Alexander Redding

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Education

University of California San Diego 2022 — Present
Ph.D. Computer Science & Engineering (in progress) *La Jolla, CA*
Advisors: Ryan Kastner, Pat Pannuto

University of California San Diego 2022 — 2025
M.S. Computer Science & Engineering *La Jolla, CA*

Northwestern University 2018 — 2022
B.A. Computer Science *Evanston, IL*

Research Experience

University of California San Diego Jan 2022 — Present
Advisors: Ryan Kastner, Pat Pannuto *La Jolla, CA*

Arbolta, *Lead researcher*

- Developing open-source workflow for reasoning about reliability and energy-efficiency of edge ML accelerators.
- Designed new transient fault-injection techniques for assessing reliability of arbitrary RTL designs.

Repurposing Discarded Smartphones to Reduce Carbon Emissions, *Research assistant*

- Created workflow for automated, versioned building of custom Debian Linux images for Google Pixel Fold cluster.
- Built and evaluated experimental smartphone Slurm cluster over distributed HPC benchmarks.

University of California San Diego Sep — Dec 2022
Advisor: Tajana Šimunić Rosing (rotation) *La Jolla, CA*

EmbHD, *Lead researcher*

- Developed a library for enabling Hyperdimensional Computing research on resourced-constrained edge devices.
- Accelerated on-device training with ARM DSP extensions, and verified power savings through bench measurements.

Northwestern University May 2021 — Sep 2022
Research Assistant *Evanston, IL*
Primary Investigator: Josiah Hester

Northwestern University Nov 2020 — May 2021
Laboratory Assistant *Evanston, IL*
Primary Investigator: Marcelo Worsley

Employment

Advanced Micro Devices (AMD) June — Dec 2024, Oct 2025 — March 2026
Research Assistant *San Diego, CA*

- Created Arbolta, an open-source hardware simulator for the HW/SW co-design of ML accelerators.
- Used Arbolta to conduct design space exploration study via dynamic power estimation on representative workload data.

Fellowships and Memberships

Qualcomm Innovation Fellowship Finalist 2024
Joint with Abarajithan Gnaneswaran

Department of Computer Science and Engineering First-Year Rotation Fellowship 2022 — 2023
University of California San Diego

Society of Hispanic Professional Engineers 2020 — Present

Publications

Towards Reliability-Driven DSE of NN Accelerators Through Arbolta Python/RTL Co-Simulation In Submission
Alexander Redding, Ian Colbert, Abarajithan Gnaneswaran, Zihan Ling, Francesco Restuccia, Andres Meza, Zhenghua Ma, Pat Pannuto, Abdulrahman Mahmoud, Olivia Weng, Ryan Kastner.

Open-CFR: Open-source Co-design Framework for Redundancy with DPR in COTS FPGA SoCs SMC-IT/SCC 2024
Francesco Restuccia, Biruk Seyoum, Alexander Redding, Zhenghua Ma, Guy Eichler, Ryan Kastner.
In *Proceedings of the 2024 IEEE Space Mission Challenges for Information Technology (SMC-IT).*
Mountain View, CA. July 2024.

Architectural Implications of Neural Network Inference for High Data-Rate, Low-Latency Scientific Applications arXiv 2024
Olivia Weng, Alexander Redding, Nhan Tran, Javier Mauricio Duarte, Ryan Kastner.
In *arXiv:2403.08980.*

Perceptions of Wearable Health Tools Post-COVID 19 in Low-income Latine Communities JMIR 2024
Stefany Cruz, Claire Lu, Mara Ulloa, Alexander Redding, Josiah Hester, Maia Jacobs.
In *Proceedings of the 2024 Journal of Medical Internet Research mHealth and uHealth.*
JMIR mHealth and uHealth.

Practical Obfuscation of BLE Physical-Layer S&P 2024
Hadi Givehchian, Nishant Bhaskar, Alexander Redding, Han Zhao, Aaron Schulman, Dinesh Bharadia.
In *Proceedings of the 2024 IEEE Symposium on Security and Privacy (S&P).*
San Francisco, CA. May 2024.

EmbHD: A Library for Hyperdimensional Computing Research on MCU-Class Devices NET4us 2023
Alexander Redding, Xiaofan Yu, Shengfan Hu, Pat Pannuto, Tajana Rosing.
In *Proceedings of the 2nd Workshop on Networked Sensing Systems for a Sustainable Society (NET4us).*
Madrid, Spain. October 2023.

EquityWare: Co-Designing Wearables With and For Low Income Communities CHI 2023
Stefany Cruz, Alexander Redding, Connie W. Chau, Claire Lu, Julia Persche, Josiah Hester, Maia Jacobs.
In *Proceedings of the 2023 Conference on Human Factors in Computing Systems (CHI).*
Hamburg, Germany. April 2023.

Presentations

Arbolta: A Fault Tolerance Study using Minimal Hardware Simulation September 2, 2025
Fast Machine Learning for Science Conference 2025. Zurich, Switzerland.

EmbHD: A Library for Hyperdimensional Computing Research on MCU-Class Devices October 6, 2023
2nd Workshop on Networked Sensing Systems for a Sustainable Society. Madrid, Spain.

Teaching

CSE 141: Introduction to Computer Architecture — *Teaching Assistant* Fall 2026
- Topics include instruction set architectures, pipelining, peripheral I/O, and processor performance analysis.
- Helped develop new course project in which students build a pipelined CPU modeled on the ARM Cortex-M0.

CSE 145/237D: Embedded Systems Design Project — *Teaching Assistant* Spring 2025, 2026
- Topics include rapid system prototyping, HW/SW co-design, project management, and research ethics.

CSE 160: Introduction to Parallel Computing — *Teaching Assistant* Winter 2024, 2025
- Topics include GPU kernel programming; and parallelization principles and applications.
- Expanded CUDA course materials with OpenCL translation for increased focus on heterogeneous computing.

CS 343: Operating Systems — *Peer Mentor* Spring 2022
- Topics include concurrency, scheduling, virtual memory, and file systems.

CS 211: Fundamentals of Computer Programming II — *Peer Mentor* Fall 2021, Winter 2022
- Topics include C and C++ programming, memory management, and the Unix shell.