Kunal **Chandan**

University of Waterloo
B.A.Sc Honours Electrical & Computer Engineering

chandan.one
github/kunalchandan
kchandan@uwaterloo.ca
647-785-1313
linkedin/kunal-chandan

Software

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

Languages

- Python
  - Numpy
  - Pandas
  - Scipy
  - Flask
  - Sympy
  - TensorFlow
  - Pytorch
- C++
- SQL
- Rust
  - nalgebra
  - Rayon
- MATLAB
- Go
- Verilog
- RISC-V
- Shell
- LaTeX

Lab Skills

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

Interests

- Cycling
- Rock Climbing
- Juggling

`107.6pt 633.2pt`

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, computer architecture, control systems, and IC design

Experience

RESEARCH ELECTRICAL ENGINEER | University of Waterloo

Sept 2022 - Apr 2023 | Waterloo, ON

- Developed research plan for packaging of μLEDs onto TFT packplanes using indium electroplating
- Characterized results using **SEM** and **X-Ray Spectroscopy**,
- Designed custom PCBs in **KiCAD** for driving small μLED active/passive matrix displays using **STM32** microcontroller and accompanying analog circuitry
- Designed characterization setups for μLEDs 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
- Used timing analysis to prevent stream conflicts & allowed for interleaving of streams

SOFTWARE ENGINEER - AUTONOMOUS VEHICHLES | University of Waterloo

Jan 2023 - Apr 2023 | Waterloo, ON

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

SOFTWARE ENGINEER - DIGITAL COMPRESSION | Huawei Technologies

May 2020 - Aug 2020 | Waterloo, ON

- Designed collision free non-cryptographic hash function (NCHF) in Galois Field 2 (GF-2)
- Analyzed NCHF 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 | Robarts Research Institute

Jan 2021 - Apr 2021 | London, ON

- Developed software in **Python** & **SQL** for existing genetics analysis pipeline
- Resolved bugs in existing lab software (**Perl**, **Python**, **C#**)
- Developed software for migration of genetic analysis database from GRCh37 to GRCh38

SOFTWARE ENGINEER - BIOINFORMATICS | Ontario Institute for Cancer Research

Jan 2019 - Apr 2019 | Toronto, ON

- Project lead of new statistical analysis tool for all future studies at OICR-GSI

- 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**)
- Open-sourced project and version controlled with **Git**; created extensive documentation

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

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

Education

UNIVERSITY OF WATERLOO

B.A.SC ELECTRICAL & COMPUTER ENGINEERING 23'

- Electronic devices, Semiconductor physics, Analog/Digital integrated circuits
- Analog/Digial/Multivariable control systems
- Radio frequency and microwave circuits

Awards and Certifications

- 2022 - Baylis Medical Capstone Design Award
- 2022 - QNFCF Cleanroom Certification
- 2022 - G2N Cleanroom Certification

`733.84pt 1044.6pt`