# Neural and behavioral data during freely-moving behavior in mice

*Authors*: Juavinett, A.L., Bekheet, G., Churchland, A.C.
*Keywords*: Neuropixels, electrophysiology, mice, behavior

## Administrative metadata

Data was collected using Neuropixels 3A probes and SpikeGLX software. It was sorted using Kilosort1 and Phy. Data was collected in 2017 and 2018.

All files are in ".mat" format and can be opened with MATLAB or imported into Python (using scipy function loadmat). This data is also stored on Dropbox as well as the CSHL server.

This dataset contains spike-sorted data, behavioral data, and corresponding metadata for five different animals. It is organized by Animal (e.g., NP8) > Experiment (e.g., NP8_001).

## Description of .mat files

### meta.mat

contains meta information about the experiment, the probe option, and the borders between brain areas. see document for each experiment for a complete illustration of the recording location.

### spikes.mat

Sample rate is 30K Hz (AP channel)
**sp.borders**: borders b/t brain regions, see individual animal descriptions for info on these regions
**sp.st:**  spike times for all spikes (length = all spikes), in seconds relative to session start
**sp.clu:** cluster identities for all spikes (length = all spikes)
**sp.cgs:** cluster group, good = 2, MUA = 1 (length = all putative units/clusters)
**sp.cids:** cluster IDs (same as in sp.clu) (length = all clusters)
**sp.clusterDepths** = depths of cluster where *0 is the bottom of probe*

### etho.mat

contains the behavioral tracking data (xy position, distance, and velocity), as well as the time stamps for the coded behaviors. the sampling rate of these data are 40 Hz.

- **etho.trial_time** is the time for the ethovision experiment, relative to the start of the trial
- **etho.x_center & etho.y_center** is position  of Center Of Mass of mouse
- **etho.distance_moved** is the cumulative distance from trial on pulse
- **etho.velocity** is the speed in cm/s

Note that COM trajectory is Lowess smoothed with 10 samples before & after

- **etho.heading** is the direction of the velocity vector (time derivative of COM) -pi to pi.
- **etho.etho_photodiode** is the same as photodiode pulse.
- **etho.etho_sync** is a TTL sync pulse sent to ethovision & neuropixels
- **in_nest, grooming, rearing** (hindlegs) **, eating, exploring** (moving around)**, bout** (moving towards yoghurt drop) are timestamp indices for mostly non-overlapping behavioral states (except sometimes exploring+bout)
- escape is not annotated, but can be calculated using in_nest, exploring and velocity.
- **etho.meta** is experiment metadata
- **etho.reactionTime** is time from stimulus onset to the time when (local diff gauss smoothed by imgaussfilt of sig=1) acceleration >60cm^2/s
- **etho.vStimToNest, acceleration, maxAcceleration** are quantities from stimulus to nest (upto 6 seconds given to return to the nest).

## sync.mat

contains all of the sync timestamps and stimulus information, all are relative to the start of the session. Sample rate is 2500 Hz (LFP)

- the # trials does not necessarily = the # of stimuli. sometimes, multiple stimuli are presented within a trial. see **sync_data.trialPulses** for how many stimuli were played on a given trial.
- **sync_data.trial_on** and **trial_off** are the timestamps of the beginning & end of the trial
- **sync_data.photodiode** is the stimulus times. in some experiments, there are three stim per trial (the looming stimulus repeats consecutively).
- **sync_data.stimIDs** contains the stimulus identity, where

  1    = high contrast audiovisual
  2 = high contrast visual
  3 = low contrast audiovisual
  4 = low contrast visual
  5 = sound only
  6 = blank

  **NOTE**: not every experiment has all 6 of these conditions. Check the documentation for individual experiments to see which are included.

**Information about individual experiments can be found at the links below:**

NP8: https://paper.dropbox.com/doc/NP8-experiments-overview--AjXABA2gSNUPpSVOeSjcnfufAQ-k8w9ahpigHIaJAyvsxvuE

NP9: https://paper.dropbox.com/doc/NP9-experiments-overview--AjVn4T8MeSOcKDMFohlGQH5bAQ-VqnQwKwVu7P2cmf0Uw1Ke

NP14: https://paper.dropbox.com/doc/NP14-experiments-overview--AjV8KjmveEUGBjBqUhEjRRGxAQ-vtV8XQaj85LfehLCHHPkq

NP15: https://paper.dropbox.com/doc/NP15-experiments-overview--AjVHwskDCZRHxzTOtzFSyL_kAQ-7ZXK6VKAdIgQ2x8mvj3fX

NP16: https://paper.dropbox.com/doc/NP16-experiments-overview--AjXN9YqNRUWFDxA6oOWEc5jYAQ-PjpBwghbVVSl0XWElpLy0