Prakam

+91-7302949709 • prakam579@gmail.com • LinkedIn

EDUCATION

Indian Institute of Technology, Delhi   2018 - 2022
Bachelor of Technology in Computer Science and Engineering **(GPA: 8.12/10.0)**

- Ranked in top 1% among 950 students; received offers from top selective on-campus recruiters including Google & Graviton
- Served as Teaching Assistant for Differential Calculus course supporting over 200 undergraduate students in core topics
- Completed undergraduate thesis research on partial information extraction from intractable integer and polynomial powers

Pre-College Education: St. JP Public School (High School) & Delhi Public School (Middle School)   2015 - 2018

- Graduated high school in top 3 among 300 students with academic score of 96% in STEM courses demonstrating excellence
- Achieved perfect 10.0 CGPA across middle school graduating as top ranked; awarded Gold Medal in 10th grade
- Two-time State Champion in Abacus Mental Arithmetic representing Delhi at national competitions across multiple years
- Represented school at Under 16 National Inter Collegiate Chess Tournament for three consecutive years with distinction

INDUSTRY AND RESEARCH EXPERIENCE

Carnegie Mellon University, Pittsburgh, USA   Remote
Research Assistant: LLM Reasoning Benchmarking   May 2025 - Present
Advisors: Prof. Carolyn Rosé, Prof. David R. Mortensen

- **PBEBench Benchmark Development**
  - Developed PBEBench, a contamination-free synthetic benchmark generator for evaluating multi-step inductive reasoning in LLMs, under a knowledge-independent string rewrite formulation; currently submitted to ICLR 2026
  - Controlled reasoning difficulty using number of rewrite steps, ordering constraints, and number of string examples
- **Large-Scale Model Evaluation**
  - Evaluated 20 open- and closed-source LLMs, with GPT-5 and gpt-oss-120B as top performers; accuracy remained below **5%** pass@1 on challenging benchmarks, demonstrating LLM's failure in forward reconstruction for linguistics.
  - Conclusively showed that LLMs rely on surface-level heuristics, avoiding ordering constraints of string rewrite rules when possible and failing when they cannot, leading to brittle breakdowns in multi-step rule composition.
- **Test-Time Scaling and Reasoning Limits**
  - Studied test-time scaling strategies (sampling budget, max sequence length, reasoning effort), identifying performance saturation (GPT-5 peak 43.8% pass@1); showed sampling as slower and more redundant than CoT scaling.
  - Discovered a critical minimum CoT length threshold for various models, below which performance collapses to zero.

University of Illinois Urbana-Champaign, USA   Remote
Research Assistant: RL Post-Training Optimization   Sept 2025 - Present
Advisors: Prof. Dilek Hakkani-Tür, Prof. Hao Peng

- Empirically showed that a small subnet (10%) within the parameters updated during RL fine-tuning process drive 99% of performance on benchmarks; consistent across various fine-tuning regimes (PPO, DPO, and GRPO) and benchmarks
- Developing ranking methods for model parameters using Fisher scores and Hessian diagonal approximations to identify performance critical subnets early in training, enabling large scale parameter freezing to reduce RL fine-tuning costs

Graviton Research Capital   Gurgaon, India
Systems Research Engineer II (2024-2025) | Systems Research Engineer (2022-2024)   May 2022 – May 2025

- **Distributed Systems & Network Instrumentation**
  - Led design and implementation of a bi-directional network sniffer using TCP sequence/ACK correlation to map RX/TX traffic, enabling accurate cross-server packet ordering and state reconstruction across servers.
  - Architected a distributed capture pipeline using switch SPAN and kernel-bypass networking, incorporating packet gap detection and recovery to ensure high-fidelity traffic replication with zero impact on live trading latency.
- **Systems Design & Specialized Implementations**
  - Engineered a hybrid market-data aggregation pipeline for Hong Kong, merging incompatible real-time event streams and snapshot feeds to maintain continuous market visibility during periods of partial data availability.
  - Delivered a full hardware–software integration pipeline for FPGA payloads, building low-latency communication channels and custom protocols for trigger generation and order submission, now used across 10+ venues.

- **Low-Latency Engineering & Performance Optimization**
  - Performed latency profiling using Linux `perf`, diagnosing cache misses and branch mispredictions; applied targeted prefetching and branchless code design, reducing median processing latency by 40% on critical market-data paths.
  - Built hot-path warm-up mechanism using test injection for cache warming, reducing initial packet latency by **50%**.
  - Built large-scale PCAP ingestion and latency analysis tool, enabling systematic performance bottleneck detection.
  - Designed a partial TCP chunk-read API enabling early payload parsing, reducing latency on slow network links.

GlobalLogic Pvt Ltd (Junior-year summer internship) Noida, India
Software Development Intern May 2021 – July 2021
- Built ARCore indoor navigation system fusing 6-DoF tracking, depth sensing, & SLAM-style mapping for stable localizing
- Designed 3D guidance pipeline anchoring virtual waypoints to physical environments, with stable overlays under motion
- Evaluated performance across lighting and device conditions, analyzing drift, stability, and deployment constraints

MovTrack Biomedical Pvt Ltd (Freshman-year summer internship) New Delhi, India
Research & Developement Intern May 2019 – Jul 2019
- Optimised integration of electronic sensors into wearable textiles, analyzing placement, flexibility, and data fidelity.
- Prototyped garment-embedded sensing methods at IIT Delhi labs, quantifying signal reliability under motion and strain
- Led the technical Q&A session at the Biotechnology Ignition Grant review, addressing panel questions on system design

PUBLICATIONS AND AWARDS

Publication
- Naik, A., **Prakam**, Agrawal, D., Kapadnis, M., An, Y., Mathur, Y., Rosé, C., Mortensen, D. R. (2025). PBEBench: A multi-step programming by examples reasoning benchmark inspired by historical linguistics. Submitted to ICLR 2026.

Awards
- Awarded the KVPY Fellowship (2017), placing 1127th nationwide among 500,000 candidates (top 0.25%) in a two-stage government research scholarship examination for admission to the Indian Institute of Science (IISc), Bangalore.
- JEE Main (2018): Ranked 604 among 1.1 million candidates in India's national engineering entrance examination.
- JEE Advanced (2018): Ranked 528 among 155k candidates; for admission to the Indian Institutes of Technology (IITs).

ACADEMIC PROJECTS

Self-Learning CPU Cache Prefetcher Jun - Jul 2020
Sophmore year summer research project | Advisor: Prof. Kolin Paul

- Designed modular cache prefetcher in the gem5 simulator, built to operate independently of the simulation configuration
- Evaluated multiple prefetching strategies and incorporated signals from recently-evicted cache lines to guide dynamic prefetch decisions; achieved 20% reduction in cache misses and noticeable decrease in runtime of executables

PintOS Kernel Development Apr - May 2021
Operating Systems course project | Advisor: Prof. Kolin Paul
- Implemented kernel-space system calls in the PintOS operating system and successfully executed user programs on them
- Facilitated priority scheduling and donation for multi-threaded programs in PintOS for semaphores and condition variables

Processor Design Jan - Mar 2020
Digital Logic course project | Advisor: Prof. Preeti Ranjan Panda
- Designed and synthesized a MIPS processor in VHDL (FPGA), supporting arithmetic, comparison, and branch instructions.
- Implemented a pipelined processor in C++ with detection, forwarding, and stalling for data and branch hazards.

RL Pacman Agents Apr – May 2021
Machine Learning course project | Advisor: Prof. Rohan Paul
- Implemented intelligent Pacman agents using reinforcement learning algorithms including value iteration and Q-learning.

TECHNICAL SKILLS

Languages: Python (expert), C/C++ (expert), Bash (comfortable), JavaScript (novice)
Frameworks: Verl, vLLM, Open-Instruct, Olmes, Prime-RL, PyTorch, HuggingFace, TensorFlow, FastAPI, JupyterLab, Git

COMMUNITY & INTERESTS

- Member of AINA, organizing study groups and informal discussion circles to support collaborative, judgment-free learning.
- Volunteer at community school, teaching Math and English to primary students and mentoring on educational opportunities
- Languages & Interests: 10+ years performing guitar at school and college events; Fluent in English, Hindi and Sanskrit