Kyle Daruwalla

Curriculum Vitae

darsnack.github.io
darsnack

Current Position

Aug. 2022 – Present **NeuroAI Scholar**, *Cold Spring Harbor Laboratory*, Long Island, NY
Independent postdoctoral scholar
Bridging computer science and neuroscience in artificial neural networks to build more energy-efficient computing. Collaborating with neuroscientists to study facial expressions in mice.

Education

2016 – 2022 **Ph.D. in Electrical Engineering**, *University of Wisconsin-Madison*,
Dissertation: "Building Energy Efficient Computers with Brain-Inspired Computing Models"

2016 – 2019 **M.S. in Electrical Engineering**, *University of Wisconsin-Madison*,

2012 – 2016 **B.S. in Computer Engineering and Continuous Applied Mathematics**,
Rose-Hulman Institute of Technology,
Magna Cum Laude

Academic Experience

Research Experience

2016 – 2022 **Research Assistant**, *University of Wisconsin-Madison*,
Advised by: Dr. Mikko Lipasti
Worked on energy-efficient computing paradigms in stochastic computing and neural networks.

2014 – 2016 **Research Assistant**, *Rose-Hulman Institute of Technology*,
Advised by: Dr. Mario Simoni and Dr. Daniel Chang
Developed configurable architecture for simulating Hodgkin-Huxley neural systems.

Teaching Experience

Sep. 2021 – Dec. 2021 **Lecturer**, *University of Wisconsin-Madison*,
ECE252: Introduction to Computer Engineering
Instructed a course section on introductory material for computer engineering.

Sep. 2018 – Aug. 2019 **Teaching Assistant**, *University of Wisconsin-Madison*,
ECE532: Matrix Methods for ML
Taught as an in-class TA for a flipped class on linear algebra and machine learning.

Sep. 2017 – Dec. 2018 **Teaching Assistant**, *University of Wisconsin-Madison*,
ECE315: Intro. to Microprocessor Laboratory
Instructed lab course on designing, assembling, and programming a printed circuit board.

Jan. 2017 – May 2018 **Teaching Assistant**, *University of Wisconsin-Madison*,
ECE353: Intro. to Microprocessor Systems
Taught as an in-class TA for a flipped class on embedded systems.

Mar. 2016 – May 2016 **Teaching Assistant**, *Rose-Hulman Institute of Technology*,
ECE530: Advanced Microcomputers

Mar. 2014 – May 2014 **Teaching Assistant**, *Rose-Hulman Institute of Technology*,
CSSE332: Operating Systems

Manuscripts

Preprints (in-progress work)

May 2025 **Walking the Weight Manifold: a Topological Approach to Conditioning Inspired by Neuromodulation**, *Preprint*,
Authors: A. S. Benjamin*, *K. Daruwalla**, C. Pehle*, A. Zador

Mar. 2025 **Cheese3D: Sensitive Detection and Analysis of Whole-Face Movement in Mice**, *Preprint (under review)*,
Authors: *K. Daruwalla**, I. N. Martin*, L. Zhang, D. Naglič, A. Frankel, C. Rasgaitis, X. Zhang, Z. Ahmad, X. H. Hou

Nov. 2021 **Accelerating Deep Learning with Dynamic Data Pruning**, *Preprint*,
Authors: R. S. Raju, *K. Daruwalla*, M. Lipasti

Publications

Dec. 2024 **Continual learning with the neural tangent ensemble**, *NeurIPS 2024 (🔦 spotlight paper)*,
Authors: A. S. Benjamin, C. Pehle, *K. Daruwalla*

Dec. 2024 **Delays in generalization match delayed changes in representational geometry**, *NeurIPS 2024 Workshop on Unifying Representations in Neural Models (UniReps)*,
Authors: X. Zheng, *K. Daruwalla*, A. S. Benjamin, D. Klindt

May 2024 **Information Bottleneck-Based Hebbian Learning Rule Naturally Ties Working Memory and Synaptic Updates**, *Frontiers in Computational Neuroscience*,
Authors: *K. Daruwalla*, M. Lipasti

Apr. 2024 **BitFit: Bitstream-Aware Training for Stochastic Neural Networks**, *Second Workshop on Unary Computing (WUC 24)*,
Authors: N. Joshi, *K. Daruwalla*, M. Lipasti

Feb. 2023 **Energy-Efficient Bayesian Inference Using Bitstream Computing**, *IEEE Computer Architecture Letters*,
Authors: S. Khoram, *K. Daruwalla*, M. Lipasti

Nov. 2019 **BitSAD v2: Compiler Optimization and Analysis for Bitstream Computing**, *ACM Transactions on Architecture and Code Optimization (TACO)*,
Authors: *K. Daruwalla*, H. Zhuo, R. Shukla, M. Lipasti

Jun. 2019 **BitBench: A Benchmark for Bitstream Computing**, *Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES 19)*,
Authors: *K. Daruwalla*, H. Zhuo, C. Schulz, M. Lipasti

Jun. 2019 **Resource Efficient Navigation Using Bitstream Computing**, *First ISCA Workshop on Unary Computing (WUC 19)*,
Authors: *K. Daruwalla*, H. Zhuo, M. Lipasti

Jun. 2019 **BitSAD: A Domain-Specific Language for Bitstream Computing**, *First ISCA Workshop on Unary Computing (WUC 19)*,
Authors: *K. Daruwalla*, H. Zhuo, M. Lipasti

Jan. 2019 **A quantitative analysis of the performance of computing architectures used in neural simulations**, *Journal of Neuroscience Methods*,
Authors: *K. Daruwalla*, N. Olivero, A. Pluger, S. Rao, D. W. Chang, M. Simoni

Presentations

Invited and contributed talks

Jun. 2023 **Intro. to FluxML and Machine Learning in Julia** [Invited]
Data Umbrella Seminar Series, Online (YouTube Live)

Feb. 2022 **Building Energy-Efficient Computers** [Invited]
Cold Spring Harbor Lab NeuroAI Seminar, Long Island, NY

Jan. 2020 **BitSAD v2: A Domain-Specific Language for Bitstream Computing** [Conference]
High-performance Embedded Architecture and Compilation Conference (HiPEAC 20), Bologna, Italy

Oct. 2019 **BitSAD v2**
Industry Affiliates Meeting, Madison, WI

Jun. 2019 **Resource Efficient Navigation Using Bitstream Computing** [Workshop]
First ISCA Workshop on Unary Computing (WUC 19), Phoenix, AZ

Jun. 2019 **BitBench: A Benchmark for Bitstream Computing** [Conference]
Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES 19), Phoenix, AZ

Oct. 2018 **BitSAD: A Domain-specific language for Bitstream Computing**
Industry Affiliates Meeting, Madison, WI

Oct. 2017 **Seeing Through the FoG: A Biologically Inspired Navigation System**
Industry Affiliates Meeting, Madison, WI

Posters

Jul. 2025 **Neuromodulation implies a manifold of model weights** [Conference]
NeuroAI in Seattle 2025, Seattle, Washington

Mar. 2025 **Cheese3D: sensitive detection and analysis of whole-face movement in mice** [Conference]
Computational and Systems Neuroscience (COSYNE 2025), Montreal, QC

Sep. 2024 **Generative modeling of trained networks as an analogy for neuronal development** [Conference]
From Neuroscience to Artificial Intelligence (NAISys 2024), Long Island, NY

Mar. 2024 **The dynamics of interpretable 3D facial features reflect hidden neural and physiological states in mice** [Conference]
Neuronal Circuits, Long Island, NY

Nov. 2021 **A Biologically Plasible Learning Rule Based on the Information Bottleneck** [Workshop]
Spiking Neural networks as Universal Function Approximators (SNUFA 21), Virtual

Oct. 2019 **BitSAD v2**
Industry Affiliates Meeting, Madison, WI

Jun. 2019 **BitBench: A Benchmark for Bitstream Computing** [Conference]
Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES 19), Phoenix, AZ

Oct. 2018 **BitSAD: A Domain-specific language for Bitstream Computing**
Industry Affiliates Meeting, Madison, WI

Oct. 2017 **Seeing Through the FoG: A Biologically Inspired Navigation System**
Industry Affiliates Meeting, Madison, WI

Nov. 2016 **Drone Control with Map-Seeking Circuits**
Industry Affiliates Meeting, Madison, WI

General public talks

Jun. 2024 **Cocktails & Chromosomes: Kyle Daruwalla**
Cocktails & Chromosomes Series, Long Island, NY

Apr. 2024 **Research & AI Panel Discussion** [Panel]
Long Island Artificial Intelligence Conference, Long Island, NY

Jun. 2023 **Cocktails & Chromosomes: Kyle Daruwalla**
Cocktails & Chromosomes Series, Long Island, NY

Jan. 2023 **Computers, Brains, and the In-Between**
Cold Spring Harbor Lab DeMystifying Science Series, Long Island, NY

Awards

Sep. 2021 Second place – AFRL xView2 Overhead Imagery ML Hackathon

May 2018 Gerald Holdridge Teaching Excellence Award

Feb. 2016 Honor Student Award

Service, Mentorship, and Leadership

Mentorship

Research mentor
- Catherine Rasgaitis (undergraduate)
- Irene Nozal Martin (graduate student)
- Xingyu Zhang (graduate student)

Open-source mentor *(as part of Google Summer of Code for FluxML)*
- Abhirath Anand
- Chandra Kiran
- Jiangeng
- Saksham Rastogi

Service and Leadership

Program Committee Second ISCA Workshop on Unary Computing

Reviewer NeurIPS, UniReps, ICLR, ISCA Workshop on Unary Computing

2021 – 2022 Graduate student representative on departmental committee

2019 – 2020 Vice-President of ECE Graduate Student Association

2017 – 2019 President of ECE Graduate Student Association

2016 – 2017 Public Relations Officer of ECE Graduate Student Association

2012 – 2016 President of Linux Users Group

2014 – 2016 Operations Manager of Rose Tech Radio Club

2015 – 2016 Founder of Rose Maker Lab

Press

Jun. 2024 **Can AI learn like us?**, *CSHL Press*, 20 June 2024. Available: https://www.cshl.edu/can-ai-learn-like-us/

Jul. 2024 **Advancing AI's boundaries at Cold Spring Harbor Labs**, *Long Island Herald*, 5 July 2024. Available: https://www.liherald.com/stories/advancing-ais-boundaries-at-cold-spring-harbor-labs,208824

Industry Experience

Jun. 2020 – Dec. 2020 **Research Co-op Intern**, *AMD*, Austin, TX
Explored neural network sensitvity to input perturbations in the context of scientific computing.

May 2017 – Aug. 2017 **Digital Design Intern**, *Texas Instruments*, Dallas, TX
Performed IP design for multimedia IPs.

Jun. 2016 – Aug. 2016 **Digital Design Intern**, *Texas Instruments*, Dallas, TX
Performed design verification for high speed I/O IPs.

Sep. 2015 – May 2016 **Project Intern**, *Rose-Hulman Ventures*, Terre Haute, IN
Worked with project team to design various products for several clients.

Jun. 2015 – Aug. 2015 **Digital Design Intern**, *Texas Instruments*, Dallas, TX
Performed design verification for high speed I/O IPs.

Sep. 2013 – May 2015 **Project Intern**, *Rose-Hulman Ventures*, Terre Haute, IN
Worked with project team to design various products for several clients.