

JONATHAN C. BALLOCH, PH.D



I am an AI research scientist and engineer who thrives in fast-moving environments.
I am passionate about integrating AI and robotics into real-world applications and products.

WORK EXPERIENCE

08/2016 - 12/2024
Georgia Institute of Technology, Atlanta
Graduate Research Assistant
Thesis: Adapting reinforcement learning agents to changes in the environment is vital for real-world applications of reinforcement learning. My work examines “novelties”—unexpected changes in the environment—and how learning agents can better adapt to novelties *explore* their environment and *preserve prior knowledge*.

05/2021-08/2021
SRI International, Palo Alto
PhD Intern
Designed algorithms for learning behavior trees using neural fictitious self-play for interpretable strategy in multi-agent reinforcement learning. The technique increased the convergence efficiency to winning policy on LaserTag and internal Battlefield simulators.

05/2018-08/2018
Google, Seattle
PhD SWE Intern
Implemented few-shot learning approach using active online sample selection for deep learning. Achieved a 2x sample efficiency improvement in classification tasks (MNIST & CIFAR10).

07/2013-07/2016
Intelligent Automation, Rockville, MD
Robotics Engineer
Specialized in design and development of computer vision, sensor fusion, and control systems in DARPA and DoD robotics research and development projects, collaborating with industry and academic groups. Examples of tangible contributions include improving contour-based feature tracking persistence, designing and implementing omnidirectional camera + IMU sensor head, and demonstrated our multi-arm control at the DARPA Robotic Challenge Trials Expo.

05/2012-08/2012
Lockheed Martin, Palo Alto
Graduate Research Intern
Developed a MATLAB package that reduced digital noise and increased precision in laser simulations.

06/2010-08/2010
NASA Jet Propulsion Laboratory, Pasadena
Planetary Science Intern
Modeled radiative transfer in the detached haze layer of Titan in FORTRAN. Discovered the cyclic seasonal altitude and eccentricity collapse/expansion of Titan’s atmosphere.

EDUCATION

08/2016 - 12/2024
Georgia Institute of Technology, Atlanta
PhD - Computer Science (Robotics)

08/2011 - 12/2013
University of Pennsylvania, Philadelphia
M.S. - Robotics

08/2007 - 12/2011
Georgetown University, Washington, D.C.
B.S. - Physics, Mathematics

AWARDS AND ACHIEVEMENTS

Technology Innovation: Generating Economic Results (TI:GER) Fellowship
Georgia Institute of Technology - (2020-2022)

Public Interest Technology Universities Network (PITUN) Fellowship
Georgia Institute of Technology and Georgia State University - (2020-2021)

CONTACT

jon.balloch@gmail.com
+1(203)912-1793
Atlanta, GA
jballoch.com
@balloch
Jonathan Balloch
0000-0001-9998-8415
Google Scholar

SKILLS

Programming

Python ●●●●●●
Bash ●●●●●●
C++ ●●●●●●
Matlab ●●●●●●
Java ●●●●●●
LaTeX ●●●●●●

Operating Systems

Linux ●●●●●●
MacOS ●●●●●●
Windows ●●●●●●

Software & Tools

Deep Learning Frameworks ●●●●●●
(PyTorch, TensorFlow, JAX)
SciPy Data Stack ●●●●●●
(numpy, pandas, matplotlib)
Git ●●●●●●
Docker & Kubernetes ●●●●●●

Expertise


Software Engineering ●●●●●●
(OOD, Algos, CI/CD, Testing)
AI & Machine Learning ●●●●●●
(LLM, RL, NN, VAE, +more)
Math & Statistics ●●●●●●
Physics ●●●●●●
Engineering ●●●●●●
Entrepreneurship ●●●●●●


Languages

English ●●●●●●
Russian ●●●●●●
Spanish ●●●●●●


SELECT PUBLICATIONS



Neuro-Symbolic World Models for Adapting to Open World Novelty

 **Balloch, J. C.**, Lin, Z., Peng, X., Hussain, M., Srinivas, A., Wright, R., Kim, J.M. and Riedl, M.O.

 2023  Proceedings of the International Conference on Autonomous Agents and Multiagent Systems (AAMAS), pp. 2848-2850.

The Role of Exploration for Task Transfer in Reinforcement Learning

 **Balloch, J. C.**, Inman, J., Kim, J., Riedl, M.O.


 2022  ICRA Workshop on Lifelong Learning of High-level Cognitive and Reasoning Skills



NovGrid: A Flexible Grid World for Evaluating Agent Response to Novelty

 **Balloch, J. C.**, Lin, Z., Hussain, M., Srinivas, A., Wright, R., Peng, X., Kim, J., Riedl, M.


 2022  AAAI2022 Spring Symposium on Designing Artificial Intelligence for Open Worlds [Long Oral]


Memory-efficient semi-supervised continual learning: The world is its own replay buffer

 Smith, J., **Balloch, J. C.**, Hsu, Y. C., Kira, Z.


 2021  In 2021 International Joint Conference on Neural Networks (IJCNN), IEEE


Always be Dreaming: A new approach for data-free class-incremental learning

 Smith, J., Hsu, Y. C., **Balloch, J. C.**, Shen, Y., Jin, H., and Kira, Z.


 2021  In Proceedings of the IEEE/CVF International Conference on Computer Vision, pp. 9374-9384.



Fabula Entropy Indexing: Objective Measures of Story Coherence

 Castricato, L., Frazier, S., **Balloch, J. C.**, Riedl, M.

 2021  Proc. of the 3rd Workshop on Narrative Understanding

Tell Me A Story Like I'm Five: Story Generation via Question Answering

 Castricato, L., Frazier, S., **Balloch, J. C.**, Riedl, M.


 2021  Proc of the 3rd Workshop on Narrative Understanding



Detecting and Adapting to Novelty in Games

 Peng, X., **Balloch, J. C.**, Riedl M.


 2020  AAAI2020 Workshop on Reinforcement Learning in Games


Taking Recoveries to Task: Recovery-Driven Development for Recipe-based Robot Tasks

 Banerjee, S., Daruna, A., Kent, D., Liu, W., **Balloch, J. C.**, Jain, A., Krishnan, A., Chernova, S.


 2019  IEEE International Symposium on Robotics Research

The MacGyverbot: Tool Construction by Autonomous Agents

 Nair, Lakshmi, **Balloch, J. C.**, Chernova, S. " ", 2019.

 2019  IEEE International Conference on Robotics and Automation (ICRA)



Unbiasing Semantic Segmentation for Robot Perception using Synthetic Data Feature Transfer

 **Balloch, J. C.**, Aggraval, V., Essa, I., Chernova, S.


 2018  ArXiv:1809.03676



An RGBD segmentation model for robot vision learned from synthetic data

 **Balloch, J. C.**, Chernova, S.

 2017  Robotics Science and Systems (RSS): Workshop on Spatial-Semantic Representations in Robotics



Landmark-Based Robust Navigation for Tactical UGV Control in GPS-Denied Communication-Degraded Environments

 Endo, Y., **Balloch, J.**, Grushin, A., Lee, M.W., Handelman, D.


 2016  SPIE Unmanned Systems Technology XVIII



Titan's Detached Haze and Polar Vortex: Large-Amplitude Seasonal Variations

 West, R. A., Ovanessian, A., Turtle, E. P., Ray, T., **Balloch, J.**, Dumont, P., Lavvas, P., Lorenz, R., Rannou, P.

 2012  Lunar and Planetary Science Conference, 43

The Evolution of Titan's detached haze layer near equinox in 2009

 West, R. A., **Balloch, J.**, Dumont, P., Lavvas, P., Lorenz, R., Rannou, P., Turtle, E. P., Ray, T.

 2011  Geophysical Research Letters, 38, doi: 10.1029/2011GL046843