Sharadh Rajaraman

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Education

National University of Singapore — *Singapore*

Bachelor of Computing (Honours) in Computer Science; 2nd Major in Physics — *Aug 2018 – May 2023*

- Computer science: parallel computing; real-time computer graphics; operating systems; compiler design.
- Physics: astrophysics; quantum mechanics; solid-state physics.

Skills

Experienced Languages C++, C, C#, Python, Java, LaTeX, GLSL/HLSL

Familiar Languages OCaml, F#, Rust, Objective-C, TypeScript, PowerShell, `bash`

Frameworks & Tools OpenGL, DirectX, Vulkan, OpenMP, CUDA, CLion/IDEA/Rider, Visual Studio, CMake

Experience

NUS School of Computing (SoC) — *Singapore*

Undergraduate Teaching Assistant — *Aug 2020 – Nov 2022*

- CS1101S Programming Methodology, CS2100 Computer Organisation, CS3241 Computer Graphics, CS4247 Real-time Rendering.
- Conducted weekly tutorials and recitations, prepared materials and videos for students, and marked assignments.
- Set up auto-grading scripts for computer graphics assignments to automate marking.

Government Technology Agency, Singapore (GovTech) — *Singapore*

Embedded Software Engineering Intern (Sensors and IoT Division: C/C++, CMake, STM32) — *May 2022 – Aug 2022*

- Implemented a C++ wrapper over Linux Serial Peripheral Interface (SPI) syscall interface. Reduced wheel-reinvention, and improved linkage for other projects using C++.
- Implemented firmware on an STM32 microcontroller in C++ to emulate a Trusted Platform Module (TPM) over I^2C for Raspberry Pi (rPi). Improved security on the rPi, and saved costs on purpose-built TPMs.

Civil Aviation Authority of Singapore (CAAS) — *Singapore*

Software Engineering Intern (TypeScript/Express.js, C#/ASP.NET Core) — *May 2021 – Aug 2021*

- Implemented a RESTful API for a UUID generator to identify flights.
- Automated a serialiser/deserialiser code generator to consume XML schemas; migrated codebase from TypeScript to C#.
- Inspected class structures at runtime to build a lookup table, serving a RESTful API.

Projects

Oat Compiler

Compiler for Oat language (OCaml, Menhir)

- Front-end outputs a subset of LLVM IR; back-end compiles IR to a subset of x86_64 assembly.
- Includes compile-time type-checking and optimisations e.g. constant folding, dead-code elimination, and register allocation with graph colouring.

cache-sim *(GitHub repository)*

Quad-core cache-coherence simulator (C++20, CMake)

- Implements MESI, MOESI, and Dragon cache-coherence protocols.
- Correctly simulates cache-coherence behaviour of a real quad-core CPU, is configurable (cache size, associativity), and outputs statistics in `.csv` format.

Static Program Analyser

Lexer and parser for a C-like toy language (C++17)

- Lexer implemented with `std::regex` state machine; parser is recursive-descent.
- Inserts information such as variable declarations, function calls, and control flow into a database about a given program written in the toy language.

Extracurriculars

NUS Astronomical Society (NUSAS) — *Singapore*

Honorary General Secretary, AstroHead — *Sept 2018 – Aug 2022*

- Organised outreach events and pavement/sidewalk astronomy with public libraries and schools
- Assisted in 2019 Boxing Day solar eclipse event, managed ~5 telescopes, and introduced public to basic astronomy
- Prepared and delivered talks on topics in astronomy to club members