

## Software

- KiCAD
- LTSpice/PySpice
- Cadence
- LayoutEditor
- Quartus Prime
- Linux

## Languages

- Python
- Scipy
- Flask
- Sympy
- TensorFlow
- Pytorch

- C++
- SQL
- Rust
- nalgebra
- Rayon
- MATLAB
- Go

- Verilog
- RISC-V
- Shell
- LaTeX

## Lab Skills

- PCB Design
- Oscilloscope
- Network Analyzer
- Probe Station
- Wirebonder
- Diebonder
- Plasma Cleaner & Asher
- Dicing saw
- HMDS Oven
- Spincoater
- SEM
- X-Ray Spectroscopy

## Summary of Qualifications

- Multidisciplinary generalist electrical engineering skills specialist in software development at scale in data engineering with **Python** and performance critical development in **C++**
- Experienced electrical engineering skills with clean-room and hands-on electrical lab-work
- Strong electrical engineering foundation through coursework in semiconductor device physics, RF devices, control systems, and IC design

## Experience

### RESEARCH ELECTRICAL ENGINEER

University of Waterloo @

Sept 2022 - Apr 2023 | Waterloo, ON

- Developed research plan for packaging of  $\mu$ LEDs onto TFT packplanes using indium electroplating
- Characterized results using **SEM** and **X-Ray Spectroscopy**,
- Designed custom PCBs in **KiCAD** for driving small  $\mu$ LED active/passive matrix displays using **STM32** microcontroller and accompanying analog circuitry
- Designed characterization setups for  $\mu$ LEDs in **Fusion360** and **Arduino** interfaced with **Python**
- Validated flip-chip diebonding results with thermal and electrical simulations in **MATLAB**
- Designed and validated new layouts to improve mechanical and electrical performance

### SOFTWARE ENGINEER - FIRMWARE

Groq Inc.

Jan 2022 - Apr 2022 | Mountain View, CA, USA

- Defined resource allocation over memory & processing units of tensors on Groq's TPU
- Developed **Python** & **C++** API/firmware to improve streaming of instructions & data
- Used **PyBind11** for interoperability of **C++** & **Python** API/firmware for migration from older codebase

### SOFTWARE ENGINEER - AUTONOMOUS VEHICLES

University of Waterloo @

Jan 2023 - Apr 2023 | Waterloo, ON

- Fault analysis of autonomous vehicles, used **Python**, logged to **PostgreSQL** server
- Created a dashboard using **Flask/Dash** to allow for data exploration and identification of failures

## Projects

### BEAMFORMING HEARING AID @

- Designed 4 channel microphone array PCB in **KiCAD**, PCB does active analog bandpass filtering, differential amplification, and multichannel **ADC** over **SPI** to Raspberry Pi
- R-Pi does compression and sends audio over **Flask** server for further digital filtering and beamforming
- **Pytorch** to create quantized voice isolation model and minimize latency and maintain performance
- Used **multiprocessing**, **asyncio**, and **websockets** to maximize throughput and performance

### SOFTWARE ENGINEER - DIGITAL COMPRESSION

Huawei Technologies

May 2020 - Aug 2020 | Waterloo, ON

- Designed and Analyzed non-cryptographic hash function with linear algebra, SAT & self-designed GF(2) matrix solver to verify properties
- Benchmarked the optimized SIMD hashing function against existing NCHFs (**Rust**, **C++**)
- Implemented novel border detection algorithm in **Go** using **probabilistic data structures** to maximize performance with Go-routines

### SOFTWARE ENGINEER - MACHINE LEARNING

MappedIn

Sept 2019 - Dec 2019 | Waterloo, ON

- Designed data pipelines for cleaning & analysis; integrated new **SQL** data warehouse
- Increased prediction accuracy from **40%** to **80%** on existing **LSTM** models with feature engineering, hyperparameter optimization, & automated data cleaning (**Python**, **SQL**)
- Created **Embeddings + SVM + Random Forest** ensemble models to replace existing **LSTM** models, reducing inference costs **2X** while maintaining prediction accuracy

### SOFTWARE ENGINEER - BIOINFORMATICS

Ontario Institute for Cancer Research @

Jan 2019 - Apr 2019 - Jan 2021 - Apr 2021 | Toronto, ON

- Developed software in **Python** & **SQL** for existing genetics analysis pipeline
- Resolved bugs in existing lab software (**Perl**, **Python**, **C#**)
- Designed genomics pipelines for visualization, cleaning, and analysis; interfacing with existing **R**, **Perl**, and **Shell** pipelines
- Wrote future-proof and extensible code to process big datasets (**Pandas**, **Shell**)

### PIPELINED RISC-V CORE

- Designed 5-stage pipelined **RISC-V** 32-bit core in **Verilog** using only synthesizable constructs
- Core synthesized on FPGA and successfully ran programs. Testbenches used to ensure cycle accuracy

### RAY TRACING ENGINE @

- Implemented 3D recursive path-tracing for arbitrary materials on basic geometric shapes
- Used **nalgebra** for arbitrary rotations & positions of camera & objects
- Parallel processing of ray-tracing using **rayon** yielding **~10X** performance speed-up