *ECML PKDD 2023*.
18. Oliver Michel, Satadel Sengupta, Hyojoon Kim, Ravi Netravali, and Jennifer Rexford. "Enabling Passive Measurement of Zoom Performance in Production Networks," *ACM IMC 2022*.
19. Murali Ramanujam, Helen Chen, Shaghayegh Mardani, and Ravi Netravali. "Floo: Automatic, Lightweight Memoization for Faster Mobile Apps," *ACM MobiSys 2022*.
20. Ayush Goel, Jingyuan Zhu, Ravi Netravali, and Harsha Madhyastha. "Jawa: Web Archival in the Era of JavaScript," *USENIX OSDI 2022*.

21. Frank Cangialosi, Neil Agarwal, Venkat Arun, Junchen Jiang, Srinivas Narayana, Anand Sarwate, and Ravi Netravali. "Privid: Practical, Privacy-Preserving Video Analytics Queries," *USENIX NSDI 2022*.

22. Pradeep Dogga, Karthik Narasimhan, Anirudh Sivaraman, Shiv Saini, George Varghese, and Ravi Netravali. "Revelio: ML-Generated Debugging Queries for Distributed Systems," *MLSys 2022*.

23. Qizheng Zhang, Kuntai Du, Neil Agarwal, Ravi Netravali, and Junchen Jiang. "Understanding the Potential of Server-Driven Edge Video Analytics," *ACM HotMobile 2022*.

24. Joseph Noor, Mani Srivastava, and Ravi Netravali. "Portkey: Adaptive Key-Value Placement over Dynamic Edge Networks," *ACM SoCC 2021*.

25. Murali Ramanujam, Harsha Madhyastha, and Ravi Netravali. "Marauder: Synergized Caching and Prefetching for Low-Risk Mobile App Acceleration," *ACM MobiSys 2021*.

26. Shaghayegh Mardani, Ayush Goel, Ronny Ko, Harsha Madhyastha, and Ravi Netravali. "Horcrux: Automatic JavaScript Parallelism for Resource-Efficient Web Computation," *USENIX OSDI 2021*.

27. John Thorpe, Yifan Qiao, Jonathan Eyolfson, Shen Teng, Guanzhou Hu, Zhihao Jia, Jinliang Wei, Keval Voral, Ravi Netravali, Miryung Kim, and Harry Xu. "Dorylus: Affordable, Scalable, and Accurate GNN Training over Billion-Edge Graphs," *USENIX OSDI 2021*.

28. Nikhil Kansal, Murali Ramanujam, and Ravi Netravali. "Alohamora: Reviving HTTP/2 Push and Preload by Adapting Policies On the Fly," *USENIX NSDI 2021*.

29. Ronny Ko, Blake Loring, James Mickens, and Ravi Netravali. "Oblique: Accelerating Page Loads Using Symbolic Execution," *USENIX NSDI 2021*.

30. Chenxi Wang, Haoran Ma, Shi Liu, Yuanqi Li, Zhenyuan Ruan, Khanh Nguyen, Michael Bond, Ravi Netravali, Miryung Kim, and Harry Xu. "Semeru: A Memory-Disaggregated Managed Runtime," *USENIX OSDI 2020*.

31. Neil Agarwal, Matteo Varvello, Andrius Aucinas, James Newman, Fabian Bustamante, Ravi Netravali. "Mind the Delay: Adverse Effects of Delay-Based TCP on HTTP," *ACM CoNEXT 2020*.

32. Haneen Mohammed, Ziyun Wei, Eugene Wu, and Ravi Netravali. "Continuous Prefetch for Interactive Data Applications," *VLDB 2020*.

33. Yuanqi Li, Arthi Padmanabhan, Pengzhan Zhao, Yufei Wang, Harry Xu, Ravi Netravali. "Reducto: On-Camera Filtering for Resource-Efficient Real-Time Video Analytics," *ACM SIGCOMM 2020*.

34. Shaghayegh Mardani, Mayank Singh, and Ravi Netravali. "Fawkes: Faster Mobile Page Loads via App-Inspired Static Templating," *USENIX NSDI 2020*.

35. Prateesh Goyal, Anup Agarwal, Ravi Netravali, Mohammad Alizadeh, and Hari Balakrishnan. "ABC: A Simple Explicit Congestion Controller for Wireless Networks," *USENIX NSDI 2020*.

36. Lana Ramjit, Matteo Interlandi, Eugene Wu, and Ravi Netravali. "Acorn: Aggressive Result Caching in Distributed Data Processing Frameworks," *ACM SoCC 2019*.

37. Pradeep Dogga, Karthik Narasimhan, Anirudh Sivaraman, and Ravi Netravali. "A System-Wide Debugging Assistant Powered by Natural Language Processing," *ACM SoCC 2019*.

38. Ravi Netravali and James Mickens. "Reverb: Speculative Debugging for Web Applications," *ACM SoCC 2019*.

39. Ravi Netravali, Anirudh Sivaraman, James Mickens, and Hari Balakrishnan. "WatchTower: Fast, Secure Mobile Page Loads Using Remote Dependency Resolution," *ACM MobiSys 2019*.

40. Ravi Netravali, Vikram Nathan, James Mickens, and Hari Balakrishnan. "Vesper: Measuring Time-to-Interactivity for Modern Web Pages," *USENIX NSDI 2018*.

41. Ravi Netravali and James Mickens. "Prophecy: Accelerating Mobile Page Loads Using Final-state Write Logs," *USENIX NSDI 2018*.

42. Hongzi Mao, Ravi Netravali, and Mohammad Alizadeh. "Neural Adaptive Video Streaming with Pensieve," *ACM SIGCOMM 2017*.

43. Vaspol Ruamviboonsuk, Ravi Netravali, Mohammad Uluyol, and Harsha Madhyastha. "Vroom: Accelerating the Mobile Web with Server-Aided Dependency Resolution," *ACM SIGCOMM 2017*.

44. Ravi Netravali, Ameesh Goyal, James Mickens, and Hari Balakrishnan. "Polaris: Faster Page Loads Using Fine-grained Dependency Tracking," *USENIX NSDI 2016*.

45. Ravi Netravali, Anirudh Sivaraman, Keith Winstein, Somak Das, Ameesh Goyal, James Mickens, and Hari Balakrishnan. "Mahimahi: Accurate Record-and-Replay for HTTP," *USENIX ATC 2015*.

46. Shuo Deng, Ravi Netravali, Anirudh Sivaraman, and Hari Balakrishnan. "WiFi, LTE, or Both? Measuring Multi-homed Wireless Internet Performance," *ACM IMC 2014*.

47. Jack Brassil, Ravi Netravali, Stuart Haber, Pratyusa Manadhata, and Prasad Rao. "Authenticating a Mobile Device's Location Using Voice Signatures," *IEEE WiMob 2012*.

Refereed Workshop and Demo Publications

1. Jessica Berg, Fabian Ruffy, Khanh Nguygen, Nick Lee, Taegyun Kim, Anirudh Sivaraman, Ravi Netravali, Srinivas Narayana. "Snicket: Query-Driven Distributed Tracing," *ACM HotNets 2021*.

2. Arthi Padmanabhan, Anand Iyer, Ganesh Ananthanarayanan, Yuanchao Shu, Nikolaos Karianakis, Harry Xu, and Ravi Netravali. "Towards Memory-Efficient Inference in Edge Video Analytics," *ACM HotEdgeVideo 2021*.

3. U. Naseer, T. Benson, and R. Netravali. "WebMedic: Disentangling the Memory–Functionality Tension for the Next Billion Mobile Web Users," *ACM HotMobile 2021*.

4. A. Goel, V. Ruamviboonsuk, R. Netravali, H. Madhyastha. "Rethinking Client-Side Caching for the Mobile Web," *ACM HotMobile 2021*.

5. Lana Ramjit, Zhaoning Kong, Ravi Netravali, and Eugene Wu. "Physical Visualization Design," *ACM SIGMOD 2020*.

6. Pradeep Dogga, Sandip Chakraborty, Subrata Mitra, and Ravi Netravali. "Edge-based Transcoding for Adaptive Live Video Streaming," *USENIX HotEdge 2019*.

7. Prateesh Goyal, Ravi Netravali, Mohammed Alizadeh, and Hari Balakrishnan. "Secure Incentivization for Decentralized Content Delivery," *USENIX HotEdge 2019*.

8. Ravi Netravali and James Mickens. "Remote-Control Caching: Proxy-based URL Rewriting to Decrease Mobile Browsing Bandwidth," *ACM HotMobile 2018*.

9. Peter Iannucci, Ravi Netravali, Ameesh Goyal, and Hari Balakrishnan. "Room-Area Networks," *ACM HotNets 2015*.

Journal Publications

1. Anirudh Sivaraman, Thomas Mason, Aurojit Panda, Ravi Netravali, and Sai Anirudh Kondaveeti. "Network Architecture in the Age of Programmability," *ACM SIGCOMM CCR 2020.*
2. Jack Brassil, Pratyusa Manadhata, and Ravi Netravali. "Traffic Signature-Based Mobile Device Location Authentication," *IEEE Transactions on Mobile Computing, Volume 13, 2013.*
3. Xiaopeng Huang, Ravi Netravali, Hong Man, and Victor Lawrence. "Multi-Sensor Fusion of Infrared and Electro-Optic Signals for Night Images," *MDPI Sensors, Volume 12, 2012.*

STUDENTS

Current Students and Postdocs

1. Neil Agarwal (PhD)
2. Murali Ramanujam (PhD)
3. Pengzhan Zhao (PhD, co-advised with Harry Xu)
4. Mike Wong (PhD)
5. Rui Pan (PhD)
6. Yinwei Dai (PhD)
7. Emma Farkash (Masters)
8. Alan Zhang (Masters)

Graduated Students

1. Pradeep Dogga (PhD, 2024), now Researcher at Google
2. Ayush Goel (PhD, 2023), now Researcher at HP Labs
3. Lei Zhang (postdoc, 2023), now Researcher at Bytedance
4. Arthi Padmanabhan (PhD, 2022), now Assistant Professor at Harvey Mudd College
5. Shaghayegh Mardani (PhD, 2021), now postdoc at UT Austin
6. Lana Ramjit (PhD, 2021), now postdoc at Cornell University
7. Nikhil Kansal (Masters, 2020), now at Stripe
8. Mihir Mathur (Masters, 2020), now at Lyft

TEACHING

1. COS 597k: Systems for Serving Generative AI (Princeton) *Fall 2024*
2. COS 316: Principles of Computer System Design (Princeton) *Fall 2022, Fall 2023*
3. COS 598A: Advanced Topics in CS: ML-Driven Video Systems (Princeton) *Spring 2022*
4. COS 561: Advanced Computer Networks (Princeton) *Fall 2021, Spring 2023*
5. CS239: ML-Driven Video Analytics Systems (UCLA) *Winter 2020, Fall 2020*
6. CS219: Web and Mobile Systems (UCLA) *Winter 2019, Fall 2019*
7. CS134: Distributed Systems (UCLA) *Spring 2019, Spring 2020*

DEPARTMENT SERVICE

1. Faculty Hiring Committee *2022-2025*

2. PhD Admissions Committee *2021-2025*
3. Faculty Point Person for "Pre-application support for PhD applicants" program *2023, 2024.*
4. Ad-Hoc Committees for "Graduate Student Issues" and "Future of Faculty Growth" *2022-2024*
5. UCLA PhD Visit Days Organization Committee *2020-2021*
6. UCLA Masters and PhD Admissions Committee *2018-2021*

STUDENT COMMITTEES

1. Princeton Thesis (FPO) Committees: Austin Hounsel, Jordan Holland, Zhuqi Li, Khiem Ng, Andrew Or, Christopher Hodsdon, Theano Stavrinos, David Liu, Yushan Su, Zhenyu Song, Jeffrey Helt, Ashwini Raina, Srikar Kasi, Mary Hogan
2. Princeton Qualifying (Generals) Committees: Molly Pan, Sophia Yoo, Neil Agarwal, Murali Ramanujam, Nanqinqin Li, Anja Kalaba, Shai Caspin, Dongsheng Yang, Mike Wong
3. UCLA Thesis and OQE Committees: John Thorpe, Lana Ramjit, Shaghayegh Mardani, Arthi Padmanabhan, Joseph Noor, Chloe Tsai, Jinghao Zhao, Christian Kalhauge, Orpaz Goldstein, Siva Kesava, Jason Teoh, Pradeep Dogga, Mihir Mathur, Nikhil Kansal

FUNDING

Total of $5.5M with $2.6M managed by me.

1. VMWare Early Career Faculty Award, *PI, $50,000, 2023-2024*
2. Cisco Research Gift, *PI, $100,000, 2022-2023*
3. NSF RINGS: "Object-Oriented Video Analytics for Next-Generation Mobile Environments," *PI, $1,000,000, 2022-2025*
4. Facebook Research Award, *PI, $50,000, 2021-2022*
5. NSF CNS Core: Small: "Fast or Dynamic Websites? Eliminating the Need to Choose," *PI, $500,000, 2021-2024*
6. NSF CNS Core: Medium: "A Unified Prefetch Framework for Approximation-Tolerant Interactive Applications," *co-PI, $600,000, 2021-2024*
7. Sloan Research Fellowship, *PI, $75,000, 2021-2023*
8. Cisco Research Gift, *PI, $50,000, 2020-2021*
9. NSF CNS Core: Small: "Not All Cameras are Created Equal: Systems Support for Highly Adaptive Video Analytics Pipelines," *PI, $500,000, 2020-2023*
10. NSF CNS: CAREER: "Adaptive Web Execution: Supporting Billions of Diverse Users by Adapting Execution to Available Resources," *PI $500,000, 2020- 2025*
11. Google Faculty Research Award, *PI, $80,000, 2020-2021*
12. NSF CNS CORE: Large: "Network Design Automation." *co-PI, $1,999,404, 2019-2023*