Alex Baranski

PhD Student · Cognitive Neurorobotics
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Education

Okinawa Institute of Science and Technology — Onna, Okinawa, Japan
PhD in Cognitive Neurorobotics — 2021/01 - present
- Advisor: Dr. Jun Tani, in the Cognitive Neurorobotics Research Unit
- Created a dynamic spectral memory system that generalizes to higher dimensions.
- Developed a generalized neural graph representation with a fast pathfinding algorithm.
- Invented new rapid online learning algorithm based on Active Automata Learning.

University of Chicago — Chicago, Illinois, United States
Bachelor of Science in Mathematics, General Honors — 2013/09 - 2017/06

Professional Experience

Angelo Lab — Stanford, California, United States
Computational Research Scientist — 2018/08 - 2021/01
- Engineered MAUI, a GUI for processing multiplexed ion-beam imaging (MIBI) data.
- Developed a hierarchical anomaly-detection system for brain tissue images.
- Created a metric of spatial heterogeneity for MIBI data.
- Made a mathematical model of field-intensity artifacts in MIBI data.
- Built a variational autoencoder for quantitative analysis of single cell morphology.

4th Law — San Jose, California, United States
Software Engineer — 2017/07 - 2018/04
- Developed database model for efficient storage of geospatio-temporal data.
- Engineered modular control platform.
- Worked with control engineer to design adaptive control system.
- Wrote technical recommendations for the CTO and head engineer.

MacLean Lab — Chicago, Illinois, United States
Undergraduate Researcher — 2015/05 - 2015/08
- Created model of transient excitation in anesthetized mouse brain.

Freedman Lab — Chicago, Illinois, United States
Student Technician — 2014/05 - 2014/08
- Wrote acquisition software for neural and eye-tracking data from Rhesus macaques.

Skills

- Python, Java, MatLab, JavaScript, some C++ and C
- PyTorch, MuJoCo, Deep Neural Networks, Genetic Algorithms, Generative Modeling, Reinforcement Learning
- Abstract and Applied Mathematics, Numerical and Approximation Techniques, Theoretical Computer Science
- Cellular, Systems, Developmental, Evolutionary, and Cognitive Neuroscience

Career Goals

- Make theoretical and practical advancements in fundamental aspects of artificial intelligence.
- Investigate neurally-implemented algorithms supporting online active learning for robust autonomy.
- Extend my current research to create robots able to exploit dynamic and unstructured environments.

Publications (selected)

- **Baranski, A.**, Jun, T. *Life, uh, Finds a Way: Hyperadaptability by Behavioral Search.* arXiv, 2025

- **Baranski, A.**, Froese, T. *Efficient Spike Timing Dependent Plasticity rule for Complex-Valued Neurons.* ALIFE 2021: The 2021 Conference on Artificial Life

- **Baranski, A.**, Milo, I., Greenbaum, S., Oliveria, J., Mrdjen, D., Angelo, M., Keren, L. *MAUI (MBI Analysis User Interface)—An image processing pipeline for Multiplexed Mass Based Imaging.* PLoS Computational Biology, 2021

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• Risom, T., Rivero, B., Liu, C., **Baranski, A.**, Strand, S., Greenwald, N., McCaffrey, E., Varma, S., Keren, L., Srivastava, S., Zhu, C., Vennam, S., Hwang, S., Colditz, G., Bendall, S., West, R., Angelo, M. *Mapping the tumor and microenvironmental evolution underlying DCIS progression through multiplexed ion beam imaging.* Cancer Research, 2020

• Risom, T., Glass, D., Averbukh, I., Liu, C., **Baranski, A.**, Kagel, A., McCaffrey, E., Greenwald, N., Gutiérrez, B., Strand, S., Varma, S., Kong, A., Keren, L., Srivastava, S., Zhu, C., Khair, Z., Veis, D., Deschryver, K., Vennam, S., Maley, C., Hwang, E., Marks, J., Bendall, S., Colditz, G., West, R., Angelo, M. *Transition to invasive breast cancer is associated with progressive changes in the structure and composition of tumor stroma.* Cell, 2022

• Vijayaragavan, K., Cannon, B., Tebaykin, D., Bossé, M., **Baranski, A.**, Oliveria, J., Mrdjen, D., Corces, M., McCaffrey, E., Greenwald, N., Sigal, Y., Khair, Z., Bruce, T., Rajaraman, A., Bukhari, S., Montine, K., Angelo, R., Montine, T., Bendall, S. *Single-cell Spatial Proteomic Imaging for Human Neuropathology.* bioRxiv, 2022

• McCaffrey, E., Donato, M., Keren, L., Chen, Z., Delmastro, A., Fitzpatrick, M., Gupta, S., Greenwald, N., **Baranski, A.**, Graf, W., Kumar, R., Bosse, M., Fullaway, C., Ramdial, P., Forgó, E., Jojic, V., Valen, D., Mehra, S., Khader, S., Bendall, S., Rijn, M., Kalman, D., Kaushal, D., Hunter, R., Banaei, N., Steyn, A., Khatri, P., Angelo, M. *The immunoregulatory landscape of human tuberculosis granulomas.* Nature Immunology, 2022

• Ferrian, S., Liu, C., McCaffrey, E., Kumar, R., Nowicki, T., Dawson, D., **Baranski, A.**, Glaspy, J., Ribas, A., Bendall, S., Angelo, M. *Multiplexed imaging reveals an IFN- -driven inflammatory state in nivolumab-associated gastritis.* Cell Reports Medicine, 2021

• Hartmann, F., Mrdjen, D., McCaffrey, E., Glass, D., Greenwald, N., Bharadwaj, A., Khair, Z., Verberk, S., **Baranski, A.**, Baskar, R., Graf, W., Valen, D., Bossche, J., Angelo, M., Bendall, S. *Single-cell metabolic profiling of human cytotoxic T cells.* Nature Biotechnology, 2021

Presentations

• **A Baranski**. *Generating Adaptive Behavior by a Self-Mutating Search Process*. Presented at Neuroscience 2024.

• **A Baranski**, D Mjurden, JP Oliveria, K Vijayaragavan, TJ Montine, SC Bendall and M Angelo. *Automatic pattern differentiation in multiplexed imaging data*. Presented at BioImage Informatics 2019.

• B Cannon, **A Baranski**, K Vijayaragavan, D Mrdjen, J Oliveria, and S Bendall. *Capturing human brain tissue phenotypes with pixel-connected object identification in multiplexed ion beam imaging data*. Presented at BioImage Informatics 2019.