SAMUEL SCHMIDGALL

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EDUCATION

Johns Hopkins University — Baltimore, MD
PhD | *Electrical and Computer Engineering* — Sept 2023 – *Present*

WORK & RESEARCH EXPERIENCE

Stanford University, School of Medicine — Palo Alto, CA
Research Intern — *April 2024 - July 2024*

- Research in AI for cardiovascular surgery. Advised by William Hiesinger, M.D. and Cyril Zakka, M.D.

Johns Hopkins University, School of Engineering — Baltimore, MD
Graduate Research Assistant — Sept 2023 - *Present*

- Research toward developing autonomous surgical robots through deep imitation learning. Advised by Rama Chellappa, PhD and Axel Krieger, PhD.

Naval Research Laboratory, Department of Spacecraft Robotics — Washington, DC
Computer Scientist — May 2019 - August 2023

- Research toward developing robotic learning systems which can adapt to new challenges during their lifetime. Robotic learning via **deep reinforcement learning** for quadrupedal (locomotion) and manipulation (articulated) systems using **neuromorphic hardware** in order to dramatically improve power-efficiency (low SWaP) for space applications. Deployment of trained models on physical robotic hardware (sim2real).

HONORS AND AWARDS

National Science Foundation Graduate Research Fellowship (NSF GRFP)
$150,000 Award over three years, area *Computer and Information Science and Engineering - Robotics*

2024 Alan Berman Research Publication Award
$5,000 Award.

2022 Alan Berman Research Publication Award
$4,000 Award.

PUBLICATIONS

- **Schmidgall, S.**, Kim, JW., Krieger, A., (2024) Can robots imitate surgeon demonstrations? *Nature Reviews Urology.*
- **Schmidgall, S.**, Krieger, A., Eshraghian, J. (2024). Surgical Gym: A high-performance GPU-based platform for reinforcement learning with surgical robots. *International Conference on Robotics and Automation (ICRA 2024).*
- Ziaei, R., **Schmidgall, S.**, Language models are susceptible to incorrect patient self-diagnosis in clinical applications (2023). *Conference on Neural Information Processing Systems (NeurIPS 2023), Workshop on Deep Generative Models for Health.*
- Kim, JW., **Schmidgall, S.**, Krieger, A., Kobilarov, M., (2023). Learning a Library of Surgical Manipulation Skills for Robotic Surgery. *Conference on Robotic Learning (CoRL 2023), CRL WS Workshop* .
- **Schmidgall, S.**, Hays, J. (2023). Meta-SpikePropamine: Learning to Learn with Neuromodulated Synaptic Plasticity in Spiking Neural Networks. *Frontiers in Neuroscience.*

- Holzer, M., Richey, Z., Rush, W., **Schmidgall, S.**, (2023). Locked fronts in a discrete time discrete space population model. *Journal of Mathematical Biology.*
- **Schmidgall, S.**, Hays, J., (2023). Synaptic motor adaptation: A three-factor learning rule for adaptive robotic control in spiking neural networks. *International Conference on Neuromorphic Systems (ICONS).*
- **Schmidgall, S.**, Parsa, M., (2023). 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).*
- **Schmidgall, S.**, Ashkanazy, J., Lawson, W., Hays, J, (2021). SpikePropamine: Differentiable Plasticity in Spiking Neural Networks. *Frontiers in Neurorobotics*.
- 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) Workshop on Never-Ending Reinforcement Learning (NERL).*
- **Schmidgall, S.**, (2020). Adaptive Reinforcement Learning through Evolving Self-Modifying Neural Networks. *The 2020 Genetic and Evolutionary Computation Conference (GECCO).*

In Review Publications

- **Schmidgall, S.**, Harris, C., Essien, I., Olshvang, D., Rahman, T., Kim, J.W., Ziaei, R., Eshraghian, J., Abadir, P., Chellappa, R. (2024) Addressing common clinical biases in medical language models. *New England Journal of Medicine AI (NEJM AI).*
- **Schmidgall, S.**, Kim, JW., Krieger, A., (2024) A video pre-trained foundation model for general surgery. *2024 Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI 2024).*
- Liu, J., Henrich, P., Ge, J., Shepard, L., **Schmidgall, S.**, Ghazi, A., Mathis-Ullrich, F., Krieger, A. (2024) Advancing RAPN Outcomes: Integrating 3D Hydrogel Phantoms and Occupancy Network-Based Deformable Organ Registration from a Single View Point Cloud. *2024 Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI 2024).*
- Kim, JW., **Schmidgall, S.**, Zhao T., Finn, C., Krieger, A., (2024) Surgical Diffusion Policy: Learning Autonomous Surgical Subtasks *Robotics: Science and Systems (RSS 2024).*
- Yik, J., Van den Berghe, K., den Blanken, A., ..., **Schmidgall, S.**, ..., Janapa Reddi, V. (2024) NeuroBench: A Framework for Benchmarking Neuromorphic Computing Algorithms and Systems. *Nature Communications.*
- Luppi, A., Achterberg, J., **Schmidgall, S.**, Bilgin IP., Herholz, P., Sprang, M., Fockter, B., Ham, AS., Thorat, S., Ziaei, R., Milisav, F., Proca, AM., Tolle, HM., Suárez, L., Scotti, P., Gellersen, H., (2024). Training the next generation of NeuroAI researchers: Trainees' perspectives. *Nature Communications.*
- Opferman, J., **Schmidgall, S.**, Krieger, A., (2024) State-of-the-Art and Future of Autonomous Robotic Surgery *Artificial Intelligence in Urology, Elsevier Health Textbooks*
- **Schmidgall, S.**, Kim, JW., Ghazi, AE., Krieger, A., (2024) Generalist models for increased autonomy in robot-assisted surgery. *Nature Machine Intelligence.*
- **Schmidgall, S.**, Ziaei, R., Jascha, A., Louis, K., Hajiseyedrazi, T., Eshraghian, J., (2023). Brain-inspired learning in artificial neural networks. *Applied Physics Letters Machine Learning.*

In Preparation Publications

- **Schmidgall, S.**, Rama, C., (2024) Understanding the ethical viewpoints of medical language models.
- **Schmidgall, S.**, (2024) A language model for general surgery.
- **Schmidgall, S.**, Opferman, J., Krieger, A., (2024) Autonomous soft-tissue robotic surgery.
- **Schmidgall, S.**, Stewart, K., Hays, J. (2024) Differentiate anything: discovering surrogate gradients for non-differentiable functions.
- Alam El Din, DM., Monkemoller, L., Schenkman, J., Loeffler, A., Habibollahi, F., **Schmidgall, S.**, Mitra, A., Johnson, E., Kagan, B., Hartung, T., Smirnova, L., (2023) Intelligence-in-a-Dish: Human Induced Pluripotent Brain Organoids Show the Building Blocks Necessary for Basic Learning and Memory.

Medical Experience

Ahmed Ezzat Ghazi, M.B.B.Ch., M.D.
· Director of Robotic Surgery, Johns Hopkins Hospital
· Associate Professor of Urology, Johns Hopkins University School of Medicine
· *Contact Information:*
· Email: aghazi1@jh.edu
· Phone: 410-614-9484
· *Hours shadowed: 19*
· *Procedures observed:*
· Feb/15/2024: 1. Partial Nephrectomy
· Feb/19/2024: 2. Radical Prostatectomy
· Feb/19/2024: 3. Radical Nephrectomy
· Feb/29/2024: 4. Partial Nephrectomy
· Feb/29/2024: 5. Partial Nephrectomy

Kochai Jawed, M.D.
· Pediatric Surgeon, Children's National Hospital
· *Hours shadowed: 3*
· *Procedures observed:*
· Mar/22/2024: 1. Laparoscopic Cholecystectomy

Presentations

Invited reviewer at the *NSF "Brain-Inspired Dynamics for Engineering Energy-Efficient Circuits and Artificial Intelligence"* Program.
Reviewer editor for *Neural Networks* journal.
Invited speaker at the 2023 *Neuro-Inspired Computing Elements (NICE)*.
Invited speaker at the *Intel Labs INRC Spring 2022 Continual Learning Workshop* [link].
Invited speaker for ECE556 *Neuromorphic Computing* at George Mason University [link].
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].

Mentoring

Rajdeep Singh Lather, Fall 2020 — Junior at George Mason University → Software Engineer at Oracle
Joseph Parrotta, Fall 2020 — Sophomore at George Mason University → Data Scientist at Battelle
Satvik Matta, Summer 2022 — Senior at Thomas Jefferson HS → Duke University
Katie Jimenez, Summer 2022 — Sophomore at Thomas Jefferson HS → Junior at Thomas Jefferson HS
Andrew Di Donna, 2022-2023 — Sophomore at George Mason University → Junior at George Mason University