Jaylen Wang

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EDUCATION

Carnegie Mellon University — Pittsburgh, PA
PhD Candidate in Electrical and Computer Engineering — *August 2022 ~ May 2027*
Advisor: Prof. Akshitha Sriraman

Harvard University — Cambridge, MA
Bachelor of Science in Electrical Engineering, *Minor* in Computer Science — *May 2022*
GPA: 4.0 | See last page for Selected Courses

RESEARCH INTERESTS

My research interest broadly covers hardware-software co-design to perform novel design space explorations and illuminate **design tradeoffs in of performance, resilience, and sustainability**. This has manifested itself in my current work to find co-design strategies to increase fault tolerance of machine learning accelerators as well as previous work to improve carbon-efficiency of cryptocurrency mining hardware.

Currently I am exploring how to co-design solutions for **more energy and carbon efficient datacenter/cloud systems, hardware, and applications**. I am also newly interested in how to build equitable systems that ensure fair use to the diverse set of users that systems today must serve.

WORKSHOPS/ POSTERS

Jaylen Wang, Abdulrahman Mahmoud, Gu-Yeon Wei, David Brooks, *A Dataflow-Aware Fault Resilience Analysis Framework for Deep Neural Network Accelerators*, Young Architect Workshop (YArch) co-located with ASPLOS, 2021.

Sahana Rangarajan, Xuesi Chen, **Jaylen Wang**, Pratyush Patel, Akshitha Sriraman, *Designing Equitable Data Center Scheduling Systems*, Career Workshop for Inclusion and Diversity in Computer Architecture (CWIDCA) co-located with MICRO, 2022.

RESEARCH EXPERIENCE

Systems and Architecture Research Lab — Pittsburgh, PA
Graduate Researcher — *Fall 2022 – Present*

- Developing hardware/software solutions for carbon-efficient data center hardware.
- Profiling data center applications to run on heterogeneous generations of hardware to promote hardware reuse.

Harvard Architecture, Circuits, and Compilers Group — Cambridge, MA
Undergraduate Researcher — *Summer 2021 – Present*

- Leading research to develop framework for analyzing hardware-aware resilience of deep neural network systems to soft errors (*working towards publication*).
- Providing insights into how an accelerator's dataflow affects error propagation in DNN systems.
- Led research project into sustainability of cryptocurrency, considering mining server operational and manufacturing carbon costs of cryptocurrency hardware.

Harvard Edge Computing Lab — Cambridge, MA
Undergraduate Researcher — *Summer 2020*

- Wrote C++ code to add a SLAM ROS node within an existing micro aerial vehicle (MAV) simulation framework called "MAVBench".

- Analyzed and studied how using SLAM for localization affects efficiency and power usage within MAV applications depending on the environment and hardware.

Hoffman Lab Cambridge, MA
Undergraduate Researcher *Summer 2019*

- Developed a tensioning system for an XY-walker system in order to extend the range of a scanning tunneling microscope used to research the proximity effect of superconductivity.
- Gained experience with LabVIEW, SolidWorks, and working with graduate students and professors to solve engineering problems.

WORK EXPERIENCE

MathWorks Natick, MA
Intern in Deep Learning HDL Toolbox Team *Summer 2021*

- Enabled mapping of non-square convolution kernels onto square PE array allowing users to deploy models using non-square kernels onto FPGAs.
- Improved performance of mapping algorithm using more efficient data structures.
- Led work to support imported flatten layers from Keras and ONNX.

AWARDS

Carnegie Institute of Technology Dean's Fellow *August 2022*
Full tuition and support for first year.

Harvard SEAS Dean's Engineering Design Award *May 2022*
$500 awarded to top 7 (out of 43) best Senior engineering design projects.

Sophia Freund Prize *May 2022*
$1000 awarded to highest ranking undergraduate in major's department (EE).

Phi Beta Kappa Member *Class of 2022*
Admitted into Harvard's chapter, one of 146 out of 1962 (7.4%) students.

John Harvard Scholar *May 2020*
Award given to top 5% (4.0 GPA) of students in respective class.

Derek Bok Center Distinction in Teaching *Fall 2020-Fall 2021*
Awarded to highly rated (by students) TAs; received distinction in three semesters.

Harvard College Research Program Funding Recipient *May 2019*
Awarded $3,500 to perform independent research during the summer of 2019.

Detur Prize Winner *September 2019*
Recognizes students with top academic standing in their first year at Harvard.

TEACHING EXPERIENCE

Harvard University, Undergraduate Teaching Assistant Cambridge, MA

- Systems Programming and Machine Organization (CS 61) *Fall 2020, 2021*
  Prof. Eddie Kohler
- Circuits, Devices, and Transduction (ES 152) *Fall 2021*
  Profs. Gage Hills & Woodward Yang
- Systems and Control (ES 155) *Fall 2021*
  Profs. Li Na & Yue Lu
- Introduction to Electrical Engineering (ES 50) *Spring 2021*
  Profs. Chris Lombardo & Marko Loncar
- Integration, Series and Differential Equations (Math 1B) *Fall 2019*
  Dr. Hakim Walker

LEADERSHIP & ACTIVITIES

CIT K-12 Outreach Pittsburgh, PA
STEM Volunteer *Fall 2022 – Present*

- Crafting curricula in computer engineering for bi-weekly lessons in underserved and marginalized public schools in the greater Pittsburgh area.
- Presenting research to students to promote future students to pursue STEM.

Harvard Club Tennis Cambridge, MA
Captain/President *May 2019 – Spring 2022*

- Elected by club tennis members to organize practices and handle the organization's trips to national tournaments and finances.
- Presided over meetings members of the Harvard Tennis community.

Harvard College Engineering Society Cambridge, MA
Co-President *Fall 2020 – Spring 2021*

- Elected to lead organization and manage ten committees, delegating work and keeping track of various engineering community of events.
- Secured sponsorships and contacts with companies.
- Managed contact with administration and faculty to discuss students' needs.

Harvard Engineering Peer Concentration Advisors Cambridge, MA
Co-President *May 2020 – August 2021*

- Elected to lead organization and manage ten committees, delegating work and keeping track of various engineering community of events.
- Secures sponsorships and contacts with companies.
- Manages contact with administration, meeting with faculty to discuss students' needs.

SELECTED COURSES

Carnegie Mellon University
Modern Computer Architecture and Design (18.740)
Modern Computer Systems (18.847B)

Harvard University
Advanced Computer Architecture (CS 146)
Advanced Design of VLSI Circuits and Systems (CS 248)
Close Readings in Distributed Systems (CS 246)
Computing Hardware (CS 141)
Circuits, Devices and Transduction (ES 152)
Operating Systems (CS 161)
Systems Programming and Machine Organization (CS 61)
Data Structures and Algorithms (CS 124)
Computer Vision (ES 143)
Signals and Communications (ES 156)

MIT (Cross-Registered)
Hardware Architecture for Deep Learning (6.812)
Intro to Machine Learning (6.036)

COURSE PROJECTS

Hardware Architecture for Deep Learning (6.812) Cambridge, MA
Final Project *Spring 2021*

- Explored trade-offs between accuracy, area, and energy of different quantization methods in DNN models on accelerator frameworks.
- Used Timeloop/Accelergy, a DNN accelerator energy and area modeling framework, to perform analysis.

Advanced Computer Architecture (CS 146) Cambridge, MA
Final Project *Spring 2019*

- Researched for and wrote final research paper on how an understanding of fundamental computing hardware leads to speedups in machine learning matrix multiplication computations.

- Implemented and optimized such techniques as loop unrolling and tiling in C to allow for more effective computations and utilization of the CPU.

TECHNICAL SKILLS

Programming Languages	C++, C, Python, Verilog, SystemVerilog, Assembly, Catapult HLS, MATLAB
System Skills	Systems programming, Docker, performance characterization
Simulators/Tools	Gem5, Pin, Linux perf, PyTorch, Git