# Aakash Kulkarni

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## SUMMARY

I find the bugs that single-platform testing cannot see, and build the methods that find them systematically. My IEEE AIxSE 2025 paper introduced HeteroBugDetect — LLM-generated inputs, grammar-constrained fuzzing and CPU/GPU differential execution — which found 8 of 20 known and 2 previously unknown bugs in LAMMPS. I want to extend that from one scientific code to heterogeneous kernels as a class.

## EDUCATION

**Oregon State University** — Corvallis, OR
*Master of Engineering in Computer Science (GPA: 3.90/4.0)* — *Sep 2022 – Jun 2025*

*Graduate coursework: Software Engineering Methods; Software Maintenance and Evolution; Parallel Programming; Advanced Deep Learning and High-Performance Computing; Algorithms; Tensor Methods.*

** Sep 2024 – Mar 2025: enrolled in the Computer Science doctoral programme at this department; withdrew in March 2025 for personal reasons before completing the degree. The Master of Engineering was awarded in June 2025.*

**Jawaharlal Nehru Technological University** — Hyderabad, India
*Bachelor of Technology in Computer Science (First Class; CGPA 7.25/10.0)* — *Jul 2018 – Aug 2022*

## RESEARCH

**Graduate Research Assistant** — Apr 2024 – Mar 2025
*Oregon State University — with Prof. Manish Motwani* — *Corvallis, OR*

- Deployed AFL++ and a grammar-based generator, then ran large-scale fuzzing campaigns across distributed HPC systems.
- Performed differential driver testing between CPU and GPU builds, isolating the platform-specific failures that single-platform testing cannot see.
- Built the defects benchmark of 20 known heterogeneous bugs used to evaluate the approach; the study detected 8 and uncovered 2 previously unknown bugs.
- Released HeteroBugs — the first dataset of real-world heterogeneous bugs in a scientific application — with a replication package at doi.org/10.7910/DVN/VHO9RH.

## PUBLICATIONS

**LLM-Guided Differential Fuzzing for Detecting Platform-Specific Bugs in Scientific Applications.** Motwani, M., **Kulkarni, A.***, Qiao, Y.*, Davis, M., Chen, Z. *IEEE AIxSE 2025*, pp. 59–66. *Equal contribution. Introduced HeteroBugDetect; detected 8 of 20 known and 2 previously unknown bugs in LAMMPS.

**Automatically Detecting Heterogeneous Bugs in High-Performance Computing Scientific Software.** Davis, M., **Kulkarni, A.**, Chen, Z., Qiao, Y., Terrazas, C., Motwani, M. arXiv:2501.09872, 2025 (preprint).

Google Scholar: scholar.google.com/citations?user=BsNhRZUAAAAJ | ORCID: 0009-0002-8999-4533

## TEACHING EXPERIENCE

**Graduate Teaching Assistant** — Mar 2025 – Jun 2025
*Oregon State University* — *Corvallis, OR*

- Taught CS 475/575 Parallel Programming to a mixed undergraduate and graduate section of more than 100 students, under Prof. Mike Bailey.
- Held weekly office hours on the three failure modes that stop first-time parallel programmers: race conditions, deadlocks and performance regressions.
- Reviewed student code and designs on correctness, concurrency safety and maintainability.

## INDUSTRY EXPERIENCE

**Software Engineer** — Sep 2025 – Present
*CloudVik LLC* — *Remote*

- Built the Spring Boot microservices that orchestrate LangChain extraction pipelines for an automotive client's intelligent document processing system.
- Developed the REST APIs behind a sensor integration platform, ingesting real-time telemetry and syncing it into cloud infrastructure.
- Containerised the services and moved their deployment onto CI/CD on AWS, replacing manual release steps.
- Worked inside a scoped AI coding harness — tool permissions, human review gates and auditable diffs — so AI-assisted changes stayed reviewable.

### Associate Software Developer
Jan 2022 – Apr 2022

*Zemoso Technologies* — *Hyderabad, India*

- Built TransUnion's financial data dashboard, visualising credit trends and risk metrics in real time for enterprise users.
- Reworked the database structures behind credit-record management, improving retrieval performance for the financial modules.
- Implemented OAuth 2.0 authentication to protect consumer financial data and hold the platform to its compliance requirements.
- Delivered two client projects across React Native, Spring Boot and MySQL, reviewing code across both.

### Mobile Application Developer Intern
Jul 2021 – Sep 2021

*FindMind Analytics* — *Remote*

- Shipped ZuPay — a Flutter banking app for teenagers with parental controls — to both app stores, where it reached more than 10,000 active users.

## SELECTED PROJECTS

**JAAABS — Job Application Automator** | *Python, Playwright, LangChain, Next.js, SQLite* 2026

- Built a human-in-the-loop studio that discovers companies, scores roles against a fact bank, tailors a LaTeX resume per posting and autofills applications in Chromium.
- Gated every risky step — login, CAPTCHA, OTP, review, submit — behind a human, with idempotent run state and an evidence ledger, so a failed run resumes instead of repeating.

**The Lazy Radical — Deterministic 4K Motion Pipeline** | *Python, Playwright, FFmpeg* 2026

- Replaced timeline editing with a deterministic pipeline: HTML/CSS scenes are frame-stepped by Playwright and mastered by FFmpeg, so a full 4K render rebuilds from source with one command.

**PolyRootNet — Neural Network for Polynomial Roots** | *Python, TensorFlow, NumPy* 2025

- Built and trained a transformer model to approximate the roots of high-degree polynomials, benchmarked against classical numerical methods on precision and runtime.

**AWS Infrastructure Automation** | *Terraform, AWS, Python, Bash* 2025

- Built reusable Terraform modules for VPC, subnets, security groups, EC2, RDS, S3 and Route 53 across dev, staging and production, and automated deployment and monitoring around them.

**Guitar Hub** | *Python, OpenAI, Hugging Face* 1st place, OSU Winter Hackathon 2024

- Built an AI-powered guitar tuner and song analysis tool with OpenAI and Hugging Face, in a team, against the clock.

## SKILLS

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| **Languages:** | Java, Python, C++, JavaScript, TypeScript, SQL, Bash |
| **Frameworks:** | Spring Boot, Node.js, FastAPI, React, Next.js, Kafka |
| **Cloud & DevOps:** | AWS (Solutions Architect Associate), GCP, Docker, Kubernetes, Terraform, GitHub Actions |
| **Data & AI:** | PostgreSQL, MySQL, MongoDB, LangChain, RAG, PyTorch, TensorFlow |

## CERTIFICATIONS

AWS Certified Solutions Architect — Associate (Jan 2026).