Models and Methods for the Analysis of Large-Scale Neural Recordings, with Application to Allen Brain Observato

Project #1: Spike inference from calcium imaging data

- **A fast algorithm for estimating spike times (Jewell et al., 2020, Biostatistics)**
- **Quantifying uncertainty associated with estimated spike times (Chen et al., 2021, Biostatistics)**
- **Applying spike inference methods to dopamine neurons (Fleming and Jewell et al., 2021, PLoS One)**

Project #2: Comparisons of calcium imaging and electrophysiology

- **Analysis of jointly recorded calcium imaging and juxtacellular electrophysiology (Huang, Ledochowitsch, et al, eLife 2021)**
- **A comparison of physiological responses recorded with either extracellular electrophysiology or calcium imaging with large scale datasets collected with standardized pipelines. (Siegle, Ledochowitsch, et al, eLife 2021)**

Project #3: A mixture model for neural activity

- **We propose a model in which each neuron belongs to one of several clusters based on its functional response stimulus**
- **We fit the model using an EM algorithm**
- **Application to the Allen Cell Types Database**

Project #4: Building and training anatomically constrained deep neural networks

- **We constructed a convolutional neural network whose architecture is determined by data from the Allen Mouse Brain Connectivity Atlas and other sources. (Shi, et al, in review, 2021)**

End Users

Anybody who collects calcium imaging data or other large-scale neural recordings

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