# Rohan Tripathi

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## Education

**Rutgers University – New Brunswick** — New Brunswick, NJ
*Master of Science in Computer Science* — *2023 – 2025*

- GPA: 3.75/4.0
- Concentration: Systems & Machine Learning

**Manipal Institute of Technology** — Manipal, Karnataka
*Bachelor of Technology in Computer Science* — *2019 – 2023*

- GPA: 8.32/10
- Concentration: Computer Networks & Security

## Research Experience

**Research Assistant — Rutgers University New Brunswick** — Feb. 2025 – Present
*Advisor: Prof. Richard Martin* — *New Brunswick, NJ*

- Developing an end-to-end GPU-accelerated IPv4 source authentication design using SHA256 hashing and packet header manipulation to address source verification problems in the internet.
- Designed the middleware key-selection layer using Longest Prefix Match (LPM) on IPv4 source addresses, implemented with Patricia Trie, Binary Radix Trie, and DIR-24-8 and DXR algorithms for performance comparisons.
- Benchmarked lookup algorithms over routing tables up to 10M prefixes to support real-time cryptographic key selection.
- Developed optimized CUDA kernels for hashing 120-byte expanded IPv4 headers using SHA-256 with warp-level parallelism and coalesced memory.

**Student Researcher — Manipal Institute of Technology** — Jan. 2023 – May 2023
*Advisor: Dr. Vivekananda Bhat K.* — *Manipal, Karnataka*

- Built a secure, blockchain-based industrial IoT data exchange model for large scale deployment setups
- Designed and deployed ethereum smart contracts that reward fair exchanges and penalize malpractice
- Measured end to end deployment time and gas (ethereum cost) of each transaction/exchange using this setup and demonstrated its usability with a prototype

## Publications

Tripathi, Rohan; Rao, Ritam; Bhat K., Vivekananda; Kumar Pandey, Abhishek; Kumar Das, Ashok. "*Secure Blockchain Integration Approach for Knowledge Discovery in Industrial Internet of Things*," *IEEE Open Journal of the Communications Society*, vol. 6, pp. 4772–4787, 2025. DOI: 10.1109/OJCOMS.2025.3574816.

## Industry Experience

**Software Developer — Xtreme Care** — Oct. 2025 – Present
*OneCheck Exclusions Platform* — *Bayside, New York*

- Developed and deployed a production-ready healthcare exclusions screening platform supporting ElasticSearch with high performance fuzzy search on federal and state exclusion databases
- Built backend using AWS EC2, PostgreSQL, Redis, and NGINX with automated ingestion, normalization, versioning, and high-performance fuzzy search.
- automated re-checks, and creation of audit logs, multi-list filtering, and role-based access controls.
- Implemented monitoring, logging, and performance dashboards for reliability and compliance workflows (HIPAA and FWA compliance).

**Network Security Intern — ERNET India** — Jun 2022 - July 2022
*Web Application Testing* — *Delhi, India*

- Generated Penetration Test reports for different web applications using OWASP ZAP, Burpsuite and manual testing
- Set-up new networks with IPv6 configuration and firewall filtering
- Joined and completed the ICBBR Bug Bounty Researcher Certification and attained Falcon status in the National Security Database

## Academic Projects

**Ciphertext Classification using Machine Learning Models** 2025

*Rutgers University* *New Brunswick, NJ*

- Developed ML models to classify ciphertexts encrypted with AES, DES, and RC5 using Logistic Regression, Random Forest, XGBoost, and BERT.
- Extracted statistical, n-gram, and entropy-based features enabling reliable attribution under variable length ciphertext conditions.
- Demonstrated that RC5 is easily distinguishable and AES and DES can be identified for short length ciphertexts

**Coverage-Optimized Fuzzer for Black-Box Adder Circuits** 2024

*Rutgers University* *New Brunswick, NJ*

- Designed a mutation-guided fuzzer for black-box hardware adder circuits to maximize functional and edge-case coverage.
- Used directed heuristics to discover rare corner cases and propagate faults through multi-bit structures.
- Evaluated coverage improvements using simulated hardware fault injection.

**Custom OS Schedulers and User-Level Thread Library** 2023

*Rutgers University* *New Brunswick, NJ*

- Implemented Round Robin, MLFQ, and priority-based schedulers in C with preemption and configurable time slicing.
- Built a user-level threading library providing context switching over pthreads with cooperative and preemptive modes.
- Added abstractions for thread creation, synchronization, and scheduling policies similar to lightweight kernel schedulers.

## Open Source Contributions

**Linux Kernel Contributor (drivers/staging)** Oct. 2025

*Linux Kernel*

- Authored and upstreamed Linux kernel patches through the LKML review process, focusing on coding-style correctness, dead code removal, and long-term maintainability of kernel drivers.
- Patches were reviewed and merged upstream, including a commit reviewed by Dan Carpenter and signed off by subsystem maintainer Greg Kroah-Hartman (kernel commit).

## Technical Skills

**Programming Languages**: C, C++, Rust, Python, CUDA, Go, Bash
**Operating Systems**: Kernel programming, system calls, process scheduling, virtual memory, paging, synchronization primitives, concurrency bugs, user–kernel boundary, filesystem internals
**Distributed Systems**: Consensus (Raft/Paxos), replication, failure detectors, consistency models, leader election, partition tolerance, membership protocols, log-structured design
**Networking**: TCP congestion control, packet scheduling, routing tables, NAT/firewalls, sockets programming, RPC frameworks, traffic engineering, software routers
**Performance Engineering**: Profiling (perf, eBPF, ftrace), microbenchmarking, cache behavior, NUMA, CPU pipeline effects, lock contention analysis, memory layout optimization
**Parallel & GPU Computing**: CUDA kernels, warp execution, memory hierarchies, streams/pinned memory, GPU–CPU data movement optimization, Nsight profiling
**Storage Systems**: SSD internals, I/O scheduling, log-structured storage, write amplification, journaling, caching layers, checkpointing
**Security**: Secure systems design, threat modeling, side-channel awareness, attack surfaces in OS/networks, cryptographic protocol basics
**Tools & Platforms**: Linux, Docker, Kubernetes, Git, perf, eBPF, Valgrind, gdb, strace, tcpdump, Wireshark, PostgreSQL, Redis, AWS

## Social Activities

**Sightsavers India** Aug 2021 – Jan 2022

*Community health outreach (vision care awareness)* *India*

**REACH (Government of India Initiative)** Apr 2020 – Mar 2021

*Public health outreach (tuberculosis awareness)* *India*