

DEVANSH LODHA

Systems Research • AI for Good

Undergraduate Researcher | Computer Science and Engineering

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EDUCATION

Indian Institute of Technology Gandhinagar

B.Tech in Computer Science and Engineering (Honors)

CPI: 9.38/10

2023-2027

AWARDS AND ACHIEVEMENTS

- Young Researcher, 13th Heidelberg Laureate Forum: 1 of 100 CS researchers globally selected to attend. 2026
- HLFF Travel Grant: Awarded full sponsorship by the Heidelberg Laureate Forum Foundation. 2026
- Best Graduate Forum Paper Award (Runner Up), IEEE COMSNETS 2026. 2026
- Top 20% Award: Recognized by Head of Department, CSE. 2025
- Dean's List Awards: Semester I, Semester II, Semester V. 2023-26
- State Topper, Indian Olympiad Qualifier in Physics (IOQP) organized by HBCSE-TIFR. 2023
- Ranked Top 0.27% in JEE Mains (1.2M candidates) & Top 2.7% in JEE Advanced (200k candidates). 2023
- NTSE Scholar: National Talent Search Examination scholarship (Top 0.1% of applicants). 2021

PUBLICATIONS

MCP-Diag: Deterministic Architecture for AI-Native Network Diagnostics

Devansh Lodha, Mohit Panchal, Sameer G. Kulkarni

IEEE COMSNETS 2026 (Graduate Forum)

Best Graduate Forum Paper Award (Runner Up)

Peer-Reviewed Short Paper & Oral Presentation

Arxiv | [GitHub](#) | [Poster](#)

- Novel Architecture: Proposed a deterministic governance layer adapting the Model Context Protocol (MCP).
- Formal Guarantees: Engineered type-safe translation layer guaranteeing CLI schema adherence, eliminating hallucinations.
- Performance: Enforced governance on commands and streaming via parallel SSE, maintaining <0.2% latency overhead.

EXPERIENCE

Google

Bangalore, India

Software Engineering Intern

May'26-Jul'26

- Self-Healing Networks: Architecting AI pipelines on production telemetry for automated global routing anomaly triage.

Sustainability Lab

Gandhinagar, India

Research Intern | IIT Gandhinagar | Advisor: Prof. Nipun Batra

Jan'25-Dec'25

- Skyfall (VLM Evaluation): Designed Earth Observation failure-mode benchmark. Introduced CASCADE metric, utilizing semantic embedding distance over binary accuracy to heavily penalize hallucinated classifications. ([Poster](#))
- Data Engineering at Scale: Built a Google Earth Engine pipeline processing 200k+ points for probabilistic ground-truth generation. Implemented hierarchical sampling to enforce model evaluation on rare-biome hard negatives.
- ViT-FPN Architecture: Developed a Generalized ViT-FPN Adapter to bridge the dimensional gap between 1D token sequences of Remote Sensing Foundation Models (e.g., TerraMind) and 2D object detectors. ([Poster](#))
- Low-Shot VLM Adaptation: Benchmarked PaliGemma/Qwen2.5-VL against YOLOv11-OBB. Demonstrated fine-tuned VLMs achieve parity using <5% training data, validating viability for data-scarce enforcement. ([GitHub](#) | [Blog](#) | [Poster](#))

SELECTED PROJECTS

Flamingos (Rust Unikernel)

Contributor | Mentors: Prof. Barton Massey, Philipp Oppermann | [GitHub](#)

Feb'26-Present

- Invited to architect the Hardware Abstraction Layer (HAL) for the Raspberry Pi 5 on the experimental Flamingos OS.

BareBonesML: Deep Learning Framework from Scratch

Personal Project | [GitHub](#)

May'25-Present

- Built NumPy-based Reverse-Mode AutoDiff engine and implemented chain rule for dynamic computational graphs.
- Constructed Transformers and ViTs to analyze scalar-level gradient flow, vanishing gradients, and optimization dynamics.

Secure ATM: Cryptographic Client-Server Architecture

Advisor: Prof. Abhishek Bichhawat | [GitHub](#)

Mar'26-Apr'26

- Engineered zero-dependency C++23 POSIX daemon securing financial state via AES-256-GCM.
- Neutralized MITM and timing side-channels using temporal nonces and `CRYPTO_memcmp`.
- Designed Monadic (`Result<T>`) and RAIL architecture ensuring `O_EXCL` TOCTOU immunity.

8-Bit Processor Design and Simulation in Verilog

Advisor: [Prof. Joyce Mekié](#) | [GitHub](#) | [Blog](#)

Jan'24-Apr'24

- Designed modular Verilog accumulator-based processor with custom 19-instruction ISA, ALU, and Control Unit.

TEACHING

SC 409: Modern Bare Metal Embedded Systems with Rust

[IIT Gandhinagar](#) | [Course Materials](#)

Mar'26

- Instructed 5-lecture curriculum on bootstrapping 64-bit AArch64 OS on Raspberry Pi 5 using SWD, OpenOCD, and GDB.
- Taught cross-compilation, linker-script, AAPCS64 C-ABI compliance, and register manipulation for privilege level drops.
- Covered MMIO for PL011 UART drivers, volatile intrinsics and encoding hardware constraints into Rust tpestates.

Vision Language Models

[ACM India Summer School on AI for Social Good 2025](#) | [Blog](#) | [YouTube](#)

Jun'25

- Delivered tutorial on VLM architectures and fine-tuning strategies to 60+ undergraduate and postgraduate attendees.

Certification in Teaching

[IIT Gandhinagar](#) | [Certificate](#)

Jan'25

- Completed program covering effective teaching methodologies, pedagogy, and student mentorship.

TALKS

Modern Bare Metal Systems in Rust

[Rust India Conference 2026](#) | [YouTube](#)

Apr'26

- Presented bare-metal OS architecture on Raspberry Pi 5, detailing MMIO, volatile intrinsics and `#[repr(C)]`.
- Demonstrated compile-time hardware state enforcement and `dyn` traits for dynamic dispatch without OS runtime.
- Detailed bare-metal concurrency utilizing `UnsafeCell` and CPU interrupt masking for safe global hardware mutation.

SKILLS

Languages: [Python](#) [Rust](#) [Go](#) [C](#) [C++](#) [Verilog](#) [TypeScript](#) [ARM Assembly](#)

Systems & Networking: [GDB](#) [OpenOCD](#) [QEMU](#) [Wireshark](#) [Mininet](#) [Vivado](#) [Arduino](#)

DevOps & Tooling: [Git/GitHub Actions](#) [Docker](#) [Bazel](#) [uv, ty, ruff](#) [pre-commit](#) [Cargo](#) [Make](#) [Bun](#)

Cloud & Databases: [Google Cloud Platform \(GCP\)](#) [MongoDB](#) [PostgreSQL](#)

AI/ML Stack: [PyTorch](#) [JAX](#) [HuggingFace](#) [mmrotate](#) [Unsloth](#) [Ultralytics](#) [Scikit-Learn](#) [Pandas](#) [NumPy](#)

POSITIONS OF RESPONSIBILITY

Organizer, Licensee | [TEDxIITGandhinagar](#)

May'24-Aug'25

- Led 80+ member cross-functional team (Curation, Tech, Sponsorship) to execute globally licensed TEDx event.
 - Directed the production of talk videos, ensuring standards for the official TEDx YouTube channel (**42.5M subscribers**).
- ### Co-Organizer | [ACM India Summer School on AI for Social Good](#)
- Jun'25
- Managed logistics for a national-level AI event involving 60+ participants and distinguished speakers.

RELEVANT COURSES

Computer Science Systems: Operating Systems [A], Computer Networks [A], Computer and Network Security [A], Databases [A], Software Tools & Techniques [A], Computing [A], Digital Systems [A-], Principles of Electrical Engineering [A]

AI & Data Science: Computer Vision [A], Deep Learning [A-], Machine Learning [A], Introduction to Data Science [A], Probability, Statistics & Data Visualization [A-]

Mathematics: Calculus of Single Variable [A], Calculus of Several Variables [A-], Discrete Mathematics [A-], Ordinary Differential Equations [A]

OPEN SOURCE CONTRIBUTIONS

[rust-embedded/rust-raspberrypi-OS-tutorials](#)

[14.6k stars](#) | [GitHub](#)

- Engineered RPi 5 disaggregated PCIe kernel boot, managing Cortex-A76 and RP1 Southbridge initialization.
- Mapped Inbound Window BARs for RP1 MSI-X interrupts; wrote hierarchical controller routing to GICv2.
- Replaced UART chain-loading with JTAG/SWD and custom OpenOCD scripts for hardware-in-the-loop debugging.