William Liu

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Bio

I am a software engineer, as well as a computer scientist and cognitive scientist.
I generally find myself working on problems in parallel systems/algorithms, domain-specific compilers, human-AI interaction, deep learning, linguistics, and applications of cognitive science.
I usually work on developing robust large-scale systems, and also doing applied research.

For a shorter overview of my work, please check out my resume at: williamliu.me/Rez_U_May.pdf

Updated: Jan 30, 2022

Education

The University of Texas at Austin // Austin, Texas
Master of Science in Computer Science (Part Time, Remote) — Dec 2023 (Expected)

Carnegie Mellon University // Pittsburgh, Pennsylvania
Bachelor of Science in Cognitive Science — May 2020
Minor in Computer Science
Alpha Epsilon Pi Fraternity
Research Advisor: Saugata Ghose

University of Wisconsin—Madison // Madison, Wisconsin
High School Dual Enrollment in Applied Mathematics, Engineering and Physics (AMEP) — May 2016

Professional Experience

CoPilot // Pittsburgh, Pennsylvania (Remote)
Backend Systems Engineer — Aug 2021 — Present
- Build, manage, and maintain the entire backend infrastructure of the company
- Design systems for coaches to communicate with clients about exercise movements
- Create data pipelines and perform data analysis for key business metrics

SambaNova Systems // Palo Alto, California
Software Engineer — Jun 2020 — Aug 2021
- Led small team to increase performance of multiple 2D and 3D computer-vision ML models more than 10X on custom hardware
- Designed and optimized architecture-specific high-throughput convolution operators
- Built optimizing compiler for ML and high-performance computing applications, and designed and implemented dataflow graph optimizations algorithms in the compiler

Nvidia // Santa Clara, California
Deep Learning Software Intern — May 2019 — Aug 2019
- Machine learning model compression for custom embedded processor
- Designed and built new performance testing infrastructure for all embedded ML apps

Uber // Pittsburgh, Pennsylvania
Software Engineering Intern — May 2018 — Aug 2018
- Surveyed, designed, and implemented multiple latency reduction algorithms in the autonomous vehicle distributed operating system's message-passing protocol

Skills

Programming Languages:
Python, TypeScript, JavaScript, C, C++, SML, MATLAB, Octave, R, OCaml

Machine Learning:
PyTorch, Tensorflow, Keras, High-Resolution Image Processing, Semantic Segmentation

Web Development:
GraphQL, React, PostgreSQL, NextJS, Urql, TypeORM, AWS, DigitalOcean, Vercel, Fastify, Express, MongoDB, Flask

Tools:
LLVM, Cuda, OpenMP, Open MPI, Unix, Git, Perforce

Design:
InDesign, Photoshop, Illustrator, Adobe XD, Sketch, AutoCAD, SolidWorks, Figma, User Research

Languages:
Mandarin Chinese (Basic Professional Proficiency), Japanese (Very Basic)

Miscellaneous:
LaTeX, Gantt Charts, Agile Software Development, Asana, JIRA

Research Experience

The University of Texas at Austin // Austin, Texas
Graduate Researcher Jan 2022 — Present
Research Areas: Augmented Reality, Asynchronous Collaboration, Human-AI Interaction, Physical-Digital Information Representation
Research Advisor: Amy Pavel

Computer Architecture Lab at Carnegie Mellon // Pittsburgh, Pennsylvania
Research Assistant Dec 2016 — May 2020
Research Areas: Operating Systems and Memory Architecture
Research Advisor: Saugata Ghose

CMU Articulab // Pittsburgh, Pennsylvania
Research Intern Aug 2017 — Dec 2017
Research Areas: Rapport Modeling and Human-AI Interaction
Research Advisors: Michael Madaio and Justine Cassell

Scientific Publications

M. Emani, V. Vishwanath, C. Adams, M. E. Papka, R. Stevens, L. Florescu, S. Jairath, **W. Liu**, T. Nama, and A. Sujeeth
"Accelerating Scientific Applications With SambaNova Reconfigurable Dataflow Architecture"
in Computing in Science & Engineering, Vol. 23, No. 2, pp. 114-119, Mar 2021

S Ghose, A G Yağlıkçı, R Gupta, D Lee, K Kudrolli, **W X. Liu**, H Hassan, K K. Chang, N Chatterjee, A Agrawal, M O'Connor, O Mutlu
"What Your DRAM Power Models Are Not Telling You: Lessons from a Detailed Experimental Study"
in Proc. of the ACM SIGMETRICS Conference, Irvine, CA, June 2018
in Proc. of the ACM on Measurement and Analysis of Computing Systems (POMACS), Vol. 2, No. 3, Dec 2018

Teaching Experience

15-418 Parallel Computer Architecture and Programming // Carnegie Mellon University
Teaching Assistant *(Rating: 5.0/5)* Spring 2020
- 15-418 "provides a deep understanding of the fundamental principles and engineering trade-offs involved in designing modern parallel computing systems as well as teaches parallel programming techniques necessary to effectively utilize these machines"
- Designed homework/exam questions, held office hours, answered questions on Piazza

85-310 Research Methods in Cognitive Psychology // Carnegie Mellon University
Head Teaching Assistant *(Rating: 4.5/5)* Spring 2020
- 85-310 teaches students how to conduct independent research in cognitive science by designing, running, and evaluating a novel research project and writing up a report
- Graded reports, designed quizzes, provided supplemental lectures, held office hours

15-110 Principles of Computing // Carnegie Mellon University
Teaching Assistant *(Rating: 4.8/5)* Fall 2019
Teaching Assistant *(Rating: 5.0/5)* Fall 2018
Teaching Assistant *(Rating: 4.6/5)* Spring 2018
Teaching Assistant *(Rating: 3.5/5)* Fall 2017
- 15-110 is a fast-paced and broad introduction to the field of computer science that introduces basic theory and programming techniques
- Lectured recitation sessions, graded homework and exams, held office hours

Projects

Detailed descriptions for all projects can be found at: ***https://williamliu.me/categories/project/***

Ice Hockey Agent // Course Project, Dec 2021
Designed and implemented an agent that plays ice hockey in a MarioKart-esque game environment. Used PyTorch to design a fully-convolutional model for detecting game features and reinforcement learning to act.

Reducing Cache Pollution at Compile Time // Course Project, May 2020
Reduced cache pollution in large memory streaming applications by inserting non-temporal memory instructions through multiple compiler passes

Improving CNN Interpretability // Course Project, May 2019
Improve CNN kernel interpretability by guiding and extracting kernel gradient convergence results using part-templates which can be used to interpret model convergence behavior

Parallel Galaxy Simulation // Course Project, May 2019
Built and optimized parallel galaxy simulator with a lock-free quadtree and experimented with different parallel numerical integration methods

Simon // PennApps XVIII Hackathon, Sep 2018
Train a robot to do a simple mechanical task by doing it yourself and the robot will mimic your actions
Top 30 Hack

Modware // PennApps XVII Hackathon, Jan 2018
Prototype with basic modular hardware components by controlling the "wiring" through software
2nd Place Overall, Best Hardware Hack, Hacker's Choice Award, and Best IoT Prize

Facebook Discourse // Facebook Global Hackathon Finals, Nov 2017
Digitize and organize political debates in real time to streamline political media
Grand Prize out of 14 finalists from 11 different countries

ResistAR // TartanHacks 2017 Hackathon, Feb 2017
Augmented reality app that visualizes the voltage across and current through each component in a circuit
Grand Prize

Autonomous Ground Support Equipment // NASA's Centennial Challenge, Apr 2016
Autonomous robotics system to support a rocket launch carrying payload
2nd Place as the only high school team in this college competition

Select Coursework

Mathematics and CS Theory:
Neural Network Design, Topics in Deep Learning, Topology and Modal Logic, Parallel Algorithms, Functional Programming, Machine Learning, Computational Perception, Numerical Analysis and Algebra, Theoretical Computer Science

Systems:
Optimizing Compilers, Parallel Computer Architecture, Advanced Operating Systems

Psychology:
Consciousness, Adaptive Neural Decision Making, Systems Neuroscience, Human Factors in Design, Neural Foundations of Behavior

Organization Involvement

CMU Tricking Club I highly encourage you to look up Tricking if you like gymnastics or parkour :)
Member — Jan 2020 — May 2020
Co-Founder and President — Dec 2016 — Jan 2020

Cognitive Science Student Advisory Board
Treasurer — Aug 2018 — May 2020
Board Member — Jan 2018 — Aug 2018

Scotch'n'Soda Theatre
Assistant Director for *RENT* — Feb 2020 — Mar 2020
Production Manager for *The House of Yes* — Jan 2018 — Feb 2018
Stage Manager for *Young Frankenstein* — Aug 2017 — Oct 2017
Stage Manager for *Heathers: The Musical* — Feb 2017 — Apr 2017
Assistant Stage Manager for *Rosencrantz and Guildenstern are Dead* — Jan 2017 — Feb 2017
Hair and Makeup Artist for *Murder Ballad* — Sep 2016 — Oct 2016

St. Mary's Hospital
Inpatient Volunteer — Jul 2013 — May 2015

Professional Affiliations

IEEE, IEEE TCuARCH, IEEE TCCA, ACM, ACM SIGARCH

Interests

Anime/Animation, Photography, Music, Writing, Weight Lifting, League of Legends, Filmmaking, Pokémon