Ajay Tatachar

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OBJECTIVES

- Learn more about operating systems and compiler development, particularly for high-performance supercomputers and constrained embedded systems.
- Explore the applications of such systems in scientific research.
- Experience working in the software industry.
- Find a career in computer science and/or molecular genetics research.

EDUCATION

University of Illinois at Urbana-Champaign, Urbana, Illinois, USA

- B.S. in Molecular and Cellular Biology — Aug 2018 – May 2022 (Expected)
  - Cumulative GPA: 3.94

WORK EXPERIENCE

CS 125: Introduction to Computer Science

- Course Developer — Jan 2019 – May 2019
  - Developed jtrace, a JVM native agent that traces program state, and java-complexity, a static code analysis tool that calculates cyclomatic complexity. Used to gather data on student homework submissions.
  - Worked on janini, an online Java execution platform designed for educational use.
  - Held ~4 office hours per week to help students with assignments and answer questions.
- Office Hour Captain — Aug 2019 – Present
  - Helped coordinate office hours for a class of ~900 students and ~100 Course Assistants.
  - Held ~10 office hours per week to help students with assignments and answer questions.
  - Organized and conducted Course Assistant Training to make office hours more effective and efficient.

PROJECTS

- **Mako**: Operating System for 32-bit x86 computers — *Summer 2019*
  - Supports a Linux-compatible ext2 filesystem, pre-emptive and cooperative multitasking, graphical user interface and much more.
  - Developed in approximately six months entirely from scratch.
- **thorin**: debugger for C programs on Linux and macOS — *Spring 2019*
  - Traces debuggee using ptrace (linux) or mach ports (macOS) and reads DWARF-formatted debug information
  - Provides GDB-like state-inspection features.
  - Implemented in Rust and C.
- **Golsp**: Interpreted, general purpose lisp-like programming language — *Fall 2018*
  - Implemented entirely in Go and itself.
  - Features a standard library that provides file I/O routines and an extensible module system.
  - Functional purity and Go runtime make it a good fit for concurrent applications.
- **crunch**: memory profiling and debugging tool for macOS — *Spring 2019*
  - Tracks memory allocations in C/C++ programs and detects leaks and errors.
  - Uses the `DYLD_INSERT_LIBRARIES` mechanism to override memory management functions.
- **trash-detector**: 36-hour hackathon project developed with two teammates — *Spring 2019*
  - Convolutional neural network that detects trash (plastic bottles, crushed cans, etc.) in images.
  - Gathered data manually (because of a lack of comprehensive trash datasets) to train network.
  - Connected the neural network to a web backend and exposed an API to scan and highlight trash in images.
- Many more open source projects.

SKILLS

OS Development and Systems Programming

- Proficient in languages suited for high-performance computing: C, Rust, C++ and Go.
- Familiar with the x86 architecture: memory virtualization, context switching mechanisms, interrupt handling etc.
- Experience writing system software for linux and macOS.
- Experience developing a multi-tasking operating system kernel capable of hosting user programs and interfacing with common hardware devices.

Programming Languages

- Experience designing and implementing a general-purpose programming language from scratch.
  - Working with ANTLR and yacc LALR(1) and LR(1) grammars, and implementing a parser by hand.

Machine Learning

- Familiar with convolutional neural networks and their applications in image processing.
- Experience implementing simple classification algorithms for tasks like sentiment analysis and image recognition.