Ajay Tatachar

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Education

University of Illinois at Urbana-Champaign

B.S. in Computer Science & Chemistry (May 2022, GPA: 3.95/4.0)

Relevant coursework: Algorithms and Models of Computation, Programming Languages and Compilers, Computer Systems Engineering, Computer Architecture, Data Structures, Abstract Linear Algebra

Experience

Optiver US LLC (June 2021 - August 2021)

Developed fast and accurate option pricing software as part of the Automated Trading Systems team.

- Learned about basic derivative theory and option pricing models.
- Implemented support for real-time option price adjusts based on live data from exchanges.
- Refactored applications to simplify the parameterization and modification of option price adjusting behavior.
- Wrote tests and testing tools to ensure correctness and measure performance of option pricing applications.

Developed live data recording, processing and reporting applications as part of the Data Engineering team.

- Designed and prototyped a new data recording platform, including new applications and interfaces for data producing and consuming applications.
- Designed and built a new application to filter, sort and record UDP broadcasts from Optiver applications and exchanges; this application processes multiple gigabytes of network data per minute in real time.

UIUC Parallel Programming Lab (June 2020 - August 2020)

Worked on ParaTreeT (Parallel Tree Toolkit), a framework for implementing tree-based parallel applications.

- Refactored the framework to enable greater flexibility and versatility in tree type/structure and domain decomposition.
- Implemented parallel domain decomposition based on space-filling curves for a Barnes-Hut N-Body simulation written with ParaTreeT.
- Gathered extensive performance data and wrote detailed documentation on the code structure and organization of the project.

CS 125: Introduction to Computer Science (January 2019 - May 2020)

Course Developer & Office Hour Captain

- 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 ~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.

Selected Projects

nanoc: Compiler, assembler and linker for a C-like language (Spring 2021)

- Small, dependency-free and highly portable.
- Compiles a subset of C directly to 32-bit x86 machine code.
- Capable of linking multiple ELF object files to produce executables.

Silk: Compiled systems programming language (Spring 2020)

- C-like semantics with additional safety guarantees and a sophisticated type system.
- Features parametric polymorphism (generics) and simple, modern syntax.
- Leverages the portability and powerful optimization of the LLVM platform.

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.

Skills

Languages: C, C++, Python, Go, Rust, Java, OCaml, JavaScript, x86 Assembly, Verilog
Technologies: Node.js, Flask, Django, jQuery, Git, Linux, Charm++, Cocoa/AppKit

Parallel Programming

- Experience designing and implementing highly scalable parallel applications with the actor-based Charm++ framework.
- Experience implementing parallel N-Body simulations based on the Barnes-Hut algorithm.

OS Development and Systems Programming

- Familiar with the x86 architecture: memory virtualization, context switching mechanisms, interrupt handling etc.
- Experience writing system software for linux and macOS, including debuggers and high-performance networking software.
- 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 interpreted programming language from scratch.
- Experience designing and implementing a systems programming language and compiler frontend for the LLVM platform.
- Experience working with the ELF binary format, including writing a linker and assembler to produce and process ELF files as well as a loader to read and execute ELF files.