Ashwini Raina

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Research Interests

Distributed systems, storage, ML for systems

Education

- **Princeton University** — Advisor: Michael J. Freedman
  Ph.D. candidate in Computer Science; GPA: 4.00 — *Aug. 2018 – present*
- **University of Illinois Urbana-Champaign** — Advisor: Indranil Gupta
  Master of Science in Computer Science; GPA: 4.00 — *Aug. 2016 – Aug. 2018*
- **University of Nevada** — Advisor: Venkatesan Muthukumar
  Master of Science in Electrical Engineering; GPA: 3.96 — *Aug. 2005 – Aug. 2007*
- **University of Mumbai** — Mumbai, India
  Bachelor of Engineering in Information Technology; GPA: 3.62 — *Aug. 2000 – July. 2004*

Research

- **PrismDB**: A novel key-value store architecture and compaction algorithm that exploits two extreme ends of the spectrum of modern NVMe storage technologies (3D XPoint and QLC NAND flash) simultaneously.
- **Getafix**: A lightweight, heterogeneous data replication scheme that cuts memory costs in real-time analytics engines - **EuroSys'18**.
- **Rubble (ongoing)**: A novel replication scheme that leverages new generation network storage protocols like NVMe over Fabrics and Remote Direct Memory Access(RDMA) to reduce CPU and I/O overhead in replicated LSM-tree based key-value stores.

Industry Experience

- **Apple - iOS Software Engineer** — *Jan 2016 - June 2016*
  - *FaceTime video adaptation*: Built data stack queue tracking for adapting FaceTime video bitrate
  - *iOS data bottlenecks*: Built an offline analyzer to investigate data throughput bottlenecks across different protocol stacks, hardware modules, and processors.
- **Qualcomm - Staff Software Engineer** — *Oct 2007 - Sept 2015*
  I was an 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 3GPP standards body, and is now present in leading iOS and android devices. I presented part of this work at the Mobile World Congress.
  - *LTE/4G data stack*:
    - 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 and ZTE on their back-end infrastructure.
    - Designed memory, cpu and power based flow control mechanisms in LTE protocols to support resource constrained devices in developing nations.

- *TCP/IP accelerator*:
  - Identified key latency and throughput bottlenecks in LTE/4G 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.

Publications

- *"Efficient Compactions Between Storage Tiers with PrismDB"*, **Ashwini Raina**, Jianan Lu, Asaf Cidon, Michael J. Freedman - Under Submission
- *"Popular is Cheaper : Curtailing Memory Costs in Interactive Analytics Engines"*, Mainak Ghosh, **Ashwini Raina**, Le Xu, Xiaoyao Qing, Indranil Gupta and Himanshu Gupta - European Conference on Computer Systems (**EuroSys**) 2018

Patents

14 granted patents on LTE/4G protocol design and related data compression techniques (complete list here)

- Efficient UE QoS/UL packet build in LTE
- Quick RLC re-transmission on HARQ failure during tune away
- Evolved data compression scheme signaling
- Enhanced compression formats for data compression
- Evolved data compression scheme for unreliable transmission modes

Technical Skills

Languages: C/C++, Python, Java, Go(familiar), SQL, LaTeX
Databases: LevelDB, RocksDB, PostgreSQL
Other: Hadoop, Tensorflow(familiar), Scikit-learn

Honors and Awards

- Princeton Fellowship in Natural Sciences and Engineering
- Upendra Patel Achievement Award, highest honor in Qualcomm, for contributions to Qualcomm's first generation LTE/4G technology development and commercialization
- Awarded 10 Qualstars (individual accomplishment awards) for key engineering contributions to various projects within Qualcomm
- James F. Adams / GPSA scholarship in recognition of outstanding Masters research
- Ballys Technologies scholarship for graduate work
- Tau Beta Pi - engineering honor society member
- Sir Ratan Tata Trust Scholarship recipient
- All India Talent Search Examination (AITSE) scholar