%% function Find\_peaks\_and\_bl receives these input variables:

%% t- time vector in seconds

%% dydt\_filtered- first derivative of signal

%% d2ydt2\_filtered- second derivative of signal

%% locs- vector of indexes of time of max dv/dt for all action potentials

%% average\_filtered- fluorescent action potential signal

%% pre- constant in milliseconds to determine the beginning time-point of the event for analysis

%% post- constant in milliseconds to determine the ending time-point of the event for analysis

%% interval- sampling interval in seconds

%%

%% function Find\_peaks\_and\_bl returns these output variables

%% peaks\_locs- vector of indexes of action potential peaks locations

%% peaks- vector of action potential peaks values

%% baselines\_pre- vector of signal values at baseline of all action potentials

%% pres- vector of indexes of action potential beginnings (defined in time as “time of max dv/dt – constant”)

%% posts- vector of indexes of action potential endings (defined in time as “time of max dv/dt + constant”)

%%

function [peaks\_locs, peaks, baselines\_pre, pres, posts] = Find\_peaks\_and\_bl(t,dydt\_filtered,d2ydt2\_filtered,locs,average\_filtered,pre,post,interval)

peaks\_locs = [];

peaks = [];

baselines\_pre = [];

pres = [];

posts = [];

%%calculate max dydt from 1st deriv unfiltered from raw filtered

%from unfiltered 1st deriv from raw filtered

dydt\_unfiltered = diff(average\_filtered)./diff(t);

dydt\_unfiltered = [dydt\_unfiltered, NaN];

% pre post num of ind

pre\_num\_of\_ind = round((pre/interval)/1000);

post\_num\_of\_ind = round((post/interval)/1000);

for i = 1:length(locs)

if ~isnan(locs(i))

% start and stop

start = locs(i) - pre\_num\_of\_ind;

stop = locs(i);

%pres

pres = [pres, start];

% baseline of pre

baselines\_pre = [baselines\_pre, average\_filtered(start)];

%start and stop for peaks

start\_peak = locs(i);

stop\_peak = locs(i) + post\_num\_of\_ind;

posts = [posts, stop\_peak];

%find peak from act to post

average\_filtered\_max = max(average\_filtered(start\_peak:stop\_peak));

peak\_loc = start\_peak + find(average\_filtered(start\_peak:stop\_peak) == average\_filtered\_max);

%add to vectors

peaks = [peaks, average\_filtered\_max];

peaks\_locs = [peaks\_locs, peak\_loc];

end

end

end

%% the next code lines extract amplitude vector for all action potentials

[peaks\_locs, peaks, baselines\_pre, pres, posts] = Find\_peaks\_and\_bl(t,dydt\_filtered,d2ydt2\_filtered,peaks\_locs\_vec,average\_filtered,pre,post,interval);

%return function values

peaks\_vec = peaks;

bl\_vec = baselines\_pre;

pre\_vec = pres;

post\_vec = posts;

%amp\_vec is a vector of amplitudes of for all action potentials

amp\_vec = peaks\_vec - bl\_vec;