

# Ritu Raj

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## EDUCATION

**Indian Institute of Information Technology Gwalior, India**

November 2022 - June 2027

*Integrated postgraduate in Information Technology.*

## COURSE WORK

**Theory:** C++ Programming, Algorithms, Operating Systems, Computer Networks, Database Management Systems, Computer Organisation and Architecture, Object Oriented Programing, Software Engineering, Computer Graphics

**Lab:** Algorithms Lab, DBMS Lab, Operating Systems Lab, Computer Networks Lab, AI Lab, ICT Workshop

## TECHNICAL SKILLS

**Languages & Frameworks:** Js, Ts, Go, C++, React.js, Next.js, Express.js, Redux, Material UI, Shadcn/UI

**Web & DevOps:** MongoDB, MySQL, Redis, Git, GitHub, Amazon Web Service, Postman, Vercel, WebSockets

## PROJECTS

**Key-Value Store** | *Go lang, Data structures, Database*

- Engineered high-performance persistent Go key-value store achieving **150k+ writes/sec** and **1M+ reads/sec** throughput on **100K** dataset using custom **B-Tree** backend with **WAL** architecture.
- Optimized disk I/O operations resulting in **85% reduction** compared to initial MVP in disk writes by developing lock-free channel-based **Batch Flusher** that coalesces **500 operations/batch** with guaranteed durability.
- Enhanced system reliability delivering **sub-50ms recovery time** and zero data loss by implementing ACID-compliant **WAL only replay** mechanism for crash recovery.
- Accelerated read performance with **97%+ cache hit rate** and **sub-200ns latency** by designing **cache-first** lookup strategy that bypasses B-Tree traversal for hot keys.
- Maximized mixed operation throughput reaching **435K+ operations/sec** by implementing **double-buffer WAL flusher** with buffer swapping while maintaining controlled **2ms durability window**.

**Version Control System** | *Go, System Design, Data Structures & Algorithms*

- Built global **CAS** with string interning using bidirectional treemaps, achieving **95%** storage reduction through **deduplication** across all versions
- Achieved sub-millisecond per-version retrieval (**65-219  $\mu$ s**) with sub-linear storage scaling: 6.85MB database, 7MB memory for 1000 versions.
- Implemented Last Snapshot Ancestor based approach enabling O(k) reconstruction with bounded chain length (k=50) for version retrieval, eliminating tree-traversal searches entirely.
- Developed a **diffing engine** using **Myers algorithm** to generate delta nodes for files with upto **10k+ LOC** in less than **50ms** latency.
- Designed hydration strategy using projections and bulk queries from MongoDB to build in-memory cache, eliminating all database calls during rendering.

**Trie Based Search Engine** | *React.js, Data Structures*

- Developed predictive search engine with **sub-150ms response latency** by implementing **Trie data structure** with prefix matching algorithms for real-time search suggestions.
- Enhanced search accuracy achieving **95% typo-tolerance rate** by integrating **fuzzy search** algorithms with **Levenshtein distance** calculations and configurable edit distance thresholds for robust string matching.

**Mail Automation Website** | *React.js, Redux Toolkit, Node.js, MongoDB, Express.js, Docker, Google Cloud*

- Developed scalable email automation client processing **100+** mails with **sub-10-second response times**.
- Streamlined authentication and email operations enabling **seamless API endpoint integration** by designing comprehensive **RESTful** architecture with Google OAuth 2.0 and Gmail API integration for secure user management and email delivery.

## ACHIEVEMENTS

- Ranked **3612** in first round of **Meta Hacker Cup 2025** among **13,000** candidates and qualifying to Round 2.
- Placed **1864** globally in **CodeFest'25 Prelims** by **IICPC** in collaboration with Jane Street, D.E. Shaw & Co.
- Achieved overall max rating of **Specialist (1549)** on CodeForces, among the top 7% coders in India - **Profile**
- Reached max rating of **4 star (1805)** on CodeChef among top 5% competitive programmers in India - **Profile**
- Rated as a **Kyu 6 (938)** on AtCoder, best contest rank **1176** in ABC. 407, among top 5% in India - **Profile**
- Rated as **Knight (1886)** on LeetCode, best rank **745** in 26,000 participants, among top 4% in India - **Profile**
- Secured **1st Rank (Certificate)** out of **200** teams at HackOdisha 2023 Hackathon organised by NIT Rourkela
- Finished **3rd rank (Certificate)** out of **2000** teams at Hack-O-Fest 2024 national hackathon by NIT Patna
- Earned multiple times **top-1000** ranks (**774, 917**) in Codeforces Divison 2 contests among 20,000+ participants
- Solved more than **1000** Data structure questions on CodeForces, LeetCode, AtCoder, CodeChef, CSES, SPOJ
- Competed in the **National Final Round (Mail)** of KnackToHack 2024 innovAItE Hackathon by M&G Gopal
- Achieved **Rank 1** in (Spring Term 2022-2023) in the **ICT Workshop** by the **Department of EEE, IIIT Gwalior**