

# SHAILAJA AKELLA

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## SUMMARY

Computational neuroscience and machine learning researcher with 7+ years of experience in neural dynamics modeling, motor-signal decoding, and large-scale electrophysiology and behavioral data analysis. Skilled in signal processing, dynamical systems, and quantitative modeling of brain-behavior relationships.

## TECHNICAL SKILLS

### Machine learning:

- Sequence modeling: RNNs, LSTMs, GLM-HMMs, state-space models
- Generative modeling: VAE, GAN, sparse-coding models
- Video analysis: Key-point tracking using CNNs and DNNs
- Information theory metrics
- Time-series modeling and forecasting
- Neural decoding methods for spikes, LFP, and behavior time-series

**Programming:** Python, C, R, HTML, MATLAB, LaTeX

**Frameworks:** TensorFlow, PyTorch

**Libraries & compute:** SciPy, Scikit-learn, NumPy, and Cluster & GPU computing

## PROFESSIONAL EXPERIENCE

### Allen Institute

Seattle, WA

Scientist II

June 2025 – Present

Project: Dynamic routing in the brain | PI: Dr. Shawn Olsen

- Developed low-rank Recurrent Neural Network (RNN) models to disentangle task-relevant and latent neural representations in large-scale brain-wide recordings during flexible behavior
- Applied dynamical systems analysis to uncover context-dependent fixed-point attractor states and characterize computations supporting selective filtering and routing of sensory inputs
- Characterizing multi-region connectivity and interactions between task and non-task variables to probe circuit-level computations involved in decision-making

Scientist I

Jan 2022 - June 2025

Projects: Deciphering neuronal variability | PI: Dr. Xiaoxuan Jia; Dynamic routing in the brain | PI: Dr. Shawn Olsen

- Developed state-based GLM-HMMs to partition neural variability into stimulus-driven, behavioral, and internal-state components, revealing non-stationary sensory encoding in the visual cortex
- Developed GLMs to identify context-encoding single neurons across the brain, revealing a distributed and hierarchical representation of context information across the brain
- Applied computer vision techniques for mouse posture and facial expression tracking, revealing context-dependent changes in mouse facial expressions
- Co-developed a standardized key-point tracking pipeline that improved accuracy and was adopted department-wide

### Computational NeuroEngineering Lab

Gainesville, FL

Research Assistant

Aug 2017 – Dec 2021

Project: Enhancing electrophysiological signal analysis | PI: Dr. Jose Principe

- Designed a generative unsupervised sparse-coding framework to model multi-scale oscillatory dynamics across EEG, ECoG, and LFP data at a high temporal resolution
- Developed feature-extraction pipelines to detect behaviorally informative neural events from brain field potentials, achieving 90% accuracy in predicting left-vs-right movement and 80% accuracy in real-time finger-movement decoding
- Built an information-theoretic causality measure to construct connectivity maps between brain areas from neural spiking and field potential data

## EDUCATION

Ph.D. Electrical and Computer Engineering Aug 2017 – Dec 2021  
University of Florida, Gainesville FL, USA  
Thesis title: Neuromodulatory pattern analysis for local field potentials

M.Sc. Mathematics | B.E. Electrical and Electronics Engineering Aug 2011 – July 2016  
Birla Institute of Technology and Science, Pilani Goa, India

## SELECTED PUBLICATIONS AND CONFERENCES

### Journals

1. **Akella, S.**, Ledochowitsch P., ... & Jia X. (2025). Deciphering neuronal variability across states reveals dynamic sensory encoding. *Nature Communications*.
2. **Akella, S.**, Mohebi, A., Principe, J. C., & Oweiss, K. (2021). Marked point process representation of oscillatory dynamics underlying working memory. *Journal of Neural Engineering*.
3. Loza, C. A., Reddy, C. G., **Akella, S.**, & Principe, J. C. (2019). Discrimination of movement-related cortical potentials exploiting unsupervised learned representations from ECoGs. *Frontiers in Neuroscience*.

### Conferences:

1. **Akella, S.**, Pereira-Obilinovic, U., ... & Olsen, S. (2026). Dynamic routing through context-dependent attractor dynamics in frontal cortex. *Computational and Systems Neuroscience (COSYNE)*.
2. **Akella, S.**, Principe, J.C. (2025). Measurable fields-to-spike causality and its dependence on cortical layer and area. *IEEE 13th International Winter Conference on Brain-Computer Interface*.
3. McBride, E.\*, **Akella, S.\***, Gale, S.\*, et al. (2024). Distributed context representations in the mouse brain during sensory task switching. *Society for Neuroscience (SFN)*.
4. **Akella, S.**, Ledochowitsch, P., Siegle, J.H., et al. (2023). Distinct brain states modulate visual cortical processing in mouse. *Computational and Systems Neuroscience (COSYNE)*.
5. **Akella, S.**, Bastos, A.M., Principe, J.C., et al. (2022). Directed information for point process systems. *NeurIPS 2022 Workshop on Information-Theoretic Principles in Cognitive Systems*.

## TALKS

1. Deciphering neuronal variability in the brain. *2023 International Conference on Intelligence: From Cell to Network*, Tsinghua University, Beijing, China, August 2023.
2. Laminar organization of spike-field connectivity during behavior. *SFN*, San Diego, CA, November 2022.
3. Laminar specific interactions in the visual cortex. *Cognitive Neuroscience Society 2022*, San Francisco, CA, April 2022.

## WORKSHOPS CONDUCTED

**Behavioral state analysis using Hidden Markov Models** Seattle, WA  
Summer Workshop on the Dynamic Brain | Allen Institute August 2023, 2025  
UW/Allen Collaboratory Workshop | Allen Institute January 2025

**Laminar organization of spike-field connectivity during behavior** Nashville, TN  
Workshop for multi-area, high-density, laminar neurophysiology data | Vanderbilt University June 2024

## COMMUNITY INVOLVEMENT

**Teaching Assistant** August 2020 – Dec 2020  
Neural Networks and Deep Learning | University of Florida, Gainesville

### Reviewer

*Nature Communications* | *Nature Scientific Reports* | *PLOS One* | *PLOS Computational Biology*  
*Computational and Systems Neuroscience (COSYNE)* | *Cognitive Science Society* | *NeuroAI Workshop 2026 – AAAI*