**Raw data description**

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**List of cell types and recording methods:**

1. **L4EVm**: in vivo whole-cell recording of L4 excitatory cells (P.depth or T.depth tells the recording depth).
2. **L4ESpikes**: cell-attached/juxtacellular recordings of L4 E cells.
3. **L4FSVm**: in vivo whole-cell recording of L4 fast-spiking cells.
4. **L4FSSpikes**: cell-attached/juxtacellular recordings of L4 FS cells.
5. **L5EVm**: in vivo whole-cell recordings of L5/6 E cells.
6. **L5ESpikes**: cell-attached/juxtacellular recordings of L5 E cells.
7. **L5FSVm**: in vivo whole-cell recordings of L5/6 FS cells.
8. **L5FSSpikes**: cell-attached/juxtacellular recordings of L5 FS cells.
9. **L23ESpikes**: cell-attached/juxtacellular recordings of L23 E cells.
10. **L23FSSpikes**: cell-attached/juxtacellular recordings of L23 FS cells.
11. **SOMVm**: in vivo whole-cell recordings of SST cells.
12. **SOMSpikes**: cell-attached/juxtacellular recordings of SST cells.
13. **VIPSpikes**: cell-attached/juxtacellular recordings of VIP cells.
14. First, add these folders in Matlab. These are dependent functions.



1. These are individual neurons. Each file corresponds to a single cell. Slight difference in their naming convention is due to a switch from ePhus to wavesufer for data acquisition during the project.



1. Load a cell of the old format (**Tarray\*\*\*.mat**) and plot a single trial



*load('TarrayJY0995AAAA.mat');*

*% This is how you plot whisker angle, touch times, and membrane potential*

*% of a single trial*

*itrial = 14;*

*twhisker = T.trials{itrial}.whiskerTrial.time{1}; % this is the time of each whisker frame, in sec. we captured 5 sec, 1000fps data usually but there were dropping frames sometimes.*

*% if length(whiskerTrial.time)>1, each cell corresponds to the tracking of a different whisker*

*whisker\_angle = T.trials{itrial}.whiskerTrial.thetaAtBase{1}; % this is the whisker angle*

*distance\_to\_pole = T.trials{itrial}.whiskerTrial.distanceToPoleCenter{1}; % this is the distance from pole center to whisker*

*touch\_times = T.contacts{itrial}.contactInds{1}; % this are the index of touch events.*

*touch\_onset = T.contacts{itrial}.segmentInds{1}(:, 1); % onset of touch*

*touch\_offset = T.contacts{itrial}.segmentInds{1}(:, 2); % onset of touch*

*tvm = T.trials{itrial}.spikesTrial.time - 0.01; % this is to account for a 10 ms latency between ephys and behavior(including whisker acquisition)*

*vm = T.trials{itrial}.spikesTrial.rawSignal;*

*% plot this trial*

*figure;*

*ha1 = subplot(2, 1, 1)*

*for i = 1:length(touch\_onset)*

 *patch(twhisker([touch\_onset(i) touch\_offset(i) touch\_offset(i) touch\_onset(i)]), [-20 -20 40 40], [0.1 0.6 0.9], 'edgecolor', 'none');*

*end;*

*hold on*

*plot(twhisker, whisker\_angle, 'k.')*

*plot(twhisker(touch\_times), whisker\_angle(touch\_times), 'r.');*

*set(ha1, 'xlim', [-0.1 5.2], 'ylim', [-20 40])*

*xlabel('time (s)')*

*ylabel('whisker angle')*

*ha2 = subplot(2, 1, 2)*

*for i = 1:length(touch\_onset)*

 *patch(twhisker([touch\_onset(i) touch\_offset(i) touch\_offset(i) touch\_onset(i)]), [-80 -80 20 20], [0.1 0.6 0.9], 'edgecolor', 'none');*

*end;*

*hold on*

*plot(tvm, vm, 'k')*

*set(ha2, 'xlim', [-0.1 5.2], 'ylim', [-80 20])*

*xlabel('time (s)')*

*ylabel('vm (mV)')*

(Note: in a subset of trials, optogenetic stimulation was applied. One can identify these trials by looking at the trial type: T.trials{5}.behavTrial.trialTypeorg. If it includes ‘Stim’, it is a stimulation trial.)

1. Load a cell of the old format (**Parray\*\*\*.mat**) and plot a single trial



*load('Parray\_ANM305599\_150915a\_Exp\_2015\_09\_15\_001.mat')*

*% This is how you plot whisker angle, touch times, and membrane potential*

*% of a single trial*

*itrial = 31;*

*twhisker = P.trials{itrial}.whiskerTrial.time{1}; % this is the time of each whisker frame, in sec. we captured 5 sec, 1000fps data usually but there were dropping frames sometimes.*

*% if length(whiskerTrial.time)>1, each cell corresponds to the tracking of a different whisker*

*whisker\_angle = P.trials{itrial}.whiskerTrial.thetaAtBase{1}; % this is the whisker angle*

*distance\_to\_pole = P.trials{itrial}.whiskerTrial.distanceToPoleCenter{1}; % this is the distance from pole center to whisker*

*touch\_times = P.trials{itrial}.contacts.contactInds{1}; % this are the index of touch events.*

*touch\_onset = P.trials{itrial}.contacts.segmentInds{1}(:, 1); % onset of touch*

*touch\_offset = P.trials{itrial}.contacts.segmentInds{1}(:, 2); % onset of touch*

*tvm = P.trials{itrial}.ephysTrial.time;*

*vm = P.trials{itrial}.ephysTrial.rawSignal; % membrane potential*

*im = P.trials{itrial}.ephysTrial.Iinj; % current injection*

*opto = P.trials{itrial}.ephysTrial.AOM; % optogenetic stimulation*

*% plot this trial*

*figure;*

*ha1 = subplot(3, 1, 1)*

*for i = 1:length(touch\_onset)*

 *patch(twhisker([touch\_onset(i) touch\_offset(i) touch\_offset(i) touch\_onset(i)]), [-60 -60 40 40], [0.1 0.6 0.9], 'edgecolor', 'none');*

*end;*

*hold on*

*plot(twhisker, whisker\_angle, 'k.')*

*plot(twhisker(touch\_times), whisker\_angle(touch\_times), 'r.');*

*set(ha1, 'xlim', [-0.1 5.2], 'ylim', [-60 40])*

*xlabel('time (s)')*

*ylabel('whisker angle')*

*% plot voltage*

*ha2 = subplot(3, 1, 2)*

*for i = 1:length(touch\_onset)*

 *patch(twhisker([touch\_onset(i) touch\_offset(i) touch\_offset(i) touch\_onset(i)]), [-80 -80 20 20], [0.1 0.6 0.9], 'edgecolor', 'none');*

*end;*

*hold on*

*plot(tvm, vm, 'k')*

*set(ha2, 'xlim', [-0.1 5.2], 'ylim', [-80 20])*

*xlabel('time (s)')*

*ylabel('vm (mV)')*

*% plot current*

*ha3 = subplot(3, 1, 3)*

*hold on*

*[hAx, hp1, hp2] = plotyy(tvm, im, tvm, opto);*

*set(hAx(1), 'xlim', [-0.1 5.2], 'ylim', [-0.2 0.5])*

*set(hAx(2), 'xlim', [-0.1 5.2], 'ylim', [-0.5 6])*

*xlabel('time (s)')*

*ylabel(hAx(1), 'current (nA)')*

*ylabel(hAx(2), 'laser signal')*