Kunal Pai

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Education

M.S., Computer Science, University of California, Davis (GPA: **4.0/4.0**) Expected: June 2026

B.S., Computer Science & Engineering, University of California, Davis (GPA: **3.8/4.0**), *with Honors* June 2023

Relevant Skills

Languages: Python, C++, C, JavaScript, Java

ML/AI: TensorFlow, PyTorch, scikit-learn, LLMs, Prompt Engineering, Ollama, Hugging Face, Multi-agent Systems

Web/Data: React, Next.js, Django, Flask, MongoDB, pandas, NumPy, Matplotlib

Tools: Git, Docker, Unix/Linux, gem5, Jupyter, LLVM, Clang

Work Experience

Graduate Student Researcher, *DavSec Lab @ UC Davis* April 2025 – Present

- Built an automated pipeline for C-to-Rust transpilation using LLMs, with 5 prompt variations, targeting secure systems migration
- Identified Halstead vocabulary as the strongest metric for predicting translation difficulty
- Validated lightweight semantic augmentations (e.g., filename context) that improved functional accuracy by 5%
- Benchmarked state-of-the-art LLMs across 746 C/C++ programs, achieving 70.2% functional accuracy with best prompt design

Graduate Student Researcher, *DECAL Lab @ UC Davis* September 2022 – December 2024

- Developed a 4,500-sample dataset for pairwise code-documentation alignment from 200 open-source Python projects, enabling future research in software maintenance
- Engineered a pipeline for measuring calibration and correctness of large language models for code repair, using Defects4J
- Collaborated in validating efficacy of semantic augmentation of language model prompts for code summarization using precision and recall metrics like ROUGE and METEOR

Publications (Selected)

CoDocBench: A Dataset for Code-Documentation Alignment in Software Maintenance, Pai, K., Devanbu, P. & Ahmed, T., *International Conference on Mining Software Repositories (MSR) 2025: Data and Tool Showcase Track*

Calibration and Correctness of Language Models for Code, Spiess, C., Gros, D., Pai, K.S., et. al., *International Conference on Software Engineering (ICSE) 2025*

Automatic semantic augmentation of language model prompts (for code summarization), Ahmed, T., Pai, K.S., Devanbu, P. & Barr, E.T., *International Conference on Software Engineering (ICSE) 2024*

Project Experience

HASHIRU: Hierarchical, Resource-Aware Multi-Agent Framework March 2025 – Present

Entrepreneurial Research Venture *Python, LLMs, Multi-Agent Systems*

- Designed and deployed a multi-agent architecture enabling dynamic, LLM-driven collaboration across diverse tasks.
- Implemented task decomposition with intelligent agent delegation based on resource cost models and task specialization.
- Engineered autonomous generation of tools and APIs for task execution.
- Developed a robust evaluation framework for agent performance across complex, multi-step tasks.

SuperNOVA: Superconducting Graph Accelerator in gem5 Jan 2024 – Present

Research Project, DArchR Lab @ UC Davis *C++, Python, gem5, Hardware Simulation*

- Modeling a superconducting graph accelerator in gem5, targeting sparse workloads under cryogenic conditions
- Integrating energy and latency estimates from superconducting literature, and RTL simulations, to improve realism
- Mentoring undergraduate researchers on modeling, benchmarking, and research writing; one co-authored a ModSim 2024 poster

gem5 Vision January 2023 – June 2023

Resource Discovery Framework *Next.js, Python, MongoDB, JSON Schema*

- Boosted resource discovery speed by 20x with optimized search functionality across 1,200+ resources.
- Enabled faster retrieval of resources across 20+ categories by introducing categorization and semantic versioning.
- Enhanced accessibility for 500+ industry and academic users by integrating local/remote JSON files and MongoDB with gem5.