Yizi Zhang

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Education

Columbia University — New York, NY, USA
Ph.D. in Statistics — 2021 - Current
Advisor: Dr. Liam Paninski

Duke University — Durham, NC, USA
M.S. in Statistics — 2019 - 2021
Advisor: Dr. David Dunson

University of California, Davis — Davis, CA, USA
Double major: B.S. in Statistics & Neuroscience — 2015 - 2019

Research Interests

- **Computational Neuroscience:** neural decoding, brain-computer interfaces
- **Probabilistic Machine Learning:** latent variable models, deep generative models, multi-task learning
- **Bayesian Statistics:** variational inference, empirical bayes

Research Experience

1. **Empirical Bayes for Multi-Task Decoding** (Ongoing project)
   Yizi Zhang*, Liam Paninski
   - Currently developing multi-task learning models to improve neural decoding accuracy by leveraging shared structure among multiple related outputs, inputs and datasets.
2. **Bypassing Spike Sorting: Density-Based Decoding Using Spike Localization from Dense Multielectrode Probes** (Preprint)
   Yizi Zhang*, Tianxiao He*, Julien Boussard, Charlie Windolf, Olivier Winter, Eric Trautmann, Noam Roth, Hailey Barrel, Mark Churchland, Nick Steinmetz, Erdem Varol, Cole Hurwitz, Liam Paninski
   - Developed spike sorting-free neural decoding algorithms that allow neuro-scientists to decode behavior robustly without relying on spike sorting which can be computationally expensive and inaccurate.
   - Benchmarked the algorithm with an extensive suite of electrophysiological recordings from different animals and probe geometries.
   - Demonstrated that the algorithm can consistently outperform current decoders based on multi-unit thresholding and spike sorting.
3. **Motion-Invariant Variational Auto-Encoding of Brain Structural Connectomes** (Preprint)
   Yizi Zhang*, Meimei Liu, Zhengwu Zhang, David Dunson
   - Performed research into variational inference and invariant representation learning.
   - Developed variational graph auto-encoders with motion-invariant latent representations to remove undesirable motion artifacts from the diffusion neuroimaging data.
4. **Predicting Rare Outcomes in Abdominal Wall Reconstruction Using Image-Based Deep Learning Models** In *Surgery, Elsevier*, 2023
   Sullivan A. Ayuso*, Sharbel A. Elhage*, **Yizi Zhang**, Bola G. Aladegbami, Keith S. Gersin, John P. Fischer, Vedra A. Augenstein, Paul D. Colavita, B. Todd Heniford
   - Performed research into anomaly detection and generative adversarial networks.
   - Developed computer vision models that enhanced the ability for surgeons to accurately foresee surgical outcomes by 20% in a time- and resource-efficient way.

Invited Talk

Bypassing Spike Sorting: Density-Based Decoding Using Spike Localization from Dense Multielectrode Probes In *International Brain Lab U19 Site Visit*, New York, NY. 2023.

Motion-Invariant Variational Auto-Encoding of Brain Structural Connectomes In *Statistical Methods in Imaging Conference*, Minneapolis, MN. 2023.

Predicting Rare Outcomes in Abdominal Wall Reconstruction Using Image-Based Deep Learning Models In *American Hernia Society Annual Meeting*, Austin, TX. 2021.

Motion-Invariant Variational Auto-Encoding of Brain Structural Connectomes In *Asilomar Conference*, Pacific Grove, CA. 2021.

Programming Languages and Tools

Languages: Python, R, Stan, MATLAB

Tools: PyTorch, TensorFlow, scikit-learn, Tidyverse.