Harrison Espino

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Education

University of California, Irvine *Sept 2021 – Present*
PhD in Computer Science

- **Research Interests:** Autonomous mapping and navigation, cognitive robotics, computer vision.
- **Coursework:** Machine Learning, Brain-inspired Learning, Computational Neuroscience, Graphical Models, Statistical NLP, Deep Generative Models.

University of California, Davis *Sept 2017 – Jun 2021*
BS in Computer Science and Cognitive Sciences (Double Major)

- **Coursework:** Artificial Intelligence, Agent-based Simulations, Algorithms and Data Structures.

Experience

Graduate Researcher *Irvine, CA*
CARL Lab *Jun 2021 – Present*

- Researched at the intersection of robotics, computational neuroscience, and artificial intelligence, focusing on continual learning and energy efficient algorithms.
- Implemented state-of-the-art algorithms such as Deep Q Networks, PPO, D*, and Rapidly Exploring Random Trees, and compared them with novel brain-inspired algorithms in simulation and real robots.
- Published research in journals (RA-L, Adaptive Behavior) and conference proceedings (ICRA, IJCNN, SAB).

NASA OSTEM Intern *Hampton, VA*
NASA Langley Research Center *Jun 2024 – Dec 2024*

- Performed regression analysis on NASA-related university activity to determine important factors in the selection of grants/awards.
- Developed new tools for automating capability statements on the minority serving institution (MSI) exchange (https://msiexchange.nasa.gov/).
- Created and presented educational tools to prepare OSTEM for the use of generative AI in their work environment.

Undergraduate Research Assistant *Davis, CA*
UC Davis Sleep Lab *Sep 2019 – Sep 2020*

- Developed automation tools to identify sleep spindles from EEG data and report spindle properties such as amplitude, density, frequency, etc.
- Assisted in research and writing an academic paper analyzing longitudinal data of sleep recordings from kids aged 6-12 years old.

Undergraduate Research Assistant *Davis, CA*
Mesgaran Lab *Apr 2019 – Jun 2021*

- Researched the use of machine learning methods to classify the origin of Palmer Amaranth, an invasive weed species.
- Imaged seeds using a hyperspectral camera and adapted convolutional neural network models like GoogleNet and AlexNet to handle image data with many color channels.

Publications

Adaptive, goal-oriented navigation using a model of directionally-polarized place cells *Aug 2025*

Harrison Espino, Jeffrey L Krichmar
10.1177/105971232513647498 ↗

A Rapid Adapting and Continual Learning Spiking Neural Network Path Planning Algorithm for Mobile Robots Apr 2024

Harrison Espino, Robert Bain, Jeffrey L Krichmar

[10.1109/LRA.2024.3457371](10.1109/LRA.2024.3457371) ↗

Vector-based navigation inspired by directional place cells Sept 2024

Harrison Espino, Jeffrey L Krichmar

[10.1007/978-3-031-71533-4$_3$](10.1007/978-3-031-71533-4) ↗

Selective Memory Replay Improves Exploration in a Spiking Wavefront Planner Jun 2023

Harrison Espino, Robert Bain, Jeffrey L Krichmar

10.1109/IJCNN54540.2023.10191940 ↗

Longitudinal analysis of sleep spindle maturation from childhood through late adolescence May 2021

Zoey Y Zhang, Ian G Campbell, Pari Dhayagude, *Harrison Espino*, Irwin Feinberg

10.1523/jneurosci.2370-20.2021 ↗

Highlighted Projects

Graphsketball 2025

- Created and managed "Graphsketball", a sports content channel that produces visually engaging data-driven NBA content. Automated data retrieval through the NBA API to create daily recap videos. Grew an audience of over 50k followers in less than one year and collaborated directly with the NBA.
- Tools Used: Python, pandas, matplotlib, API integration

Teaching Soft Robots to Walk with Reinforcement Learning 2024

- Designed and trained soft-bodied robotic agents in EvoGym using genetic algorithms and reinforcement learning to evolve locomotion strategies, enabling robots to learn to walk from scratch.
- Tools Used: Python, PyTorch, Genetic Algorithms

EKF-SLAM on Low Cost Robotic Platforms 2023

- Implemented Extended Kalman Filter SLAM on OpenBot, a low-cost mobile robot using only a single-beam sonar sensor, achieving accurate mapping in simulation and demonstrating the challenges of motion modeling and odometry error in real-world deployments.
- Tools Used: Python, ROS, Extended Kalman Filters, OpenBot hardware (Arduino + smartphone integration)

Q-Learning on a Real-life Acrobot Robot *2023*

- Built a physical acrobot-like robot and implemented online Q-learning to learn swing-up and inversion through trial-and-error, demonstrating how reinforcement learning can adapt to real-world dynamics beyond simulation.
- Tools Used: Python, Reinforcement Learning

Technologies

Languages: Python, MATLAB, C#, C++

Programming Topics: ROS, Machine Learning, Reinforcement Learning, SLAM, Mapping, Path Planning, Image Processing, Signal Processing

Libraries: pandas, NumPy, Matplotlib, Keras, scikit-learn, PyTorch, TensorFlow, OpenCV

Additional Experience and Awards

Advancement to Candidacy (2025): Successfully advanced to candidacy, proposing "A Dual Representation Model for Autonomous Mapping, Localization, and Planning".

Teaching Assistant (2022-Present): Ran discussion sections and labs for the following University of California, Irvine courses: Linear Algebra, Accelerated Python Programming, Intermediate Programming.

BRAIN NeuroAI Best Poster Runner Up (2024): Runner up for best poster presentation at the 2024 NIH BRAIN NeuroAI conference (Bethesda, Maryland, USA).

IEEE CIS Travel Grant (2023): Grant awarded towards travel for presenting published work at IJCNN 2023 (Gold Coast, Australia).