ARIEL K. FELDMAN

arielfeldman@cmu.edu | 847-571-4660 | arielfeldman.github.io/

EDUCATION

Ph.D. in Neural Computation
Carnegie Mellon University

Sept 2020 – May 2025 (Expected)

Focus: Information theory applied to cognitive systems
Advisors: Pulkit Grover & Douglas Weber

B.A. in Computer Science and Cognitive Sciences
Rice University

Aug 2016 – May 2020

Minor in Neuroscience
Advisors: Caleb Kemere & Jacob Robinson

SELECTED PROJECTS

Determining the role of proprioception in executing precise, dynamic control
Carnegie Mellon University/Allegheny Health Network

Jan 2023 - Present

- Designed a paradigm to selectively perturb proprioceptive feedback with tendon vibration, quantify its impact on motor control, and provide a comprehensive view of the effects on the peripheral and central nervous systems.
- Characterizing changes in motor unit recruitment across varying conditions and vibration levels from high density electromyography (HDEMG) recordings.
- Investigating stereoelectroencephalographic (SEEG) recordings in patients with epilepsy across levels of proprioceptive perturbation to identify where egocentric and allocentric mappings are integrated.

Electromyographic classification for control of spinal cord stimulation
Carnegie Mellon University/University of Pittsburgh

October 2022 - Present

- Classified motor intent in upper limb surface electromyographic (EMG) activity in patients who experience post-stroke hemiparesis.
- Developing a real-time EMG-based control of spinal cord stimulation for enhanced motor control and user experience.

Information theoretic analysis of grid cell activity
Carnegie Mellon University

September 2020 - Present

- Informed the selection of a newer partial information decomposition (PID) estimator applied to spatial neurons by demonstrating the failure of a commonly used estimator in this context.
- Simulated rodent grid cells with two sophisticated encoding schemes to verify intuition before applying PID to real neural data.
- Applied the chosen PID estimator to real grid cell data, and contrasted values for different localization questions to reveal how information about different questions are encoded.

AWARDS

2021 Carnegie Prize in Mind & Brain Science PhD Fellowship
Selected to receive funding for one year of graduate school and travel to train with the faculty awardee, Sheena Josselyn.

2020 R.K. Mellon Presidential Fellowship
Selected to receive $30,000 towards my first year of graduate school.

Cornell University NeuroNex REU Program
Selected to receive a $4,600 stipend for applying machine learning techniques to markerless tracking data for micro-behavior classification with Mert Sabuncu.

Rice Undergraduate Scholars Program
Selected to receive a $2,500 research grant for machine learning & neuroengineering research.

SELECT PUBLICATIONS

Journal Articles
- Feldman, A.K. et al. (in prep). “Encoding in Grid Cells in the Brain: An Information-Theoretic Analysis”.
- Singer, A. et al. (2020). “Magnetoelectric materials for miniature, wireless neural stimulation at therapeutic frequencies”. In: *Neuron*.

Conference Presentations
- Feldman, A.K. et al. (2022a). “A Partial Information Decomposition Analysis of Grid Cell Encoding”. *Society for Neuroscience*. Poster. San Diego, CA.
- – (2022b). “An Information Theoretic Analysis of Grid Cells”. *Rice Neuroengineering Initiative Conference*. Podium talk. Houston, TX.

Patents
- Forssell, M. et al. (*Patent pending*). “DeepFocus: Techniques for non-invasive and minimally invasive stimulation and sensing of deep-brain targets without manipulating bones surrounding the brain”.

SKILLS

Python | MATLAB | Signal processing | Jupyter | Java | C++ | Arduino | Teaching | Rodent neurosurgery | Hardware prototyping