BBB 4856
peterpcao

Peter Cao

petepc@umich.edu
petecao

Passionate student seeking to use tech to find advances in computer architecture, compilers and machine learning.

Education

University of Michigan – *Rackham Graduate School* Ann Arbor, MI
PhD in Computer Science and Engineering *August 2024 - Present*
Relevant Coursework: Parallel Computer Architecture, Advanced Topics in Computer Architecture, Advanced Scalable Systems

Cornell University – *College of Engineering* Ithaca, NY
B.S. in Computer Science and Applied/Engineering Physics; GPA: 3.713/4.0 *September 2020 - May 2024*
Relevant Coursework: Compilers, Computer Architecture, Distributed Systems, Functional Programming, Algorithms, Operating Systems, Embedded Systems, Natural Language Processing, Machine Learning, H. Data Structures & OOP, Quantum Information Hardware & Computing, Classical & Quantum Mechanics, Electromagnetism, H. Discrete Math, Mathematical Physics

Experience

Google Mountain View, CA
SWE Intern (Python, C++, MLIR) *May 2023 - August 2023*
- Added a performance pass to a compiler dashboard to profile and see the performance of different ML models running on a simulator
- Designed and implemented a Halide-like scheduling language for the Edge TPU ML Compiler for MLIR programs

Google Sunnyvale, CA
SWE Intern (TypeScript, Python, C++, Java) *May 2023 - August 2023*
- Performing feature exploration and fullstack engineering for Gmail's Help Me Write and other intelligence features.

Apple Cupertino, CA
SWE Intern (Python) *January 2023 - May 2023*
- Developed a tool for working with programs in CoreML's Model Intermediate Language.

Google Sunnyvale, CA
STEP Intern (Java, TypeScript) *May 2022 - August 2022*
- Added support for new ECMAScript 2022 features such as error causes, static class blocks, and class fields to closure-compiler using Java in a group of 4.

Research

CCCP (Compilers Creating Custom Processors) Lab Ann Arbor, MI
University of Michigan *August 2024 - Present*
- Working under Professor Scott Mahlke in hardware-software codesign, working with both compilers and computer architecture to make efficient applications
- Collaborating with Los Alamos National Laboratory to make indirect memory accesses more efficient

M3 Research Lab Ithaca, NY
Cornell University *August 2023 - December 2023*
- Wrote benchmarks with ML applications for use of testing a processing-in-memory processor compared to a normal CPU

Wilde Lab Ithaca, NY
Cornell University *August 2022 - December 2022*
- Studied the use of variational quantum algorithms for quantum ML, specifically the optimization algorithms compared to gradient descent

Zhang Lab Ithaca, NY
Cornell University *May 2021 - December 2021*
- Trained, designed, and accelerated convolutional neural networks for object detection and classification of a dataset of almost 20k images on FPGAs for applications for drones using Pytorch and Vivado HLS technology
- Investigated the use of color quantization optimizations to reduce the energy and runtime of the object detection model

McMahon Lab Ithaca, NY
Cornell University *August 2020 - May 2021*
- Developed and researched quantum variational PDE solving algorithms by testing ansatzes and optimization approaches for noisy intermediate scale quantum devices with 6-20 qubits using Cirq and Pennylane
- Investigated the read-in process in order to initialize a quantum state given classical initial conditions, specifically for the heat equation

Teaching

Cornell University Ithaca, NY

Teaching Assistant/Grader *January 2021 - May 2024*

- Held lab hours, organized and led review sessions, answered questions, and graded homeworks and projects for 7 semesters and thousands of students taking these courses
- **ECE/ENGRD 2300: Digital Logic and Computer Organization** SP 2021
- **CS 4820: Introduction to Analysis of Algorithms** FA 2021, SP 2021, FA 2022, SP 2023, SP 2024
- **AEP/ENGRD 2550: Quantum Information Hardware** SP 2022
- **Principles of Large-Scale Machine Learning** FA 2023
- **ECE 4750/CS 4420: Computer Architecture** FA 2023
- **AEP 4300: Advanced Mathematical Physics** SP 2024

Projects

Multicore Processor *(SystemVerilog)* August-December 2022

- Implemented a four-core pipelined processor with a ring network and a blocking 2-way associative cache in order to run RISC-V assembly instructions with a variable multiplier

Xi Compiler *(OCaml, Java)* January-May 2022

- Implemented a full compiler to x86-64 Assembly with optimizations for an imperative, statically typed language with support for records, arrays, and other control flow structures

RatHunt *(OCaml, PostgreSQL)* September-December 2021

- Made a full-stack website that was able to host a puzzlehunt and supported team creation, answer checking and submission and also storing information in a PostgreSQL database

Bot Be Named *(Python)* January 2022

- Added puzzlehunt management functions using the Google Sheets API and discord.py for a Discord bot used by 5 Discord servers

Stock Explorer *(Typescript, React, Express, Firebase, Node)* April-May 2021

- Made a full-stack website that allows users to track and save stocks and simulate having their own portfolio

CritterWorld *(Java, JavaFX)* October-December 2020

- Implemented a parser and interpreter for a critter language which was used to make a GUI world simulation accepting client-server requests

Skills

- **Languages/Frameworks:** Python, OCaml, Java, NumPy, Typescript, Node, Express, JSON, React, MatPlotLib, Verilog, Flask, SQLite, NoSQL, Cirq, Pennylane, Scikit-Quant, PyTorch, C/C++, HTML, CSS, MLIR, LLVM
- **Tools**: Git, Google Apps, Microsoft Office, Autodesk Inventor, NI Multisim, Arduino, CAD, 3-D Printing, LaTeX, Data Structures & Algorithms, Postman, Firebase, Compiler Implementation, Heroku