**Data description (2)**

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These are in vivo whole-cell recordings of relevant cell types

Layer 4 excitatory neurons: L4EVmpopulation

Layer 4 fast-spiking neurons: L4FSVmpopulation

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Layer 4 fast-spiking neurons: L4FSVmpopulation

Somatostatin interneurons: SOMVmpopulation



# cellname:

This is the name of the cell

# depth

Depth reading of the cell recorded.

# whisking\_transit

Transitions from non-whisking to whisking periods.

whiskpos: whisker position

whiskamp: whisking amplitude

# whiskphase

Vm and spks binned to whisking phase (e.g., L4FSVm(1).whiskphase.phase).

Note: vm\_phase: phase values when Vm is positive relative to the mean (for checking phase tuning)

spk\_phase: phase values when there are spkes

all\_phase: all phase values.

# touch\_size

This is the Vm response aligned to touches. Raw Vm can be found in touch\_size.PSPorg.

touch\_dynamics

Further analysis on the dynamics (e.g., onset and size of PSP depolarization etc.) of touch responses.

whiskamp

Neural responses sorted by whisking amplitudes.

whisking\_epochs

Epochs of whisking and associated neural responses.

Void. This is the latency of the touch response computed from the rising onset of touch PSTH (onset, peak, max response rate). The original method is prone to error, however. Use *latency2* instead (which computes latency based on the time PSTH crosses the half-max).

# psth

# This is PSTH constructed from touch response. Ret: touch during whisker retraction. Prot: touch during whisker protraction. thist: in seconds.

latencyL4FS.psth(1)

 ret: [1×700 double]

 thist: [1×700 double]

 prot: [1×700 double]

 all: [1×700 double]

# spkpertouch

This is average spike number evoked from touch (note that ‘nostim =’ is referred to whether there is optogenetic stimulation applied. In other words, nostim is the control, natural conditon)

It is defined as the spk number between 0-50 ms post touch minus a baseline spk number, defined as twice the spke number between 0-25 ms pre touch.

latencyL4FS.spkpertouch(1)

 nostim: [3.9713 3.1485 4.6496] mean, 95% confidence interval

 nostimspkall: [1001×165 double] spk in(0-50 ms post touch onset) x trials

 nostimspkpost\_trialbytrial: [1×165 double] # of spikes (0-50 ms post touch) each trial

 nostimspkpre: [501×165 double] spk in(-25-0 ms pre touch onset) x trials

 nostimraw: 5.5697 average spike num post touch

 nostimFF: [2.0784 1.3446 2.8850] Fano factor (variance over mean)

# transition

Spike histogram as a function of time (PSTH) around the non-whisking🡪 whisking transition (-0.2 to 0.5 sec).

# transitionsdf

Same as above computed with spike density function (kernel, 10 ms)

nwwh

Firing rate during whisking or nonwhisking periods.

latency2

latency of touch responses (in sec), computed as the time of half-max.

onsetrate

Spike rate at touch onset (note that touch evoked response hasn’t occurred).

sdf

Touch-evoked response as a function of time, computed with sdf (kernel, 1 ms). ret and prot touches combined.

depth

Depth of cell recorded.