# Mrigank Bhatnagar

**Software Development Engineer Intern | Core Systems, Distributed Infrastructure & Algorithms**

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## Education

**Bennett University** Greater Noida, India

*B.Tech in Computer Science Engineering (Specialization in Data Science) – CGPA: 8.44/10.0* *Expected July 2028*

– **Relevant Coursework:** Data Structures & Algorithms (C++), Operating Systems, Computer Networks, DBMS, Object-Oriented Programming, Software Engineering, Distributed Systems, Microprocessors & Architecture.

## Technical Skills

**Languages**: C++ (C++17/20), Go, Rust, Python, SQL
**Systems & Infrastructure**: Distributed Systems, High Concurrency, Zero-Copy I/O, Lock-Free Concurrency, Docker Containerization, Git, CI/CD
**Databases & Storage**: PostgreSQL, Redis, LSM-Trees (MemTable/WAL), SkipLists, Bloom Filters, Apache Arrow, MySQL
**Developer Tools & Frameworks**: FastAPI, REST APIs, Microservices, Unit Testing (GTest/PyTest), Linux Tools

## Open-Source Contributions

**Apache Arrow C++** | *C++, Vectorized Compute, Parquet V2, Memory Systems* | PR #55171, #55453 (Merged) Nov 2026

– Engineered direct mixed comparison kernels and prefix-aware early rejection for StringViews in Apache Arrow C++ (PR #55171, Merged; #55425), bypassing intermediate type casting to eliminate 2 MiB of temporary heap allocations per batch (99.2% reduction) and achieving a **2.6x–3.4x speedup** (up to **15.2x on 1 MiB strings**).

– Defaulted Parquet writer properties to V2 data pages across C++ and Python (PR #55453, Merged), enabling page-level null counts and selective compression to accelerate columnar scans by **12%–35%** across benchmarks.

**Apache DataFusion** | *Rust, Python, Query Optimizer, Property-Based Fuzzing, FFI* | PR #27258, #1806 (Merged) Oct 2026

– Refactored key-range bitmap union fuzz testing in Rust (PR #27258, Merged), exposing partition accessors in physical planning for reproducible CI triage; authored upstream patches across Python FFI bindings (PR #1806).

## Portfolio Projects

**Forest Storage Engine** | *Go 1.22+, LSM-Tree, Lock-Free SkipList, WAL, Bloom Filters, mTLS* | GitHub Aug 2026

– Architected a Log-Structured Merge-Tree (LSM) key-value storage engine in Go, designing a custom binary TCP protocol parser that decodes wire frames in **5.85ns** with **0 heap allocations** to eliminate garbage collection pauses.

– Implemented a concurrent lock-free active MemTable via a **SkipList** with atomic pointer swaps, backed by an `fsync`-flushed **WAL** for crash durability and probabilistic **Bloom filters** to eliminate redundant SSTable disk reads.

**Aegis** | *Go, Raw Sockets, TLS 1.3 SNI, RFC 1035 UDP DNS, Lock-Free Radix Tree* | GitHub Oct 2026

– Engineered a high-concurrency L3–L7 Zero Trust forward proxy in Go, implementing byte-level **TLS 1.3** ***ClientHello*** SNI parsing and a lock-free **Radix Tree** for sub-millisecond packet routing without terminating cryptography.

– Built an in-memory **RFC 1035 UDP DNS resolver** with TTL caching, paired with a **zero-copy TCP relay plane** using `sync.Pool` buffer recycling and Linux `splice` to sustain bidirectional traffic with **0 heap allocations**.

**CampusCompile** | *Go, Redis, PostgreSQL, Docker Sandboxes, Distributed Systems* | GitHub Feb 2026 – Mar 2026

– Architected a concurrent competitive programming judge in **Go** with a **Redis** message queue, sustaining **sub-50ms execution latency** during load testing of 100+ concurrent submissions with zero dropped requests.

– Engineered an asynchronous grading engine with isolated **Docker execution sandboxes** (strict CPU/memory cgroups), decoupling submission ingestion from test-case evaluation to eliminate process exhaustion and guarantee memory safety.

## Competitive Programming & Achievements

- **ICPC Regionals Asia West & 2x Institute Topper:** Qualified for the **ICPC Regionals Asia West (2026–27)** with **AIR 1219** in 2026 Prelims; ranked **1st at Bennett University 2 years in a row** (AIR 1219 in 2026, AIR 1347 in Prelims with team *LambdaSoup*); qualified for **INOI** in 2023.
- **Algorithmic Mastery (DSA):** Solved **1,500+** problems primarily in **C++** – **LeetCode Knight** (Peak **2094**, Top 1.61%, 700+ solved), **Codeforces Specialist** (**1422**), **CodeChef 3-Star** (**1732**), and **Meta Hacker Cup 2025** (Round 1 Rank **6,449**).
- **Competitions & Honors:** Secured **All-India Rank 2447 out of 23,000+ teams** in the Amazon ML Challenge 2026; ranked among the **Top 10 Undergraduates Nationally** in the IRM India Game of Enterprise Risk (GOER) 2026.

## Leadership & Experience

**GeeksforGeeks Student Chapter** | *Vice Chairperson (2025–2026)* | *Tech Core (2024–2025)* Sept 2024 – May 2026

– Directed a 60-member technical student community, designing comprehensive DSA curricula and mentoring peers for ICPC preliminaries.

– Led execution of *GeekCode 2.0* campus contest and organized multiple high-attendance data structures and algorithms bootcamps.

**Astronomy Club** | *President (2026–2027)* | *Developers (2025–2026)* Sept 2025 – Present