Ashwini Raina

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- 6+ years experience in designing storage systems using emerging storage technologies and new cloud architectures
- 8+ years of industry experience (SWE) in designing high-performance mobile systems and edge optimizations
- Interested in distributed systems, databases, and AI/ML infrastructure

PROJECTS AND EXPERIENCE

Princeton University | *Assistant Researcher*   2018 –Present

- Designed *Fusion*, an analytics object store that is optimized for SQL query pushdown.
  - Impact: Reduced datacenter network traffic by 64× and improved query tail latency by 48% in experimental settings.
  - Contributions: Developed a novel coding technique that co-designs erasure coding with the knowledge of analytics file format like Parquet. Fusion maximizes query pushdowns by eliminating the need for reassembly of Parquet column chunks over the network.
  - Implemented a research prototype in about 5K lines in Go language.
- Designed PrismDB, a new key-value store for emerging NVM devices, that is faster and more durable than RocksDB.
  - Impact: Improved throughput by 2.5×, reduced average write and read latency by 2.5× and 2× respectively, in experimental settings.
  - Contributions: Developed a new hybrid data layout and a multi-tiered storage compaction (MSC) mechanism that maximizes reads from NVM while minimizing flash writes.
  - Implemented research prototype in C/C++. Research paper published in top-tier systems conference, ASPLOS '23. Code on github.
- Relevant Coursework: Distributed Systems, Advanced Computer Networks, Systems and Machine Learning, Artificial Intelligence, Fundamentals of Machine Learning, Machine Learning for Signal Processing, Introduction to Data Mining

Apple | *Software Engineer*   2016 – 2016

  - Developed video packet queue tracking in iOS data stack to adapt FaceTime video bitrate to network conditions.
  - Developed an offline analyzer to investigate iOS data throughput bottlenecks across different network stacks and accelerators.

Qualcomm | *Staff Software Engineer*   2007 – 2015

- Early engineer on the team that developed and commercialized world's first LTE/4G data stack. My work led to 14 patents, some of which were adopted by the LTE standards body, and is now present in leading iOS and android devices.
  - Designed and implemented main features of RLC layer - IP packet concatenation and segmentation, re-transmissions, ACK/NAK polling and reporting, timer based discards, and handover procedures over a sliding window protocol.
  - Developed QoS features in the MAC and PDCP layer.
  - Designed a lightweight LTE/4G data compression technique optimized for resource constrained systems. This was first ever data compression scheme for LTE networks, and was deployed by Huawei on their back-end infrastructure.
  - Designed memory, cpu, and power based flow control mechanisms in LTE data stack to support resource constrained devices.
- TCP/IP accelerator
  - Identified key latency and throughput bottlenecks in LTE data stack. Collaborated with hardware teams to conceptualize Qualcomm's first generation LTE IP accelerator that supports DMA, ciphering, CRC, integrity, IP filtering, TCP checksum and QoS capabilities.

TECHNICAL SKILLS

Programming Languages : Proficient: C/C++, Python; Prior Experience: Go, SQL
Tools : Linux, performance profiling (perf, pprof), command scripting (bash), version control (git), visualization (matplotlib)

EDUCATION

Doctor of Philosophy (PhD) | *Computer Science (GPA: 4.0)*   2018 – 2024
Princeton University | Advisor: Michael J. Freedman

Master of Science (MS) | *Computer Science (GPA: 4.0)*   2016 – 2018
University of Illinois Urbana-Champaign | Advisor: Indranil Gupta

Master of Science (MS) | *Electrical Engineering (GPA: 3.96)*   2005 – 2007
University of Nevada Las Vegas | Advisor: Venkatesan Muthukumar

Bachelor of Engineering (BE) | *Information Techonology (GPA: 3.62)*   2000 – 2004
University of Mumbai

PUBLICATIONS AND PATENTS

Fusion: An Analytics Object Store Optimized for Query Pushdown   In submission 2024
Ashwini Raina, Jianan Lu, Asaf Cidon, Michael J. Freedman

Efficient Compactions Between Storage Tiers with PrismDB   ASPLOS 2023
Ashwini Raina, Jianan Lu, Asaf Cidon, Michael J. Freedman

RubbleDB: CPU-Efficient Replication with NVMe-oF   ATC 2023
Haoyu Li, Sheng Jiang, Chen Chen, **Ashwini Raina**, Xingyu Zhu, Changxu Luo, Asaf Cidon

Popular is Cheaper : Curtailing Memory Costs in Interactive Analytics Engines   EuroSys 2018
Mainak Ghosh, **Ashwini Raina**, Le Xu, Xiaoyao Qing, Indranil Gupta, Himanshu Gupta

14 patents granted for LTE/4G network optimizations. List of patents can be found here