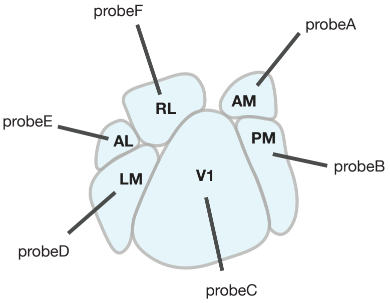
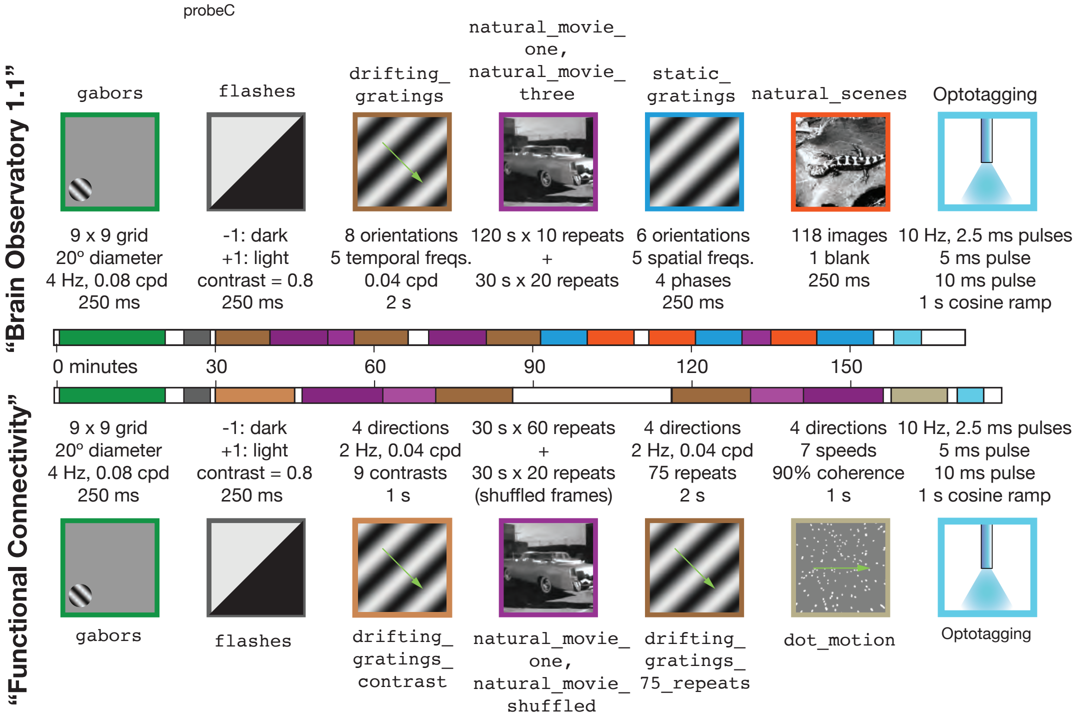
Allen Brain Observatory: Visual Coding Neuropixels Dataset



Metadata	`session.metadata`	`dict`
	`.probes`	`pandas.DataFrame`
	`.channels`	`pandas.DataFrame`
	`.units`	`pandas.DataFrame`
Stimuli	`session.stimulus_presentations`	`pandas.DataFrame`
	`.optogenetic_stimulation_epochs`	`pandas.DataFrame`
Spikes	`session.spike_times[unit_id]`	`numpy.ndarray`
	`.spike_amplitudes[unit_id]`	`numpy.ndarray`
	`.mean_waveforms[unit_id]`	`xarray.DataArray`
LFP	`session.get_lfp(probe_id)`	`xarray.DataArray`
	`.get_current_source_density(probe_id)`	`xarray.DataArray`
Behavior	`session.running_speed`	`pandas.DataFrame`
	`.get_pupil_data()`	`pandas.DataFrame`



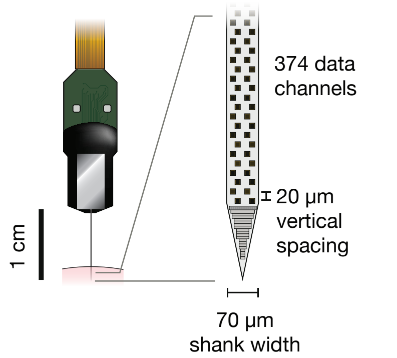
“Brain Observatory 1.1”

gabors	flashes	drifting_gratings	natural_movie_one, natural_movie_three	static_gratings	natural_scenes	Optotagging
9 x 9 grid 20° diameter 4 Hz, 0.08 cpd 250 ms	-1: dark +1: light contrast = 0.8 250 ms	8 orientations 5 temporal freqs. 0.04 cpd 2 s	120 s x 10 repeats + 30 s x 20 repeats	6 orientations 5 spatial freqs. 4 phases 250 ms	118 images 1 blank 250 ms	10 Hz, 2.5 ms pulses 5 ms pulse 10 ms pulse 1 s cosine ramp

“Functional Connectivity”

gabors	flashes	drifting_gratings_contrast	natural_movie_one, natural_movie_shuffled	drifting_gratings_75_repeats	dot_motion	Optotagging
9 x 9 grid 20° diameter 4 Hz, 0.08 cpd 250 ms	-1: dark +1: light contrast = 0.8 250 ms	4 directions 2 Hz, 0.04 cpd 9 contrasts 1 s	30 s x 60 repeats + 30 s x 20 repeats (shuffled frames)	4 directions 2 Hz, 0.04 cpd 75 repeats 2 s	4 directions 7 speeds 90% coherence 1 s	10 Hz, 2.5 ms pulses 5 ms pulse 10 ms pulse 1 s cosine ramp

Neuropixels probes



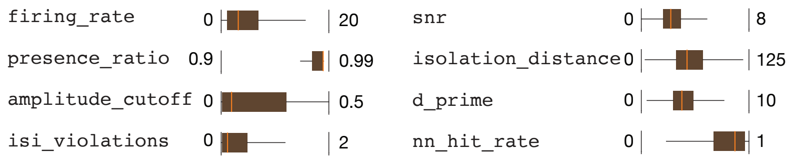
Spike band: ~30 kHz sample rate
500 Hz analog hi-pass
150 Hz digital hi-pass

LFP band: ~2.5 kHz sample rate
1000 Hz analog lo-pass
625 Hz digital lo-pass
NWB includes every 2nd sample and every 4th channel

Available sessions

	WT	Pvalb	Sst	Vip
Brain Observatory 1.1	16	5	6	5
Functional Connectivity	14	3	6	3

Unit quality metrics



VISUAL CORTEX	primary visual cortex	`VISp`	3964[1] (8603[2])
	lateromedial area	`VISl`	2075 (4935)
	rostrolateral area	`VISrl`	2567 (6013)
	anterolateral area	`VISal`	3036 (6466)
	posteromedial area	`VISpm`	1798 (4215)
	anteromedial area	`VISam`	2959 (6198)
HIPPOCAMPAL FORMATION	cornu ammonis 1	`CA1`	5878 (17,104)
	cornu ammonis 3	`CA3`	815 (3148)
	dentate gyrus	`DG`	1655 (5832)
	subiculum	`SUB`	850 (1938)
	prosubiculum	`ProS`	652 (1522)
THALAMUS	lateral geniculate nuc.	`LGd`	1306 (2582)
	lateral posterior nuc.	`LP`	2492 (4849)
MIDBRAIN	anterior pretectal nuc.	`APN`	1297 (3841)

[1] Total units passing default QC filters
[2] Total units (no QC filters)

Cheat sheet version 1.1, September 2020

AllenSDK Commands

Installation (using conda)

```
$ conda create -n allensdk python=3.7
$ conda activate allensdk
$ pip install allensdk
```

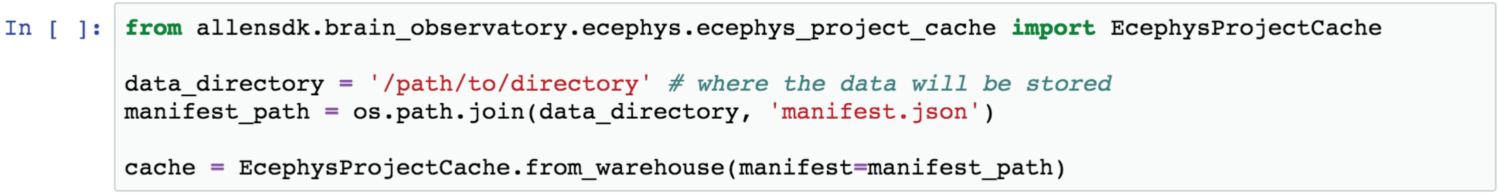
Where to go for help

Documentation: allensdk.readthedocs.io

Issues: github.com/alleninstitute/allensdk/issues

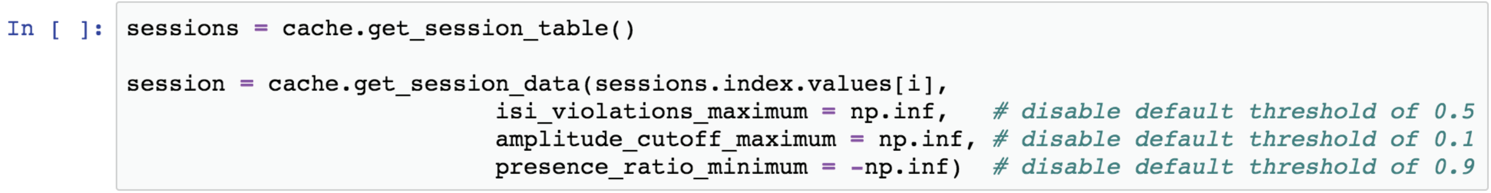
Forum: community.brain-map.org

Setting up a data cache



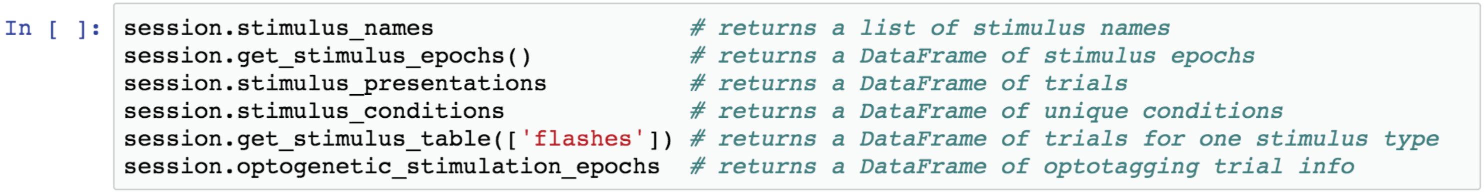
```
In [ ]: from allensdk.brain_observatory.ecephys.ecephys_project_cache import EcephysProjectCache

        data_directory = '/path/to/directory' # where the data will be stored
        manifest_path = os.path.join(data_directory, 'manifest.json')

        cache = EcephysProjectCache.from_warehouse(manifest=manifest_path)
```

Loading data for one session



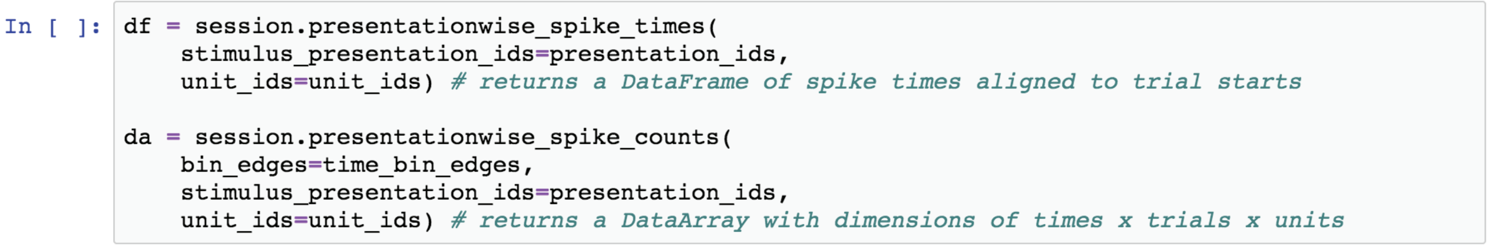
```
In [ ]: sessions = cache.get_session_table()

        session = cache.get_session_data(sessions.index.values[i],
                                    isi_violations_maximum = np.inf,    # disable default threshold of 0.5
                                    amplitude_cutoff_maximum = np.inf, # disable default threshold of 0.1
                                    presence_ratio_minimum = -np.inf)  # disable default threshold of 0.9
```

Getting stimulus information



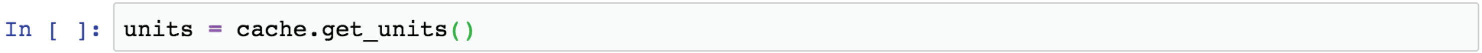
```
In [ ]: session.stimulus_names                     # returns a list of stimulus names
        session.get_stimulus_epochs()              # returns a DataFrame of stimulus epochs
        session.stimulus_presentations             # returns a DataFrame of trials
        session.stimulus_conditions                # returns a DataFrame of unique conditions
        session.get_stimulus_table(['flashes']) # returns a DataFrame of trials for one stimulus type
        session.optogenetic_stimulation_epochs  # returns a DataFrame of optotagging trial info
```

Aligning spike times to stimuli

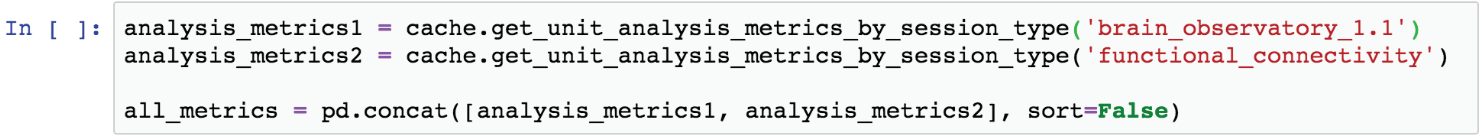


```
In [ ]: df = session.presentationwise_spike_times(
            stimulus_presentation_ids=presentation_ids,
            unit_ids=unit_ids) # returns a DataFrame of spike times aligned to trial starts

        da = session.presentationwise_spike_counts(
            bin_edges=time_bin_edges,
            stimulus_presentation_ids=presentation_ids,
            unit_ids=unit_ids) # returns a DataArray with dimensions of times x trials x units
```

Accessing information about units across all sessions



```
In [ ]: units = cache.get_units()
```



```
In [ ]: analysis_metrics1 = cache.get_unit_analysis_metrics_by_session_type('brain_observatory_1.1')
        analysis_metrics2 = cache.get_unit_analysis_metrics_by_session_type('functional_connectivity')

        all_metrics = pd.concat([analysis_metrics1, analysis_metrics2], sort=False)
```