Mayank Baranwal

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EDUCATION

Masters in CS, Carnegie Mellon University	**3.95/4.0**	*Aug 2022 - Dec 2023*
Bachelors in CS, Indian Institute of Technology, Guwahati	**9.76/10.0 (Rank 3)**	*July 2017 - July 2021*

EXPERIENCE

Apple | Software Developer Intern (*In-Progress*) Seattle, Washington | *May 2023 - Aug 2023*
- Optimizing execution time for a geo-distributed, cloud-based database that powers Apple's search infrastructure.

Microsoft Research Lab | Research Fellow Bangalore, India | *July 2021 - July 2022*
- Devised a novel paradigm to train Mixture-of-Expert models by breaking them into independent experts as opposed to industry standard of splitting only a few model layers between experts.
- Reduced training time by 2x over baselines by enabling arbitrary parallelism during model training.

Nutanix | Intern, Member of Technical Staff Bangalore, India | *Apr 2020 - June 2020*
- Created an asynchronous event-driven service that optimized latency by 90% for Prism, the Nutanix control plane.
- Performed AuthN and AuthZ, negotiated data concurrency issues for distributed systems and enabled notification service across Nutanix products by leveraging frameworks like Spring Boot and STOMP.

PROJECTS

Inlining UDFs in DuckDB | *Prof. Andy Pavlo, CMU* [GitHub PR](#) | *Spring '23*
- Engineered support for unnesting arbitrary depth correlated joins (LATERALs) in DuckDB, a first in an open-source database. With Apfel, UDFs are efficiently executed without a nested loop implementation of LATERALs.
- Comparable performance to hand-written implementation of UDFs (within 2x) with SF10, SF100 on ProcBench.

Database Systems - BusTub *Fall '22*
- Implemented buffer pool manager, extendible hash table, B+ tree index, query executors, lock manager and deadlock detection for concurrent query execution in a disk-based database management system in C++17.

Distributed Systems *Fall '22*
- Developed a distributed, consistent, replicated log with Raft protocol using RPCs for communication between replicas. Built a distributed bitcoin miner by implementing a variant of TCP for client-server interactions.

Automatic Guidance System for Motor Vehicles [GitHub](#) | *Texas Instruments IICDC '18*
- Led the development of a computer vision based vehicle anti-collision system along with a start-up business model that evaluates driver alertness, calculates live stopping distance and reduces cost by 5x over commercial solutions.

PUBLICATIONS

DAMUS: Dynamic Allocation in MUlti-Retention STT-RAM Caches [Publication](#) | *ISQED '21*
- Designed a multi-retention STT-RAM cache configuration along with online cache block reallocation policy based on write frequency that optimizes cache hit rate, latency and lifetime while being energy-efficient.
- Achieved 45% fewer write-backs, 19% lower EDP and 48% longer lifetime over SOTA caches.

CRT-KPS: A Key Predistribution Scheme Using CRT [Publication](#) | *ACISP '18*
- Created a non-interactive, energy-efficient, connected and resilient combinatorial key agreement scheme for distributed ad-hoc networks by leveraging Chinese Remainder Theorem (CRT) isomorphism.

ACHIEVEMENTS

Institute Merit Scholarship: Achieved highest GPA in IIT Guwahati during pre-final year.
ACM ICPC: All India Rank 52 among 4000+ teams in India Qualifiers (Team: SIGSEGV).
Google Kick Start: Secured **Global Rank 134** among 9000+ contestants.

SKILLS

Languages: Modern C++(14/17), Python, Go, Java, Bash, SQL, JavaScript
Tools and Frameworks: Docker, Kubernetes, AWS, gem5, Git, CUDA, PyTorch, Arduino, LaTeX
Coursework: Adv. Database Systems, Adv. Cloud Computing, Adv. Intro to ML, Networks, Operating Systems, Computer Architecture, Compilers, Data Structures, Algorithms, Probability and Statistics