Samuel Schmidgall

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🧠 Research Areas

Robotic Learning, Reinforcement Learning, Meta-learning, Online Learning, Neuromorphic Computing

📈 Professional Experience

Space Robotics Department @ U.S. Naval Research Laboratory **Washington, D.C.**
Computer Scientist since June 2021
- Development of robotic learning systems which can adapt to new challenges during their lifetime. Focus on robotic learning via **deep reinforcement learning** for quadrupedal (locomotion) and manipulation (articulated) systems using neuromorphic hardware in order to dramatically improve power-efficiency of deep learning based methods for robotic control. Focus on large-scale (>10 GPUs) deep reinforcement learning for robotic learning and deployment on physical robotic hardware (sim2real).

Undergraduate Research Intern May 2019 – May 2021
- Developed **online reinforcement learning** algorithms for **neuromorphic hardware** (Intel Loihi gen1) on robotic learning applications via meta-learning online fast- and slow-weight learning rules.

Mason Experimental Geometry Laboratory **Fairfax, VA**
Undergraduate Research Assistant January 2020 – May 2020
- Research in wave propagation dynamics for locked fronts in a discrete time discrete space population model (Matthew Holzer).

Undergraduate Research Assistant, Anton Lukyanenko & Damoon Soudbakhsh August 2018 – May 2019
- Research in robotic motion planning, finding optimal localized trajectories for the planning of multiple vehicles (Anton Lukyanenko & Damoon Soudbakhsh).

Gartner **Arlington, VA**
Data Science Intern May 2018 – March 2019
- Extracting and predicting performance based on resume features & language modelling for chat-bot automation.

Asymmetriq **Marshall, VA**
Software Engineering Intern May 2017 – May 2018
- Using computer vision learning models (via deep learning) for improving online license plate character recognition (i.e. optical character recognition).

📚 Education

George Mason University **Fairfax, VA**
Bachelor of Science in Computer Science August 2017- May 2021
- **Robotics&ML:** CS498 Research in Reinforcement Learning for Robotics I-II (*with Jana Kosecka*), MATH491 Research in Robotic Motion Planning, CS480 Artificial Intelligence, STAT472 Introduction to Statistical Learning, CS484 Data Mining
- **Computer Science:** CS483 Analysis of Algorithms, CS367 Systems Programming, CS330 Theoretical CS, CS310 Data Structures, CS471 Operating Systems, CS455 Comp Networking, CS499 Cryptography, ECE527 Learning from Data, ECE528 Introduction to Random Processes
- **Math&Physics:** Math315 Real Analysis, MATH322 Adv Linear Algebra, MATH452 Adv Mathematical Statistics, MATH213 Calculus I-III, PHYS261 Physics I-II

🧬 Publications

Under Review/In-Preparation
- **Schmidgall, S.**, Hays, J., (2023). Toward a Robotic Motor Cortex. *Frontiers in Neurorobotics (Under Review).*
- **Schmidgall, S.**, Dannenberg, H., Maryam, P., (2023). Brain-inspired learning in artificial neural networks. *Nature Machine Intelligence (Under Review).*
- **Schmidgall, S.**, Hays, J., (2023). A low-power solution for the control of legged robots. *Science Robotics (In Preparation, Expected February 2023).*

– **Schmidgall, S.**, Risi, S., (2023). A neural structure that supports rapid learning for embodied control. *The 2023 Genetic and Evolutionary Computation Conference (GECCO). (In Preparation, Expected January 2023).*

Journal

– **Schmidgall, S.**, Hays, J. (2022). Learning to Learn Online with Neuromodulated Synaptic Plasticity in Spiking Neural Networks. *Neural Networks. (Final stages of review).*
– Holzer, M., Richey, Z., Rush, W., **Schmidgall, S.**, (2022). Locked fronts in a discrete time discrete space population model. *Journal of Mathematical Biology.*
– **Schmidgall, S.**, Ashkanazy, J., Lawson, W., Hays, J, (2021). SpikePropamine: Differentiable Plasticity in Spiking Neural Networks. *Frontiers in Neurorobotics*.

Conference

– **Schmidgall, S.**, Parsa, M., (2022). Biological connectomes as a representation for the architecture of artificial neural networks. *Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI-23) "Systems Neuroscience Approach to General Intelligence" Workshop.*
– **Schmidgall, S.**, Hays, J., (2022). Stable Lifelong Learning: Spiking neurons as a solution to instability in plastic neural networks. *Neuro-Inspired Computational Elements (NICE).*
– Lukyanenko, A., Camphire, H., Austin, A., **Schmidgall, S.**, Soudbakhsh, D., (2021). Optimal Localized Trajectory Planning of Multiple Non-holonomic Vehicles. *5th Conference on Control Technology and Applications (CCTA).*
– **Schmidgall, S.** (2021). Self-constructing Neural Networks through Random Mutation. *International Conference on Learning Representations (ICLR).*
– **Schmidgall, S.**, (2020). Adaptive Reinforcement Learning through Evolving Self-Modifying Neural Networks. *The 2020 Genetic and Evolutionary Computation Conference (GECCO).*

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Activities and Awards

– **DoD Security Clearance** granted security clearance through my work at the Naval Research Laboratory.
– **2022 Alan Berman Research Publication Award** for paper *SpikePropamine: Differentiable Plasticity in Spiking Neural Networks.*
– **Invited reviewer** at the *2022 NSF "Brain-Inspired Dynamics for Engineering Energy-Efficient Circuits and Artificial Intelligence"* Program.
– **Reviewer editor** for *Neural Networks* journal.
– **Invited speaker** at the *Intel Labs INRC Spring 2022 Continual Learning Workshop* [link].
– **Invited speaker** for ECE556 *Neuromorphic Computing* at George Mason University [link].
– **Invited speaker** at the *Spring 2022 Naval Applications of Machine Learning (NAML).*
– **Oral Presentation** at the *2022 Neuro-Inspired Computational Elements Workshop (NICE)* [link].
– **Oral Presentation** at the *2021 International Conference on Machine Learning "A Roadmap to Never-Ending Reinforcement Learning" (ICLR NERL) Workshop* [link].
– **Oral Presentation** at the *2020 Genetic and Evolutionary Computation Conference (GECCO)* [link].
– **Best Poster Award** MEGL Symposium Poster Presentation Spring 2020
– **Outstanding Poster Award** Joint Mathematics Meeting Conference Spring 2019

Skills & Software Experience

Programming	**Python**, **C**, **C++**, Haskell, Java, Matlab, Lisp, x86 Assembly, CUDA
Hardware Familiarity	*Ghost Robotics* Vision 60 Q-UGV (legged), *Kinova* Gen3 7dof (articulated)
Software Packages	**PyTorch**, **IsaacGym & IsaacSim**, Tensorflow, Numpy, Scikit-learn