
Work Experience

Aug 2023 - **FPGA Compiler Engineer**, Intel, Toronto ON

- Ongoing
 - Designed a feature to generate Avalon-based **RTL** interface for compute kernels that includes registers to control and monitor hardware interrupts, ensuring usability for customers developing device drivers by engaging with FAEs for early feedback
 - Created and troubleshooted FPGA-specific **LLVM** loop optimization passes in **C++** to improve throughput and area usage for user designs written in **SYCL** and **OpenCL**, improving performance by 15% on a user benchmark suite
 - Debugged complex issues across the hardware-software boundary, including investigating compiled binaries, LLVM IR, OpenCL runtime libraries, Quartus compilation pipelines, Modelsim simulations, and HAL functionality

Sep 2022 - **Software Engineering Co-op**, Snowflake, San Mateo CA

- Dec 2022
 - Developed data privacy features at the **SQL** query engine level for Snowflake's cloud database platform
 - Added rules to an **ANTLR 3** grammar to enable managing data aggregation policies in **SQL**, enabling customers to share data while maintaining their users' privacy
 - Implemented compiler changes in **Java** to parse and generate code for applying policies to a table
 - Implemented changes to a custom **FoundationDB** layer to store information about policies

Jan 2022 - **Compiler Engineering Co-op**, Groq, Toronto ON

- Apr 2022
 - Increased neural network inference throughput by up to 20% by designing algorithms in **C++** to efficiently utilize hardware resources for common tensor operations (e.g. convolutions)
 - Created optimization passes in **C++** using the **MLIR** compiler framework to manipulate neural networks described in **ONNX** format
 - Created machine learning models in **PyTorch** to run end-to-end compiler tests and measure cycle-accurate performance when run on custom neural network accelerator hardware

Jan 2020 - **Software Engineering Co-op**, RadComm Systems, Oakville ON

- Aug 2020
 - Researched cutting-edge radiation analysis techniques using **GNU Octave** and **Python** for data visualization to assess development options
 - Implemented algorithms in **C#** to analyze radiation patterns using the **ReactiveX** library to handle real-time data emitted by an embedded device, processing energy histograms every 100ms
 - Automated the device calibration process using **C#** to allow parallel setup of many devices

Projects

May 2022 - **Bayesian Network Inference Accelerator**, Scala — Chisel — Python — Verilog

- Dec 2022
 - Created a compiler in **Scala** to convert Bayesian network specifications into a **Verilog** module that can answer queries on the network with real-time evidence based on Markov-Chain Monte-Carlo techniques
 - Created **Protobuf**-based specifications for model description and elaboration
 - Created language for expressing Bayesian networks parsed using an **ANTLR 4** grammar
 - Utilized **Chisel** to construct hardware modules dynamically and generate RTL for various backends

Feb 2022 - **CHIP-8 Emulator**, C++ — SDL2 — ImGUI

- Mar 2022
 - C++** interpreter for CHIP-8 instruction set, runs publicly available ROMs
 - Includes graphical and audio interface using the **SDL2** library
 - Implemented an assembler and disassembler to enable troubleshooting
 - Designed live debugger using **ImGUI** to inspect memory dumps and processor state

Education

Sep 2018 - **University of Waterloo**, Computer Engineering B.A.Sc, Waterloo ON

Apr 2023 Cumulative average **92%**

- Degree honours: Dean's honours list, graduated with distinction
- Scholarships and awards
 - President's Research Award
 - Savvas Chamberlain Scholarship