Sahanav Sai Ramesh

v2027.6.0

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mod research_profile

Computer Science undergraduate at UC Riverside (June 2027) and systems researcher exploring the connections between software, mathematics, hardware, and the people using them. Applies this perspective to FPGA architecture generation, Rust asynchronous execution, and production engineering—questioning inherited constraints, exploring alternative computational representations, and building dependable systems that enable others to focus on creating.

mod education

University of California, Riverside — Expected June 2027

Bachelor of Science in Computer Science

mod research

EDForge — Configurable Ed25519 FPGA Architecture Generator — June 2026 – Present

Embedded Systems and Computer Architecture Research | Manuscript in preparation

- Architected and implemented a configurable Ed25519 FPGA hardware generator that predicts resource utilization, latency, and throughput across candidate architectures, enabling users to select designs suited to their deployment constraints.
- Independently designed and implemented the signing/verification datapaths, resource-performance prediction models, and design-space exploration methodology; identified Pareto-optimal configurations within the explored design space, with typical resource-category prediction errors of 5–10% against synthesized AMD Alveo U280 designs.
- Built unified signing and verification hardware achieving peak measured throughput of approximately 6 million signatures/s and 1 million verifications/s on a physical U280 using less than a quarter of available resources, compared with 7.88 million signatures/s and 1.2 million verifications/s in simulation using approximately one third of available resources.
- Investigating Verilog-level formal verification to establish correctness guarantees for generated hardware implementations.

psync — Dependency-Aware Rust Asynchronous Runtime — May 2026 – Present

Independent Systems Research — `github.com/sahastasai/psync`

- Developed a priority-aware Rust asynchronous executor and opt-in procedural macros that infer source-visible dependencies to expose opportunities for concurrent execution.
- Implemented conservative dependency handling that rejects execution reorderings when their safety cannot be established through the current analysis.
- Measured up to 5× end-to-end speedup in selected open-source applications, including kube-rs, compared with their original implementations without procedural macros. Both versions used Tokio, requiring approximately nine annotations rather than extensive manual rewrites.
- Investigating compiler-level dependency analysis, stronger correctness guarantees, and multithreaded execution; formal correctness proofs remain future work.

mod engineering

Sai Mithra LLC — August 2025 – Present

Solutioneer (Lead Software Engineer & Technical Architect), February 2026 – Present

Previously: Junior Full-Stack Software Engineer (November 2025 – February 2026); Software Engineering Intern (August – October 2025)

- Lead architecture, development, and delivery for six production client projects serving over 1,000 users, with end-to-end ownership of technical execution and project delivery.
- Own engineering delivery and client management for revenue-generating commercial engagements, leading technical decisions, managing client expectations, and ensuring successful production deployment.
- Architect and implement full-stack systems using React, Rust, cloud infrastructure, edge computing, real-time communication, authentication, and third-party integrations, balancing technical quality with business requirements.
- Mentor two engineering interns through architectural exploration, design reviews, and implementation, encouraging independent thinking, challenging assumptions, and developing ownership while maintaining accountability for client commitments.

Verdant Robotics — Dealer Operations Portal — Selected client project

- Extended Zoho's native UI with custom React widgets, role-based access controls, and a signed Cloudflare Worker authentication handshake that reuses Zoho authentication.

- Deployed a customizable dealer portal designed for 250 users, integrating onboarding, document management, requests, and approval workflows within Zoho.

Life Training Institute — Academic Records Platform Selected client project

- Unified fragmented academic records by designing a shared data model, data migrations, and Zoho/React widgets with Thinkific and MailerLite integrations, supporting approximately 6,500 students and 20,000 grade records.
- Deployed an integrated platform for student records, grade management, and degree audits, reducing record retrieval time by approximately 70% (client estimate) and improving administrative access to student progress.

TRAX Claims — Real-Time Claims Platform Selected client project

- Architected WebSocket-based synchronization and versioned claims management using Rust/Dioxus, Cloudflare Workers, Durable Objects, and D1 to coordinate concurrent edits across users.
- Developed and demonstrated a working prototype featuring append-only audit history and explicit conflict resolution, enabling real-time collaboration with traceable changes; production deployment is pending.

Lance Morgan — Data Visualization Platform Selected client project

- Resolved a stalled insurance calculator project by identifying the client's underlying data-presentation requirements; independently implemented a dependent-row HTML/JavaScript solution in two months after four previous teams spent approximately 13 months attempting delivery. The application remains in production.
- Architected a React-based rental-investment deal finder and led an intern through implementation, enabling an insurance executive to evaluate, filter, and present investment opportunities to clients.

mod skills

Languages Rust, C, C++, JavaScript, TypeScript, Verilog, Lean 4, Nix, Java, LaTeX

Systems & Concurrency Asynchronous runtimes, concurrent programming, dependency analysis, embedded systems, performance benchmarking

Architecture & Research FPGA architecture, hardware generation, finite-field arithmetic, design-space exploration, resource and performance modeling, hardware formal verification

Frameworks & Cloud React, Dioxus, Node.js, WebSockets, Cloudflare Workers, Durable Objects, D1, Zoho Creator

mod service

Project Janathā / SevaLink — Chinmaya Mission June 2024 – Present

- Coordinated a team of youth developers building a location-aware community application using Node.js and React Native to connect students and professionals with local Chinmaya Mission centers.