PAVAN D

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SUMMARY

Final-year Electronics and Communication Engineering student (B.E., 2027) with hands-on project experience in machine learning, VLSI, circuit simulation and software engineering. I build working systems end to end, from design to testing and evaluation. Seeking an engineering internship.

PROJECTS

Faultiva - Hybrid Hardware + ML Fault Detection and Localization for VLSI *github.com/pavannithin224-abcd/faultiva*

- **Problem:** Locate a single stuck-at fault (SA0/SA1) in a synthesized gate-level netlist from output responses alone: up to 36,784 candidate sites on one crypto core.
- **Approach:** Ran stuck-at fault-injection campaigns with Yosys and Verilator across four cores (AES, SHA-256, OpenTitan HMAC, PicoRV32); built a 3-stage pipeline with a PyTorch verification MLP over netlist topology.
- **Results:** Zero false alarms across 7.85M simulated transactions; verification ROC-AUC 0.9166; localizes to the exact fault-equivalence class in ~0.5 ms per query, CPU-only (~2,000 queries/s on one core).
- **Shipped:** Windows desktop app and 4.7 MB Python package with CI; Zenodo DOI. Undergraduate major project.

Kernote - Evidence-Backed Project Memory for Developers *github.com/pavannithin224-abcd/kernote*

- **Problem:** Project notes rot silently, and nobody knows which notes the latest code change made wrong.
- **Built:** Scans a codebase read-only into memories with file, line-range and content-hash provenance; flags memories whose cited lines a diff touches; keeps contradictions open; answers with citations or "evidence not found"; serves context to coding agents over a read-only MCP server. FastAPI, SQLite FTS5, React/TypeScript; no LLM in the loop.
- **Results:** 572 backend tests (559 pass, 13 optional skipped), CI green on Windows and Linux. On a 31-question labelled set: Recall@5 0.80 keyword-only, 0.98 with semantic search; 83% useful abstention.
- **Shipped:** 65 MB per-user Windows installer (PyInstaller, Inno Setup). Security audit cut dependency advisories 93 to 0 and added Host/Origin guards against DNS-rebinding and cross-site writes. MIT.

TinySPICE - Budget-Aware LLM Agent for MOSFET Characterization *github.com/pavannithin224-abcd/TinySPICE*

- **Problem:** LLM-to-simulator pipelines can claim success on runs that fail. Goal: an agent that refuses or stops when it should, with every number coming from real simulator output.
- **Approach:** The LLM only parses plain English into a typed spec; deterministic code does validation, budgeted planning, real ngspice runs on SKY130 NFETs, measurement extraction (VTH, SS, GM), bounded failure recovery and SQLite provenance with hash-verified replay. Local parser on llama.cpp (Qwen3.5).
- **Results:** TinySPICEBench (24 pre-registered tasks): false success 30/72 for direct LLM-to-tool vs 0/72 for the full system; completion 0.50 vs 0.86 (sign test p = 0.001). 269 tests; 18/18 reproduction checks pass from a fresh clone. Negative results reported, not hidden.

IVForge - Simulation-Budgeted Transistor I-V Characterization with Active Learning *SKY130 1.8 V NMOS*

- **Problem:** Can adaptive sampling train a useful drain-current predictor from fewer SPICE simulations than uniform sampling?
- **Approach:** ngspice data on a pinned SKY130 revision with provenance manifests; PyTorch MLP on nested uniform budgets (32-256 curves) vs MC-dropout active learning at equal budget; width-held-out test vs a log-geometry MLP and a tree baseline.
- **Results:** Active learning led at 64 and 128 curves but lost at 256 (one seed): reported as mixed. Measured-data benchmark on 45 public NMOS IDVD files (42 matched to supported geometries).

SAHAYAK - AI Tool for Disaster Response *Nexora Hackathon 2025, Bengaluru*

- **Built:** AI resource-allocation tool for emergency teams, developed in a 4-member team and taken from concept to a working demo within the hackathon time limit.

Smart Voting System *Python*

- **Built:** Python voting application with user authentication, a one-vote-per-user integrity check that blocks duplicate votes, and live result tallying.

SKILLS

ML and Research: PyTorch, scikit-learn, NumPy, pandas, MLPs, active learning, ROC-AUC, held-out evaluation, sign tests
LLM Systems: llama.cpp local inference (Qwen3.5, SmolLM2), prompt engineering, typed-spec parsing, guardrails, MCP
Hardware and Simulation: ngspice, SKY130 PDK, SPICE netlists, Yosys, Verilator, Verilog/RTL, SoC design, stuck-at fault modeling
Software Engineering: Python, FastAPI, React/TypeScript, SQLite (FTS5), pytest, Git, GitHub Actions CI, PyInstaller/Inno Setup

EDUCATION

B.E. in Electronics and Communication Engineering *Expected 2027*
P A College of Engineering, Mangaluru | CGPA: 7.2

CERTIFICATIONS

VLSI System-on-Chip (SoC) Design - Maven Silicon | Data Science Workshop

LANGUAGES

English | Kannada | Hindi