Aditya Prashant Chaudhari

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RESEARCH INTERESTS

Compiler optimization and robustness; ML compiler infrastructure; automated optimization tuning; intermediate representations (LLVM/Wasm); performance variance analysis

EDUCATION

Michigan State University, East Lansing, MI — Aug 2021 – May 2025
B.S. in Computer Science, Minor in Business — GPA: 3.97/4.0
Honors: Graduated with Honor; Dean's Showcase of Stars (Top 1% of undergraduates)

Advanced Independent Coursework:
Cornell University (CS 6120): Advanced Compilers (Self-Guided). Completed PhD-level coursework on SSA, loop optimizations, and polyhedral analysis.

RESEARCH EXPERIENCE

WebAssembly Compiler Optimization — March 2025 – Present
Independent Research Project — Repo: `https://github.com/AdityaC4/tubular-upgrade`

- Investigated pass-order sensitivity in WebAssembly compilation; engineered a custom pass manager and defensive analysis framework to resolve semantic fragility in nested-loop kernels
- Conducted a reproducible study (1,080 experimental runs) with pinned CPU frequencies; quantified a global mean variance of 0.25% versus 3–5% performance gaps in structure-specific workloads (nested/stride-heavy loops)
- Applied regret analysis to identify `inline-tail-unroll` as the robust default ordering (minimizing 95th-percentile regret to 2.4%), while demonstrating that per-program selection outperforms any fixed order
- *Outcome:* Published data and findings in a *technical report*; developed a fully reproducible benchmarking pipeline

High-Performance Computing I/O Performance Analysis — Aug 2024 – May 2025
Technical Research Intern, MSU Institute for Cyber-Enabled Research (Mentor: Dr. Xiaoge Wang)

- Conducted systematic comparative benchmarking of distributed file system performance (GPFS scratch vs. research storage) using IO500 benchmark suite across varying MPI process configurations and node layouts
- Developed automated SLURM-based parameter sweep framework and Python visualization pipeline for multi-dimensional I/O performance analysis
- Characterized throughput vs. metadata operation tradeoffs across different parallelism strategies; findings documented in technical report analyzing optimal configurations for bandwidth-intensive and metadata-heavy workloads
- Analysis revealed scratch file system achieved ∼2× metadata throughput (25 kIOPS peak) while research storage sustained ∼2.4× streaming bandwidth (2.7 GiB/s peak), informing workload placement recommendations for HPCC users

OPEN SOURCE CONTRIBUTIONS

- **LLVM Project:** Implemented constexpr support for x86 vector intrinsics in Clang:
  - "Enable constexpr evaluation for element extraction/insertion intrinsics." Merged PR #161302, October 2025. Addresses Issue #159753.
  - "Enable constexpr support for AVX/AVX512 subvector insertion intrinsics." Merged PR #158778, September 2025. Addresses Issue #157709.

  Technical writeups: adityac4.github.io/blog (analysis of contributions, PR walkthroughs)

TECHNICAL REPORTS

- Chaudhari, A. P. *Pass-Order Sensitivity in a WebAssembly Teaching Compiler.* Technical Report, 2025.
- Chaudhari, A. P. *IO500 Benchmark Analysis of MSU HPCC File Systems: Performance Characterization and Infrastructure Planning Recommendations.* Technical Report, Institute for Cyber-Enabled Research, Michigan State University, 2025.
- Chaudhari, A. P. *Security Analysis of Campus RFID Access Control Systems: MIFARE Classic and HID/iCLASS Vulnerability Assessment.* Research Report, Michigan State University, 2024. (See MIFARE Classic; HID/iCLASS)

TEACHING EXPERIENCE

Teaching Assistant – CSE 232 (C++ Programming, Data Structures & OOP) Aug 2022 – May 2023

- Provided technical instruction and mentorship to 60+ undergraduate students per semester in programming and data structures in C++

Teaching Assistant – MTH 103 (College Algebra) Aug 2023 – May 2024

- Guided students in problem-solving and mathematical reasoning; conducted weekly recitation sessions and provided academic support to undergraduate students in foundational mathematics

INDUSTRY EXPERIENCE

Software Engineer Intern – XOneFi May 2024 – Aug 2024

- Designed and implemented a web-based network authentication layer connecting custom OpenWRT firmware with Web3Auth using a custom React interface.

Capstone Project Collaborator – Stryker Corporation Aug 2024 – Dec 2024

- Led 5-member team developing computer vision surgical instrument tracking system; implemented YOLOv11 model with CoreML optimization achieving 95% real-time accuracy.

COMPETITIONS & RECOGNITIONS

Dean's Showcase of Stars Award (2021, 2022, 2023, 2024) – University-wide recognition for academic excellence
MITRE eCTF Global Top-10 Finisher (2023, 2024) – International embedded systems security competition
MSU Academic Excellence Scholarship ($100,000 total) – Competitive merit-based award at admission

RELEVANT COURSEWORK

Translation of Programming Languages (CSE 450)
Computer Organization & Architecture (CSE 320)
Computer Systems (CSE 325)
Database Systems (CSE 480)
Independent Study: Embedded Systems Security (CSE 490)
Operating Systems (CSE 410)
Algorithms & Data Structures (CSE 331)
Computer Security (CSE 425)
Discrete Structures in Computer Science (CSE 260)

TECHNICAL EXPERTISE

- **Compiler & Language Design:** LLVM IR, WebAssembly (WAT/WASM), optimization pass development, autotuning frameworks, lexical analysis, and parsing
- **Systems & HPC:** C/C++, Rust, Python, distributed systems, parallel computing, performance benchmarking, SLURM workload management
- **Development Tools:** Git, Docker, data visualization, technical documentation