

Kunal Pai

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EDUCATION

M.S., Computer Science, University of California, Davis (GPA: **4.0/4.0**) Expected: June 2025

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

WORK EXPERIENCE

Graduate Student Researcher Jun 2023 - Present
DArchR Lab @ University of California, Davis Davis, CA

- Leading a project to achieve 10x acceleration in the simulation of cryogenic semiconductor computing and superconductors.
- Collaborating with 3 researchers to develop and deliver 90% correlation between gem5 simulation and hardware measurements.
- Mentoring 5 undergraduate students in the Davis Computer Architecture Lab to prepare them for graduate research.

Teaching Assistant Sep 2023 - Dec 2023
University of California, Davis Davis, CA

- Assisted 180 students in understanding course material and assignments, conducted weekly office hours, and gave and graded assignments for senior-level Probability & Statistical modeling class.

Software Developer Intern & Tech Lead Jan 2022 - Jun 2022
humanID Davis, CA

- Delivered 10 completed projects with global teams, including documentation of a Discord bot that combats spam and fake users, and a Django-based web application for permission management for 100 users.

Technical Product Marketing Intern Jul 2021 - Sep 2021
SiTime Corporation Santa Clara, CA

- Presented strategy to better distributor margin management and improve earned profits by \$250,000.
- Conducted a market survey on types of optical transceivers used in AI networking infrastructure, to identify potential customers for MEMS timing chips.
- Created Visio diagrams for the product requirements document of a timing chip.

PROJECTS

Automated Frameworks of Semantic Augmentation to Improve MWP Solving Apr 2024 - Jun 2024
Machine Learning Project Python, NLP, Prompt Engineering

- Improved language model accuracy on MWPs by 10% (prompting PaLM2) and 60% (finetuning TinyLlama) through a one-shot digit-level semantics framework, over base model performance.
- Introduced a novel demonstration selection model to identify the most similar equations for one-shot examples using BLEU scores and Levenshtein distance.

Effects of Toxicity on Disengagement in Open Source Projects Jan 2024 - Mar 2024
Software Engineering Project Python, GitHub mining, scikit-learn

- Analyzed factors contributing to developer disengagement in open-source projects, identifying a 0.76 R-squared value between less toxicity and large codebase size with high engagement for FAANG projects.
- Quantified toxicity across corporate and non-profit open-source communities, examining how toxic interactions disproportionately affected new developers compared to experienced ones, ultimately providing a roadmap for community managers to foster a more productive codebase.

Behavior of Spectre in Different Branch Predictors in gem5 Oct 2023 - Dec 2023
Computer Architecture Project C++, gem5

- Investigated susceptibility of x86-based in-order and out-of-order processors to Spectre V1 attacks using gem5 v23.0, identifying a strong correlation between Spectre attack effectiveness and branch predictor type.
- Validated design enhancements for a Spectre-resistant branch predictor, emphasizing longer training periods and mitigation of biased branches, aimed at reducing susceptibility to speculative execution attacks by upto 55%.

gem5 Vision Jan 2023 - Jun 2023
Framework Next.js, Python, MongoDB, JSON Schema

- Boosted resource discovery speed by 20x with optimized search functionality across 1,200+ resources.
- Introduced semantic versioning and built a categorization system, enabling faster retrieval of resources across 20+ categories.
- Integrated local/remote JSON files and MongoDB for gem5, enhancing accessibility for 500+ industry and academic users for cutting-edge research.

PUBLICATIONS

Calibration and Correctness of Language Models for Code
International Conference on Software Engineering (ICSE) 2025.

Spiess, C., Gros, D., [Pai, K.](#), et. al.

Automatic Semantic Augmentation of Language Model Prompts (for Code Summarization)
International Conference on Software Engineering (ICSE) 2024.

Ahmed, T., [Pai, K.](#), et. al.

Potential and Limitation of High-Frequency Cores and Caches
ModSim 2024 : Workshop on Modeling & Simulation of Systems and Applications

[Pai, K.](#), Nand, A. & Lowe-Power, J.

gem5 Vision
gem5 Workshop at International Symposium on Computer Architecture (ISCA) 2023.

Shah, P., [Pai, K.](#), et. al.

Validating Hardware and SimPoints with gem5: A RISC-V Board Case Study
gem5 Workshop at International Symposium on Computer Architecture (ISCA) 2023.

[Pai, K.](#), Qiu, Z., & Lowe-Power, J.

TECHNICAL SKILLS

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

Frameworks: React, Next.js, TensorFlow, PyTorch, Django, Flask

Tools & Technologies: Git, Docker, MongoDB, gem5