

# Eric J. Leonardis, MS, PhD

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## SKILLS

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**Programming Languages:** Python, Matlab, Arduino, Processing, Bash/Shell Scripting

**Packages:** Tensorflow, Pytorch, JAX, Keras, Mujoco, DeepMind Control, DeepMind Acme, SLEAP, OpenCV

**Machine Learning:** Reinforcement Learning, Imitation Learning, Deep Learning, Pose Estimation and Tracking

**Signal Processing:** Fourier transform, Hilbert transform, Bandpass Filtering, Wavelet Analysis, Nonlinear Prediction

**Hardware:** Arduino, Raspberry Pi, Electronic Circuits, Neuralynx Neural Implants, Servos, Actuators, Sensors

**Software Development:** Git, GitHub, GitLab, CI/CD, Unit Testing (pytest)

**Languages:** English – (Native Speaker), Mandarin Chinese – (Limited Working Proficiency)

## EDUCATION AND TRAINING

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**Salk Institute for Biological Studies** – August 2022 to Present

**Postdoctoral Fellow in Computational Neuroscience** – NIH T32 Trainee

Research Interests: Deep Reinforcement Learning, 3D Pose Estimation, Biomechanical Physics Simulations

**University of California, San Diego (UCSD)** – September 2014 to June 2022

**Ph.D. in Cognitive Science** – Systems Neuroscience, Robotics

M.S. in Cognitive Science – Brain-Computer Interfaces

**Hofstra University** – Fall 2010 to Spring 2014

B.A. in Psychology, History, and Chinese Studies

## EXPERIENCE

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**Postdoctoral Fellow – Talmo Pereira Lab and Tom Albright Lab (Salk)** – Aug 2022 – Present

Working with Talmo Pereira on 3D pose estimation, deep reinforcement learning, and imitation learning in virtual biomechanical rodent models. Also worked in collaboration with Tom Albright and Sergei Gephstein on long term monitoring of human behavior in the Los Angeles County Museum of Art using 3D pose estimation.

**Graduate Researcher – Andrea Chiba Lab (UCSD)** – August 2015 – Present

Worked with Professor Andrea Chiba and Dr. Laleh Quinn on a goal-oriented reinforcement learning paradigm where robotics agents learn how to interact with rodents. I have managed multiple groups of students, research scientists, post-docs, and engineers to acquire behavioral/neural data then analyze that data using statistical and machine learning techniques.

**Visiting Scholar – Complex and Intelligent Systems Lab (UQ)** – Brisbane, AU – March 2016, November 2017

Worked with Professor Janet Wiles and her team at the University of Queensland to create novel methods for dynamical systems analysis and topological data analysis.

## PROJECTS

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**“The impact of biomechanical actuation on neural representations for embodied control”**

Developed a simulation platform in *MuJoCo* to compare different actuator abstractions (muscle, torque, and position) in modeling mouse forelimb control. Implemented a dexterous forelimb reaching task using a reinforcement learning framework (DMPO in *Tensorflow*) and compared neural representations for each actuator type. Findings indicate that the choice of biomechanical actuator significantly influences neural control policies, providing key insights for embodied NeuroAI modeling.

**“3D Pose Tracking of the Mouse Forelimb and Imitation Learning with Track MJX”**

Developed an end-to-end pipeline utilizing a SLEAP CNN for 2D pose estimation and SLEAP-Anipose for 3D triangulation of mouse reaching data. Employed a *JAX*-powered PPO imitation learning framework to accurately replicate complex, real-world mouse reaching trajectories in *MuJoCo-MJX*. Representations developed during imitation were shown to be reusable and transferable to other online RL tasks.

## RELEVANT COURSEWORK

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Probabilistic Modeling, Data Analysis in Matlab, Introduction to The Physics of Complex Systems, Applied Complexity, Matlab Programming for Experimental Research, Applied Linear Algebra, Computational Neurobiology