

SHAY SNYDER

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🌐 github.com/shaymeister 🔗 linkedin.com/in/shay-snyder 🎓 Google Scholar

EDUCATION

George Mason University

January 2023 – August 2026

Ph.D. in Electrical & Computer Engineering

Fairfax, Virginia

Dissertation: *Computational Principles of Neural Representations for Scalable Perception, Memory, and Learning*

Advisor: Maryam Parsa, Ph.D.

East Tennessee State University

August 2019 – December 2022

B.S. in Computing (Computer Science focus)

Johnson City, Tennessee

Overall GPA: 3.95/4.00

RESEARCH APPOINTMENTS

George Mason University

September 2026 – Present

Postdoctoral Research Fellow

Fairfax, Virginia

- ◇ Supervisor: *Maryam Parsa, Ph.D.*
- ◇ Vector symbolic architecture (VSA) based spatial representation and memory for autonomous systems operating under severe compute, memory, and energy constraints
- ◇ Extending VSA-based occupancy grid mapping [J2] from binary occupancy toward full semantic mapping at a compute budget that runs on a laptop CPU
- ◇ Deploying VSA-based spatial-memory algorithms onboard a Boston Dynamics Spot quadruped; collaboration began at the 2026 Telluride Neuromorphic Workshop, manuscript in preparation
- ◇ Collective spatial memory for multi-robot teams: cooperative map-building over bandwidth-limited links by exchanging fixed-width vectors rather than map fragments

George Mason University

October 2021 – August 2026

Research Assistant

Fairfax, Virginia

- ◇ Advisor: *Maryam Parsa, Ph.D.*
- ◇ Joined the Parsa Research Laboratory as an undergraduate researcher while completing a B.S. at East Tennessee State University; continued as a Ph.D. student and Graduate Research Assistant from January 2023
- ◇ Developed a VSA algorithm for probabilistic occupancy grid mapping [J2] that provided one and two orders of magnitude reductions in memory and computational complexity compared to existing approaches
- ◇ Developed the Event-based Sensing Algorithm Development Environment (EBS ADE) in collaboration with the Leidos Innovations Center
- ◇ First external contributor to Intel's open-source Lava-Optimization library, with Lava Bayesian Optimization [C17]

Pacific Northwest National Laboratory

October 2021 – August 2026

AI & Communications Research Intern (Remote)

Richland, Washington

- ◇ Five-year appointment held concurrently with the GMU appointments above; joined as an undergraduate intern and continued without a gap through the Ph.D.
- ◇ Developed machine learning systems for RF fingerprinting: identifying and discriminating individual emitters from characteristic features of their transmitted signals

- ◇ Applied contrastive self-supervised learning to raw RF, pretraining on unlabeled signal data to improve downstream detection performance and cross-domain transferability; manuscript in preparation
- ◇ Built embedded machine learning models in TensorFlow for real-time duplex communication on the resource-constrained RedWire Oxygen platform
- ◇ Applied reinforcement learning to adaptive signaling for contested and adversarial communication environments
- ◇ Work performed for the PNNL National Security Directorate; recognized with three Outstanding Performance Awards, 2023–2025 (detailed under Honors & Awards)

East Tennessee State University
Undergraduate Student Researcher

January 2020 – October 2021
Johnson City, Tennessee

- ◇ Mentor: *Ghaith Husari, Ph.D.*
- ◇ Designed and built Thor, a Donkey Car based mobile robot on an NVIDIA Jetson Nano running onboard real-time face mask classification and bounding-box detection [C20]

Oak Ridge National Laboratory
DOE SULI Intern (Remote)

August 2020 – August 2021
Oak Ridge, Tennessee

- ◇ Mentor: *Robert Patton, Ph.D.*
- ◇ Multi-objective evolutionary optimization of neural networks (Parcae); real-time semantic segmentation of urban street scenes. Start of the ORNL/TENNLab collaboration

Oak Ridge National Laboratory
Higher Education Research Experience Intern

June 2019 – August 2019
Oak Ridge, Tennessee

- ◇ Mentors: *Josh Grant & Jesse Piburn, Ph.D.* Built database query-optimization tooling for the group's research workflow

JOURNAL PUBLICATIONS

5 journal · 20 conference · 2 extended abstracts · 1 patent (pending) · 3 in preparation · 12 first-author (9 published) · 252 citations · h-index 8 (Google Scholar, September 2026). * denotes first authorship.

[J1] Citation Network Datasets for Benchmarking Spiking Graph

Neural Networks on Experimental Neuromorphic Hardware

June 2026

npj Unconventional Computing

Journal

- ◇ Kevin Zhu, Ian Mulet, Prasanna Date, Ashish Gautam, Tyler Nitzsche, **Shay Snyder**, Shruti Kulkarni, Seung-Hwan Lim, Guojing Cong, Cameron Nowzari, Catherine Schuman, Maryam Parsa, and Thomas Potok · doi:10.1038/s44335-026-00068-2

[J2]* Brain Inspired Probabilistic Occupancy Grid Mapping with Vector Symbolic Architectures

January 2026

npj Unconventional Computing

Journal

- ◇ **Shay Snyder**, Andrew Capodieci, David Gorsich, and Maryam Parsa · doi:10.1038/s44335-026-00052-w

[J3] OptiCAM: An Optical Content-Addressable Memory Architecture for Ultra-Fast Pattern Matching

December 2025

APL Photonics

Journal

- ◇ Md Abdullah-Al Kaiser, Ankur Singh, **Shay Snyder**, Hamed Poursiami, Maryam Parsa, and Akhilesh Jaiswal · doi:10.1063/5.0288417

[J4] A Retina-Inspired Pathway to Real-Time Motion Prediction inside Image Sensors for Extreme-Edge Intelligence

July 2025

Neuromorphic Computing and Engineering

Journal

- ◇ Subhradip Chakraborty, **Shay Snyder**, Md Abdullah-Al Kaiser, Maryam Parsa, Gregory Schwartz, and Akhilesh Jaiswal · doi:10.1088/2634-4386/ade76

[J5] Evolutionary vs Imitation Learning for Neuromorphic Control at the Edge

January 2022

Neuromorphic Computing and Engineering

Journal

- ◇ Catherine Schuman, Robert Patton, Shruti Kulkarni, Maryam Parsa, Christopher Stahl, N. Quentin Haas, J. Parker Mitchell, **Shay Snyder**, Amelie Nagle, Alexandra Shanafield, and Thomas Potok · doi:10.1088/2634-4386/ac45e7

CONFERENCE PUBLICATIONS

[C1] An APS Pathway to Retinomorphonic Cameras

September 2026

ECCV Neuromorphic Vision Workshop (NeVI)

Malmö, Sweden

- ◇ Kapish Singh, **Shay Snyder**, Zihan Yin, Gregory Schwartz, Maryam Parsa, and Akhilesh Jaiswal

[C2]* SRMU: Relevance-Gated Updates for Streaming Hyperdimensional Memories

August 2026

International Conference on Neuromorphic Systems (ICONS)

Chicago, IL

- ◇ **Shay Snyder**, Andrew Capodieci, David Gorsich, and Maryam Parsa · doi:10.1145/3822454.3822487

- [C3] **From Retina to Silicon: The IRIS Framework for Bio-inspired Visual Intelligence** July 2026
IEEE Computer Society Annual Symposium on VLSI (ISVLSI) Kolkata, India
 ◇ Subhradip Chakraborty, **Shay Snyder**, Gregory Schwartz, Maryam Parsa, and Akhilesh Jaiswal
- [C4] **VS-Graph: Scalable and Efficient Graph Classification Using Hyperdimensional Computing** March 2026
Neuro-inspired Computational Elements (NICE) Atlanta, GA
 ◇ Hamed Poursiami, **Shay Snyder**, Guojing Cong, Thomas Potok, and Maryam Parsa · doi:10.1109/nice69539.2026.11567447
- [C5] **On the Privacy-Preserving Properties of Spiking Neural Networks with Unique Surrogate Gradients and Quantization Levels** June 2025
International Joint Conference on Neural Networks (IJCNN) Rome, Italy
 ◇ Ayana Moshruha, **Shay Snyder**, Hamed Poursiami, and Maryam Parsa · doi:10.1109/ijcnn64981.2025.11228352
- [C6] **Reconfigurable Retina-Inspired Looming Detection** May 2025
Int. Symposium on Field-Programmable Custom Computing Machines (FCCM) Fayetteville, AR
 ◇ Jason Sinaga, **Shay Snyder**, Md Abdullah-Al Kaiser, Dan Jinoy, Gregory Schwartz, Maryam Parsa, and Akhilesh Jaiswal · doi:10.1109/fccm62733.2025.00013
- [C7] **Retina-inspired Object Motion Segmentation for Event-Cameras** March 2025
Neuro-inspired Computational Elements (NICE) Heidelberg, Germany
 ◇ Victoria Clerico, **Shay Snyder**, Arya Lohia, Md Abdullah-Al Kaiser, Gregory Schwartz, Akhilesh Jaiswal, and Maryam Parsa · doi:10.1109/nice65350.2025.11065149
- [C8] **A Milling Swarm of Ground Robots using Spiking Neural Networks** March 2025
Neuro-inspired Computational Elements (NICE) Heidelberg, Germany
 ◇ Kevin Zhu, **Shay Snyder**, Ricardo Vega, Maryam Parsa, and Cameron Nowzari · doi:10.1109/nice65350.2025.11065293
- [C9]* **Parallelized Multi-Agent Bayesian Optimization in Lava** August 2024
International Conference on Neuromorphic Systems (ICONS) Arlington, VA
 ◇ **Shay Snyder**, Derek Gobin, Victoria Clerico, Sumedh R. Risbud, and Maryam Parsa · doi:10.1109/icons62911.2024.00051
- [C10] **Exploration of Novel Neuromorphic Methodologies for Materials Applications** August 2024
International Conference on Neuromorphic Systems (ICONS) Arlington, VA
 ◇ Derek Gobin, **Shay Snyder**, Guojing Cong, Shruti Kulkarni, Catherine Schuman, and Maryam Parsa · doi:10.1109/icons62911.2024.00049
- [C11] **Hardware-Algorithm Re-engineering of Retinal Circuit for Intelligent Object Motion Segmentation** August 2024
International Conference on Neuromorphic Systems (ICONS) Arlington, VA
 ◇ Jason Sinaga, Victoria Clerico, Md Abdullah-Al Kaiser, **Shay Snyder**, Arya Lohia, Gregory Schwartz, Maryam Parsa, and Akhilesh Jaiswal · doi:10.1109/icons62911.2024.00045

[C12] Spiking Neural Networks as a Controller for Emergent Swarm Agents

International Conference on Neuromorphic Systems (ICONS)

August 2024
Arlington, VA

◇ Kevin Zhu, Connor Mattson, **Shay Snyder**, Ricardo Vega, Daniel S. Brown, Maryam Parsa, and Cameron Nowzari · doi:10.1109/icons62911.2024.00055

[C13] Learning to Estimate Regions of Attraction of Autonomous Dynamical Systems Using Bayesian Physics Informed Neural Networks

International Conference on Neuromorphic Systems (ICONS)

August 2024
Arlington, VA

◇ Cody Scharzenberger, **Shay Snyder**, Sumedh R. Risbud, Joe Hays, and Maryam Parsa · doi:10.1109/icons62911.2024.00036

[C14]* Transductive Spiking Graph Neural Networks for Loihi

Great Lakes Symposium on Very Large-Scale Integration (GLSVLSI)

June 2024
Clearwater, FL

◇ **Shay Snyder**, Victoria Clerico, Guojing Cong, Shruti Kulkarni, Catherine Schuman, Sumedh Risbud, and Maryam Parsa · doi:10.1145/3649476.3660366

[C15] Hyperparameter Optimization and Feature Inclusion in Graph Neural Networks for Spiking Implementation

International Conf. on Machine Learning and Applications (ICMLA)

December 2023
Jacksonville, FL

◇ Guojing Cong, Shruti Kulkarni, Seung-Hwan Lim, Prasanna Date, **Shay Snyder**, Maryam Parsa, Dominic Kennedy, and Catherine Schuman · doi:10.1109/icmla58977.2023.00232

[C16]* Zespol: A Lightweight Environment for Training Swarming Agents

International Conference on Neuromorphic Systems (ICONS)

August 2023
Santa Fe, NM

◇ **Shay Snyder**, Kevin Zhu, Ricardo Vega, Cameron Nowzari, and Maryam Parsa · doi:10.1145/3589737.3606002

[C17]* Neuromorphic Bayesian Optimization in Lava

International Conference on Neuromorphic Systems (ICONS)

August 2023
Santa Fe, NM

◇ **Shay Snyder**, Sumedh R. Risbud, and Maryam Parsa · doi:10.1145/3589737.3605998

[C18] Semi-supervised Graph Structure Learning on Neuromorphic Computers

International Conference on Neuromorphic Systems (ICONS)

August 2022
Knoxville, TN

◇ Guojing Cong, Seung-Hwan Lim, Shruti Kulkarni, Prasanna Date, Thomas Potok, **Shay Snyder**, Maryam Parsa, and Catherine Schuman · doi:10.1145/3546790.3546821

[C19] Neuromorphic Computing for Autonomous Racing

International Conference on Neuromorphic Systems (ICONS)

July 2021
Virtual

◇ Robert Patton, Catherine Schuman, Shruti Kulkarni, Maryam Parsa, J. Parker Mitchell, N. Quentin Haas, Christopher Stahl, Spencer Paulissen, Prasanna Date, Thomas Potok, and **Shay Snyder** · doi:10.1145/3477145.3477170

[C20]* Thor: A Deep Learning Approach for Face Mask Detection to Prevent the COVID-19 Pandemic

SoutheastCon 2021

March 2021
Virtual

◇ **Shay E. Snyder** and Ghaith Husari · doi:10.1109/southeastcon45413.2021.9401874

EXTENDED ABSTRACTS

- [A1]* **Neuro-Symbolic Architectures for Scalable and Energy-Efficient Computation: Opportunities and Open Challenges** 2026
AAAI Workshop on Neuro for AI & AI for Neuro
◇ Shay Snyder, Hamed Poursiami, Derek Gobin, Guojing Cong, and Maryam Parsa
- [A2]* **Asynchronous Neuromorphic Optimization in Lava** June 2024
Great Lakes Symposium on Very Large-Scale Integration (GLSVLSI) Clearwater, FL
◇ Shay Snyder, Sumedh Risbud, and Maryam Parsa · doi:10.1145/3649476.3660383

PATENTS

- [P1] **Image Sensor with Reconfigurable Retinal Processing** 2025
US Utility Patent Application — Pending
◇ Akhilesh Jaiswal, Maryam Parsa, Gregory Schwartz, Subhradip Chakraborty, Victoria Clerico, **Shay Snyder**, and Md Abdullah-Al Kaiser

MANUSCRIPTS IN PREPARATION

- [U1]* **HyperSpace: A Unified Framework for Processing Continuous Spatial Information in Hyperdimensional Systems** In Preparation
◇ Shay Snyder, Andrew Capodiecì, David Gorsich, and Maryam Parsa
- [U2]* **qFHRR: Rethinking Fourier Holographic Reduced Representations through Quantized Phase and Integer Arithmetic** In Preparation
◇ Shay Snyder, Hamed Poursiami, and Maryam Parsa
- [U3]* **N-GRAM: Navigation and Grounded Recall with Algebraic Memory** In Preparation
◇ Shay Snyder, Sven Krauß, Naitri Rajyaguru, Lorin Ackey, Christoffer Heckman, Yiannis Aloimonos, Emre Neftci, Maryam Parsa, and Paul Kirkland

HONORS & AWARDS

- Departmental Special Recognition Award** 2026
Dept. of Electrical & Computer Engineering, George Mason University
- Runner-Up, Best Student Poster** 2025
US Army DEVCOM Automotive Research Center Annual Program Review
- Outstanding Performance Award** 2025
Pacific Northwest National Laboratory, National Security Directorate
- Outstanding Performance Award** 2024
Pacific Northwest National Laboratory, National Security Directorate
- Outstanding Performance Award** 2023
US Special Operations Command, Science & Technology Directorate

Outstanding Junior in Computing
Dept. of Computing, East Tennessee State University

Spring 2022

Dean's List
East Tennessee State University — all semesters

2019 – 2022

RESEARCH FUNDING

The US Army DEVCOM Automotive Research Center (ARC) is the Army's university Center of Excellence for ground-vehicle modeling and simulation, sponsored by the DEVCOM Ground Vehicle Systems Center (GVSC).

NEMOSYS: Neural Memory Organization System May 2025 – December 2026
US Army DEVCOM Automotive Research Center *Awarded*

- ◇ \$134,750 (GMU budget); initial award 2025, extended through December 2026
- ◇ Principal Investigator: Maryam Parsa. Named student researcher on the award
- ◇ Co-authored the technical approach and generated the preliminary results cited in support of the proposed work

Multi-Phase Vector Symbolic Architectures for Distributed and Collective Intelligence in Multi-Agent Autonomous Systems January 2023 – May 2026
US Army DEVCOM Automotive Research Center *Awarded*

- ◇ \$384,000 (GMU budget)
- ◇ Principal Investigator: Maryam Parsa. Named student researcher on the award
- ◇ Co-authored the technical approach and generated the preliminary results cited in support of the proposed work

PRESENTATIONS

Invited Seminars

- ◇ *Multi-Phase Vector Symbolic Architectures for Distributed and Collective Intelligence in Multi-Agent Autonomous Systems*. US Army Automotive Research Center Seminar Series, April 2026 (virtual). With Maryam Parsa.
- ◇ TENNLab Annual Review, University of Tennessee, Knoxville, TN, 2024.
- ◇ *Multi-Phase Vector Symbolic Architectures for Distributed and Collective Intelligence in Multi-Agent Autonomous Systems*. US Army Automotive Research Center Seminar Series, November 2023 (virtual). With Maryam Parsa.

Conference & Workshop Talks

- ◇ *From Retina to Silicon: The IRIS Framework for Bio-inspired Visual Intelligence*. ISVLSI 2026, Kolkata, India, July 2026.
- ◇ *SRMU: Relevance-Gated Updates for Streaming Hyperdimensional Memories [C2]*. ICONS 2026, Chicago, IL, August 2026.
- ◇ *NEMOSYS: Neural Memory Organization System*. US Army ARC Annual Review, Ann Arbor, MI, June 2026. Talk and poster.
- ◇ *Brain Inspired Probabilistic Occupancy Grid Mapping with Vector Symbolic Architectures [J2]*. US Army ARC Annual Review, Ann Arbor, MI, June 2026. Talk and poster.
- ◇ *Neuro-symbolic architectures with vector symbolic representations for scalable brain-inspired computation*. Energy Consequences of Information Workshop (DOE/AFOSR), Santa Fe, NM, February 2026.

- ◇ *Brain Inspired Probabilistic Occupancy Grid Mapping with Hyperdimensional Computing*. US Army ARC Annual Review, Ann Arbor, MI, June 2025. Talk and poster.
- ◇ *Optimizing Graph-Based Neuromorphic Systems with Bayesian Optimization*. First ORNL AI4Science Workshop, Oak Ridge, TN, April 2025. Lightning talk.
- ◇ *Graph-Based Neuromorphic Systems with Hyperdimensional Computing*. First ORNL AI4Science Workshop, Oak Ridge, TN, April 2025. Lightning talk.
- ◇ *Parallelized Multi-Agent Bayesian Optimization in Lava* [C9]. ICONS 2024, Arlington, VA, August 2024.
- ◇ *Transductive Spiking Graph Neural Networks for Loihi* [C14]. GLSVLSI 2024, Clearwater, FL, June 2024.
- ◇ *Asynchronous Neuromorphic Optimization in Lava* [A2]. GLSVLSI 2024, Clearwater, FL, June 2024. Extended abstract.
- ◇ *Brain Inspired Probabilistic Occupancy Grid Mapping with Hyperdimensional Computing*. US Army ARC Annual Review, Ann Arbor, MI, June 2024. Talk and poster, with Maryam Parsa.
- ◇ *Zespol: A Lightweight Environment for Training Swarming Agents* [C16]. ICONS 2023, Santa Fe, NM, August 2023.
- ◇ *Neuromorphic Bayesian Optimization in Lava* [C17]. ICONS 2023, Santa Fe, NM, August 2023.
- ◇ *Eventified Bayesian Optimization with Lava*. Intel Neuromorphic Research Community Bootcamp, Santa Clara, CA, December 2022.
- ◇ *Thor: A Deep Learning Approach for Face Mask Detection to Prevent the COVID-19 Pandemic* [C20]. IEEE SoutheastCon 2021, virtual, March 2021.

Posters

- ◇ *An APS Pathway to Retinomorphoc Cameras* [C1]. ECCV 2026 Neuromorphic Vision (NeVI) Workshop, Malmö, Sweden, September 2026; ICONS 2026, Chicago, IL, August 2026.
- ◇ *From Retina to Silicon: The IRIS Framework for Bio-inspired Visual Intelligence* [C3]. NIH BRAIN Conference 2026, Rockville, MD, August 2026; CVPR 2026 On-Sensor Vision (OSV) Workshop, Denver, CO, June 2026; 3rd Workshop on Unary Computing, Pittsburgh, PA, March 2026.
- ◇ *Neuro-Symbolic Architectures for Scalable and Energy Efficient Computation* [A1]. NIH BRAIN Conference 2026, Rockville, MD, August 2026.
- ◇ *From Spikes to Swarms: Evolving Spiking Neural Networks to Create Emergent Swarm Behaviors*. NICE 2026, Atlanta, GA, March 2026. Presented on behalf of the authors (Kevin Zhu, Ricardo Vega, Maryam Parsa, Cameron Nowzari); not an author.

TEACHING & INSTRUCTIONAL EXPERIENCE

- | | |
|---|---------------------------------------|
| <p>Guest Lecturer — ECE 556: Neuromorphic Computing
 <i>George Mason University</i></p> <p>◇ <i>Introduction to Vector Symbolic Architectures</i>; co-delivered with Derek Gobin</p> | <p>April 2025
 <i>Virtual</i></p> |
| <p>Guest Lecturer — ECE 556: Neuromorphic Computing
 <i>George Mason University</i></p> <p>◇ <i>Introduction to Vector Symbolic Architectures</i></p> | <p>April 2024
 <i>Virtual</i></p> |

MENTORING & ADVISING

Research mentoring in the Parsa Research Laboratory, George Mason University (faculty advisor: Prof. Maryam Parsa).

Graduate Students

- ◇ **Maria Victoria Clerico Da Costa** (M.S. thesis, 2023–2024) — retina-inspired event-based vision. Co-author on [C7], [C9], [C11], [C14] and patent [P1]. Now a Ph.D. candidate at IBM Research Zürich.
- ◇ **Ayana Moshruha** (Ph.D., early-stage mentoring from 2022) — privacy properties of spiking neural networks. Co-author on [C5].

Undergraduate Students

- ◇ **Rita Dray** (Summer 2026) — summer research intern; undergraduate at Duke University.
- ◇ **Ali Albayati** (2025–present) — current mentee.
- ◇ **Saba Niknam** (2023–2024)
- ◇ **Khang Diep** (2023–2024)

High School Students

- ◇ **Arya Lohia** (2023–2024) — retina-inspired object motion segmentation. Co-author on [C7] and [C11] while still in high school. Now at Carnegie Mellon University.
- ◇ **Vrishak Vemuri** (2023) — now at the University of Virginia.
- ◇ **Ethan Zhang** (2022, GMU ASSIP) — now at the Georgia Institute of Technology.
- ◇ **Satvik Matta** (2022, GMU ASSIP) — now at Duke University.

PROFESSIONAL SERVICE

Journal Reviewing

- ◇ ASME Journal of Autonomous Vehicles and Systems, Biological Cybernetics (Springer), IEEE Robotics and Automation Letters (IEEE RA-L), IOP Neuromorphic Computing and Engineering, Neural Networks (Elsevier)

Conference Reviewing

- ◇ ECCV Neuromorphic Vision (NeVI) Workshop 2026, ICONS 2025, IJCNN 2025, VLSID 2025, ICONS 2024, GLSVLSI 2024, ICONS 2023

Volunteering

- ◇ ICONS 2024, ICONS 2023

Professional Memberships

- ◇ IEEE, ACM

PROFESSIONAL DEVELOPMENT

Telluride Neuromorphic AI Workshop

June – July 2026

Telluride, Colorado — three-week project-driven workshop

Energy Consequences of Information (ECI) Workshop

February 2026

Santa Fe, New Mexico — Dept. of Energy / AFOSR; attended as participant and presenter

NSF I-Corps

2026

Customer discovery and research translation

TECHNICAL SKILLS

Robotics & Embedded	ROS, NVIDIA Jetson, mobile ground-robot platforms, event-based (DVS) cameras, real-time perception on edge hardware
Neuromorphic	Intel Loihi, Intel Lava (contributor to Lava-Optimization)
Machine Learning	PyTorch, TensorFlow
FPGA & Hardware	Vivado, Vitis HLS
Languages	Python, C++, C, MATLAB, Java, C#, R