Ayuub Mohamud

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Education

Imperial College London

Oct 2023 - Jun 2027

MEng Electronic and Information Engineering

- Currently in 2nd Year
- Modules: Digital Electronics and Computer Architecture (79.78%), Programming for Engineers (72.15%),
 Engineering Project (70.62%)

Harris Clapham Sixth Form

Sep 2021 - Jun 2023

A Levels

- Grades: A*AAA in Mathematics, Further Mathematics, Physics and Computer Science.

Projects

Out of Order RISC-V Implementation @ | SystemVerilog, C++, Hardware

May 2024-Oct 2024

- Built a 2-way configurable, superscalar, speculative, out-of-order RISC-V CPU.
- Implemented bimodal **branch prediction**, machine and user mode.
- Can execute over 140 instructions, including a custom DSP extension.
- Re-orders cache requests to allow for more optimal cache utilisation.
- Implemented a **dedicated test suite** \mathscr{O} in **make**, **bash and C++** for finding microarchitectural bugs.
- Utilised Verilator and GTKWave extensively to simulate and verify design, alongside on FPGA testing.
- Runs on a low-speed grade FPGA at 82.5 MHZ whilst taking **around 10K LUTs**, 10/240 of the available DSPs and 4/135 available Block RAMs.

EEERover: 1st Year Engineering Project | C++, Software/Hardware

May-Jun 2024

- Worked in a **team of 6** to develop a rover that identifies objects in an arena using various sensors.
- Delivered an ultrasound demodulation circuit, selecting necessary parts to **decode UART signals**.
- Managed the team's finances, ordering parts and discussing them with team members.
- Collaborated with team members to help **develop** the rover firmware and radio demodulation circuit.
- Achieved **70.62**% for this project (First Class).

TileLink-based SOC infrastructure @ | SystemVerilog, Hardware

Nov 2023

- Built a library of **configurable reusable modules**, for building **embedded SOCs** for FPGAs.
- GPIO controller allows for I/O pins to be **configured** as inputs or outputs at runtime.
- Block RAM controllers allow for burst accesses **maximising** bus bandwidth, including **atomics**.
- Learned about GPIO, SPI, Bus Infrastructure, Burst accesses, DMA, tri-state buffers.

ARMv8-A C Compiler 𝚱 | C++, Software

Apr-Jun 2023

- Built a compiler for a **subset of C in C++** targeting the **ARMv8-A** architecture.
- Hand-wrote the lexer and the recursive descent C parser, learning how compilers translate code.
- **Optimises** multiplications and divisions into bit shifts, by checking if the multiplier/divisor is a power of two, and **reordering code** to achieve this.
- Performs **semantic analysis** on given C code.
- Generates working assembly that can interact with standard C library.

Work Experience

Undergraduate Teaching Assistant

Oct 2024 - Present

Imperial College London (Department of Electrical and Electronic Engineering)

- Helping students learn modern C++ through live feedback during programming sessions.
- Supporting students new to programming develop critical skills like abstraction, decomposition and more.

Skills

Programming Languages: C, C++, Python, ARMv8 Assembly, RISC-V Assembly

Hardware Description Languages: SystemVerilog, Verilog

Toolchain: GCC, Git, Verilator, GTKWave, Vivado, Make, Bash, Linux, Clang

Protocols: TileLink, Wishbone, AXI

Interests

Societies: Department of Computing Society, Robotics Society, Electrical Engineering Society

Interests: Languages, History, Mathematics