

Neil Agarwal

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RESEARCH INTERESTS

Systems+Machine Learning, Networked and Distributed Systems, Video Analytics/Streaming

EDUCATION

Princeton University

Ph.D., Computer Science

Advisor: Prof. Ravi Netravali

Nov 2022 – Present

Princeton University

M.A., Computer Science

Advisor: Prof. Ravi Netravali

Sept 2019 – Nov 2022

* Spent first two years at UCLA; transferred to Princeton with advisor in 2021

University of California, Berkeley

B.A., Computer Science

Member of Upsilon Pi Epsilon, Nu Chapter – Computer Science Honor Society

Aug 2015 – May 2019

PUBLICATIONS, PRESENTATIONS & WHITE PAPERS

Neil Agarwal, Ravi Netravali. “Boggart: Towards General-Purpose Acceleration of Retrospective Video Analytics.” *USENIX NSDI 2023*. (To appear)

Neil Agarwal*, Arthi Padmanabhan*, Anand Iyer, Ganesh Ananthanarayanan, Yuanchao Shu, Nikolaos Karianakis, Guoqing Harry Xu, Ravi Netravali. “Gemel: Model Merging for Memory-Efficient, Real-Time Video Analytics at the Edge.” *USENIX NSDI 2023*. (To appear)

Frank Cangialosi, Neil Agarwal, Venkat Arun, Junchen Jiang, Srinivas Narayana, Anand Sarwate, Ravi Netravali. “Privid: Practical, Privacy-Preserving Queries on Public Video.” *USENIX NSDI 2022*.

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

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

Neil Agarwal, Jack Sullivan. *Differentially Private Queries in a Practical Systems Setting*. CS261 Final Project Report. Dec. 13, 2018.

Neil Agarwal, Hugh Greenberg, Sean Blanchard, and Nathan DeBardleben. “SaNSA – The Supercomputer and Node State Architecture.” *2018 Workshop on Fault-Tolerance for HPC at Extreme Scale (FTXS)*.

Neil Agarwal. *Supercomputer and Node State Architecture (SaNSA)*. Poster presented at the UltraScale Systems Research Center Student Symposium at the Los Alamos National Laboratory. Aug. 6, 2018.

Neil Agarwal. *The Global Data Plane Visualization & Monitoring Application: A White Paper*. Aug. 2017.

Neil Agarwal. *The Global Data Plane Visualization & Monitoring Application*. Demo presented at the TerraSwarm Annual Review at UC Berkeley. Oct. 2016.

AWARDS

- Princeton University Graduate Student Teaching Award *May 2022*
- Qualcomm Innovation Fellowship Finalist *June 2020*

EXPERIENCES

Princeton University *Sep 2019 – Present*

Graduate Student Researcher, Advisor: Prof. Ravi Netravali

- In *Gemel*, designed a memory management technique for edge-based video analytics deployments. (NSDI 2023)
- Developed *Boggart*, a system for general-purpose acceleration of retrospective machine learning-based video analytics queries. (NSDI 2023)
- In *Privid*, explored the tradeoffs between privacy and utility in video analytics on public surveillance cameras, and developed a system for privacy-preserving video analytics based on formal differential privacy techniques. (NSDI 2022)
- Studied the adverse effects of delay-based congestion control on HTTP; observed that delay-based algorithms often underestimate available network capacity in mobile networks which enables HTTP/1.1's multiple connections to achieve higher levels of network throughput than with HTTP/2's single multiplexed connection. (CoNEXT 2020)

Microsoft Research, Azure for Operators *Jun 2021 – Aug 2021*

Research Intern, Advisor: Dr. Victor Bahl

- Designed ML-based optimizations for reducing overheads in 5G beamforming.

NetSys Lab, UC Berkeley *Oct 2017 – Jun 2019*

Undergraduate Student Researcher, Advisor: Prof. Scott Shenker

- Demonstrated feasibility of the concept of packet state load balancing using TCP headers.
- Investigated security benefits of applying cryptography to stateless load balancing, comparing our results with state-of-the-art load balancing algorithms and systems.
- Explored new link state routing mechanism to handle failure more gracefully and reduce the number of packets lost while the routing table is being updated. The idea centers around using reliable flooding to handle packet delivery during recalculation of the routing table.

UltraScale Systems Research Center, Los Alamos National Laboratory *May – Aug 2018*

Research Intern, Advisor: Dr. Nathan DeBardeleben

- Designed health models of the lab's High Performance Computing (HPC) clusters
- Developed SaNSA, a software infrastructure that consumes data from multiple sources across the lab such as system logs, compute job reservations, and the system workload manager. It then aggregates the data using a multi-pass state extraction algorithm, and performs a panel of analytics such as anomaly detection via machine learning and state transition analysis using Markov Chains.
- Used SaNSA to perform a study of 4 open compute clusters at LANL, ingesting and analyzing over 1.1 billion lines of system logs.

Sony PlayStation, San Francisco

May – Aug 2017

Software Engineering Intern – PlayStation Vue

- Designed a personalized real-time televised sports recommendation system in Java using Spring, Docker, Kafka, Cassandra, and Solr.

Swarm Lab, UC Berkeley

Jan 2016 – Oct 2017

Undergraduate Student Researcher, Advisor: Prof. John Kubiatawicz

- Investigated a new architecture for IoT infrastructure, raising the level of abstraction to a data-centric design focused around the distribution, preservation and protection of information.
- Designed and developed a distributed application to monitor and visualize the Global Data Plane.

TEACHING ASSISTANT

Princeton University

- COS316: Principles of Computer System Design
- COS561: Advanced Computer Networks

Fall 2022

Fall 2021

UC Berkeley

- CS61A: The Structure & Interpretation of Computer Programs

Summer 2016

OPEN-SOURCE CONTRIBUTIONS

- Python Implementation of the Hasty Pudding Cipher, a tweakable-block cipher.
<https://github.com/neilsagarwal/hpc>