Gavin Hua
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EDUCATION

California Institute of Technology Pasadena, CA
B.S. in Electrical Engineering (Intelligent Systems track) | *GPA:* 4.2/4.3 Expected Jun. 2027
Relevant Courses: ML & Data Mining, Circuit Analysis, Analog Circuit Design, Data-Driven Control, Robotics, Data Structures & Algorithms, Large Language & Vision Models, Signal Processing, Differential Geometry, ODEs

WORK EXPERIENCE

Autonomous Control and Robotics Lab Pasadena, CA
Research Intern in Professor Soon-Jo Chung's group Nov 2024 – Present
- Developing a variation of the Monte Carlo Tree Search (MCTS) algorithm that uses Thompson sampling for statistically motivated tree traversal and node expansion.
- Developing a box-moving reinforcement learning environment to compare baselines models with the new algorithm.

AMBER Lab Pasadena, CA
Summer Undergraduate Research Fellow (SURF) in Professor Aaron Ames' group Mar 2024 – Sep 2024
- Developed a robust, real-time model predictive control library in C++ (5000+ LOC) for robotic systems (TORC). Interfaced with libraries such as CppAD for Auto-differentiation and IPOPT for optimization.
- Created common reduced-order dynamics models for robots and interfaces for cost functions and solvers.
- Created a unified control interface for the group's robots using ROS in both C++ and Python (Obelisk).
- Managed dependencies & build processes with CMake and used Docker for containerized library development.

Caltech Racing Pasadena, CA
Software Lead May 2024 – Oct 2024
EE Team Member Sep 2023 – May 2024
- Designed and implemented a PCB in Altium Designer to read pedal potentiometers and transmit it via the CAN bus. Programmed the STM32 microcontroller in C using the HAL library.
- Designed and programmed a telemetry/data acquisition system using an ESP32 to concurrently transmit vehicle information to ground control over WiFi and store information in an SD card.
- Designed onboarding lectures & projects for new members to familiarize themselves with C and electrical design.

RELEVANT PROJECTS

Machine Learning Applications
Coursework with Professor Yisong Yue Dec 2023 – Mar 2024
- Predicted whether customers will discontinue telephone service using an ensemble including Adaboost, random forests, and deep neural networks. Achieved 1st place in accuracy in the course among 50+ models.
- Trained matrix factorization models to identify and visualize latent factors in the MovieLens dataset.
- Created and trained a hidden Markov model for Shakespearean-style poem generation.

Computer Engineering Applications
Coursework with Professor Glen George Dec 2023 – Jun 2024
- Caltech-10 CPU Design: designed and implemented a Harvard Architecture RISC CPU in ABEL on a CPLD. Instruction set includes arithmetic operations, data/program memory addressing, I/O handling, and call/returns.
- Balance game design and implementation: assembled the PCB and coded an ATMega64 with 1500+ lines of AVR assembly. Interfaced with an MPU6500 through SPI, produced square waves on a speaker through timer interrupts, implemented LED multiplexing and button/rotary encoder debouncing.

SKILLS

Programming Languages: Python, C++, C, AVR Assembly
Hardware Tools: Altium Designer, KiCad
Software Tools: Git/GitHub, CMake, Docker, Linux
ML/AI Tools: PyTorch, OpenCV, JAX
Languages: English (Native), Chinese (Native)