Plotting 3D Data - Noisy signal set

Explores the spectral properties of a 3D matrix making use of several commands from the plotting package.

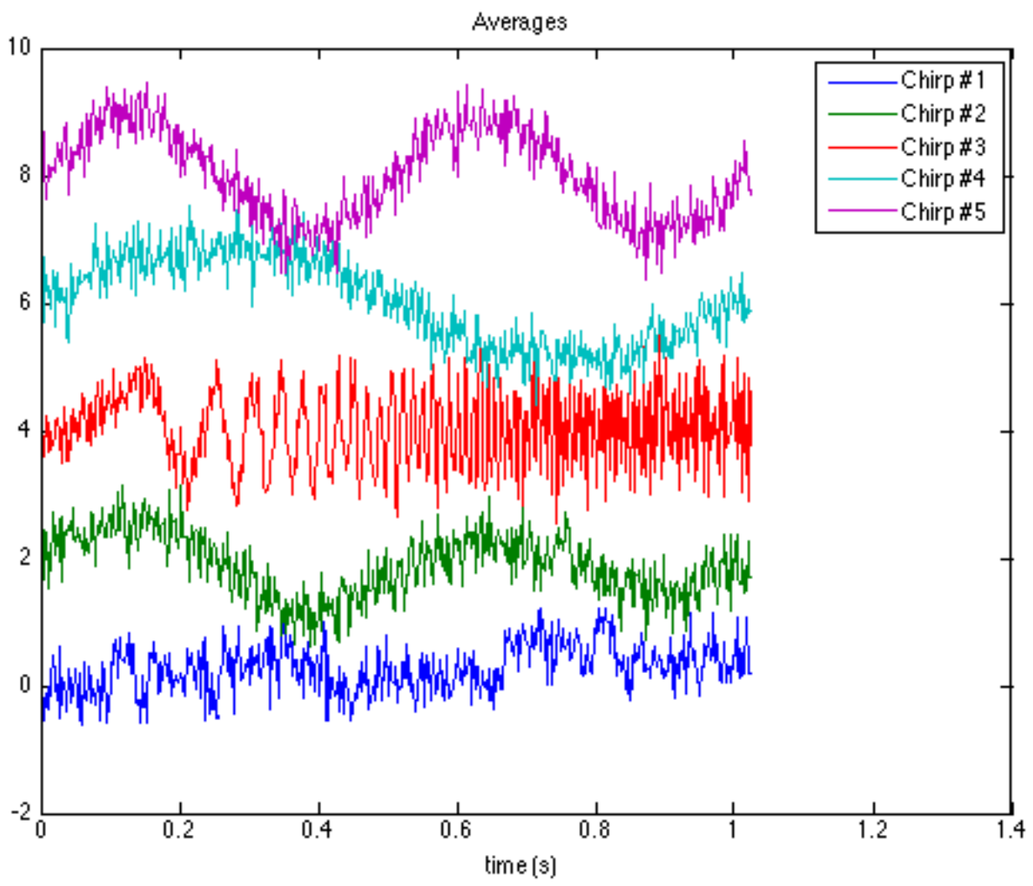
Contents

Set up signals

```
set(0, 'DefaultFigureColor', 'White');
params.tapers = [3 5];

% Load a bunch of random signals
load ex_c5_100


% Order data so in the form Ndata x Ntrials x Nsignals
[~,ind] = sort(sig_CLU);
X = signals(ind,:)';
X = reshape(X,[512,100,5]);
X = X(:,1:5,:);             % Take a subset - only a few trials
[Ndata, Ntrials, Nsignals] = size(X);
Fs = 500;
signames = arrayfun(@(x) ['Signal #' num2str(x)],1:Nsignals,'UniformOutput',0);

% Add some additional noise to a few trials to make things interesting
Xnoise = 1*randn([Ndata,2,Nsignals]);
X(:,[3 5],:) = X(:,[3 5],:) + Xnoise;
```

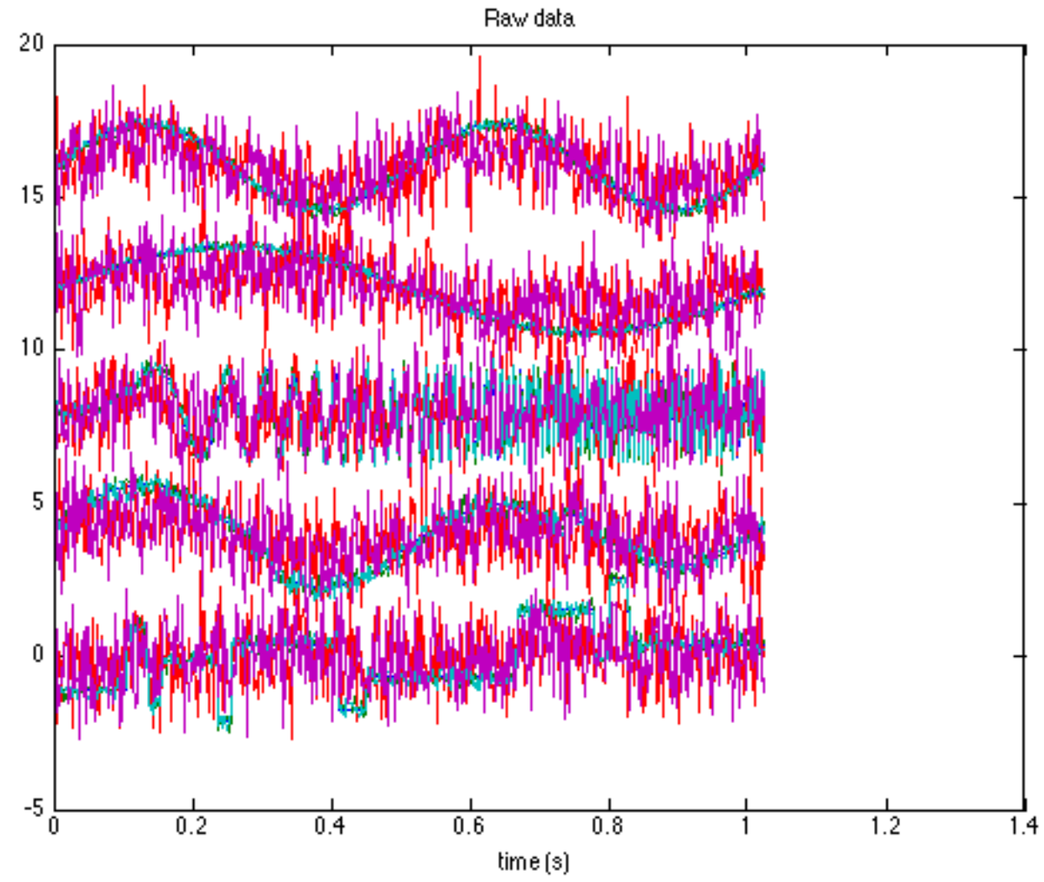
plot_matrix3D: Plot mean data

```
figure; hl = plot_matrix3D(X(:,:,:),'fs',Fs,'do_mean',1,'do_shift',2); title('Averages');
legend(hl,arrayfun(@(x) ['Chirp #' num2str(x)],1:Nsignals,'UniformOutput',0))
xlabel('time (s)');
```



plot_matrix3D: Plot raw data

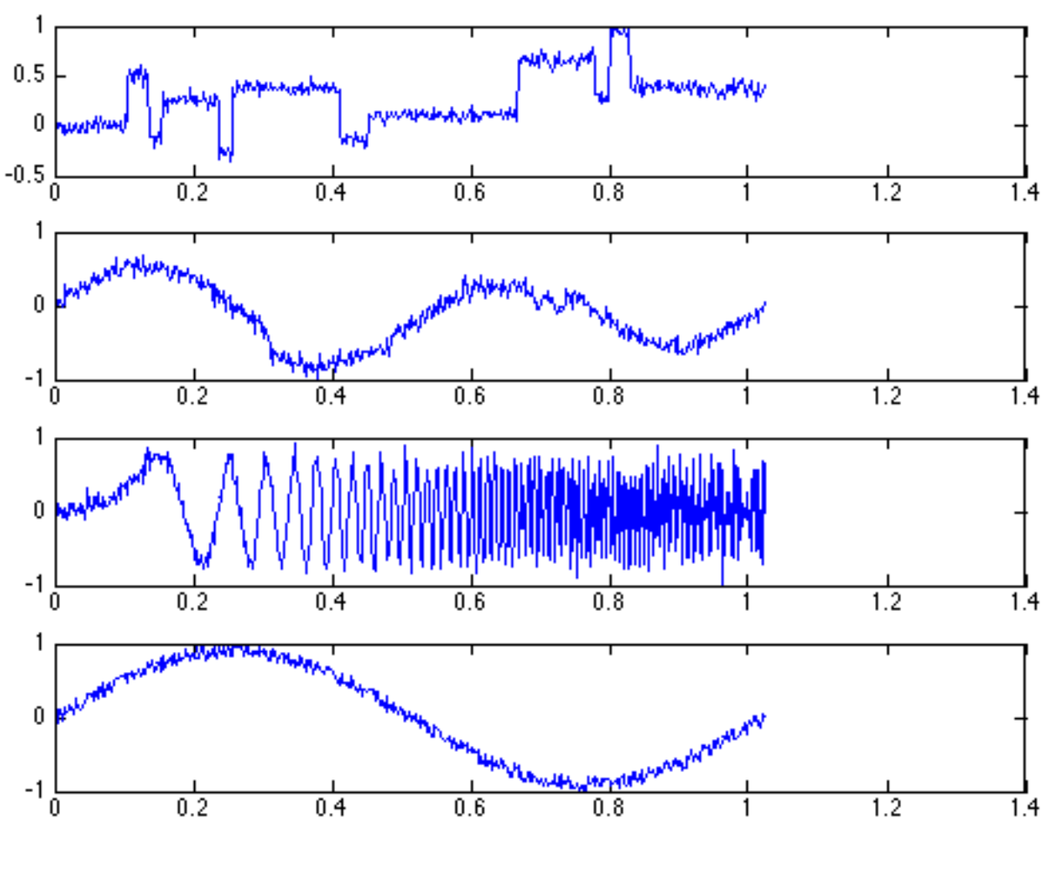
```
figure; plot_matrix3D(X,'fs',Fs,'do_mean',0,'showErrorbars',0,'do_shift',4,'active_dim',3,'do_zscore',1); title('Raw data');
xlabel('time (s)');
```



plot_ani_pairs: Animated plot along trials

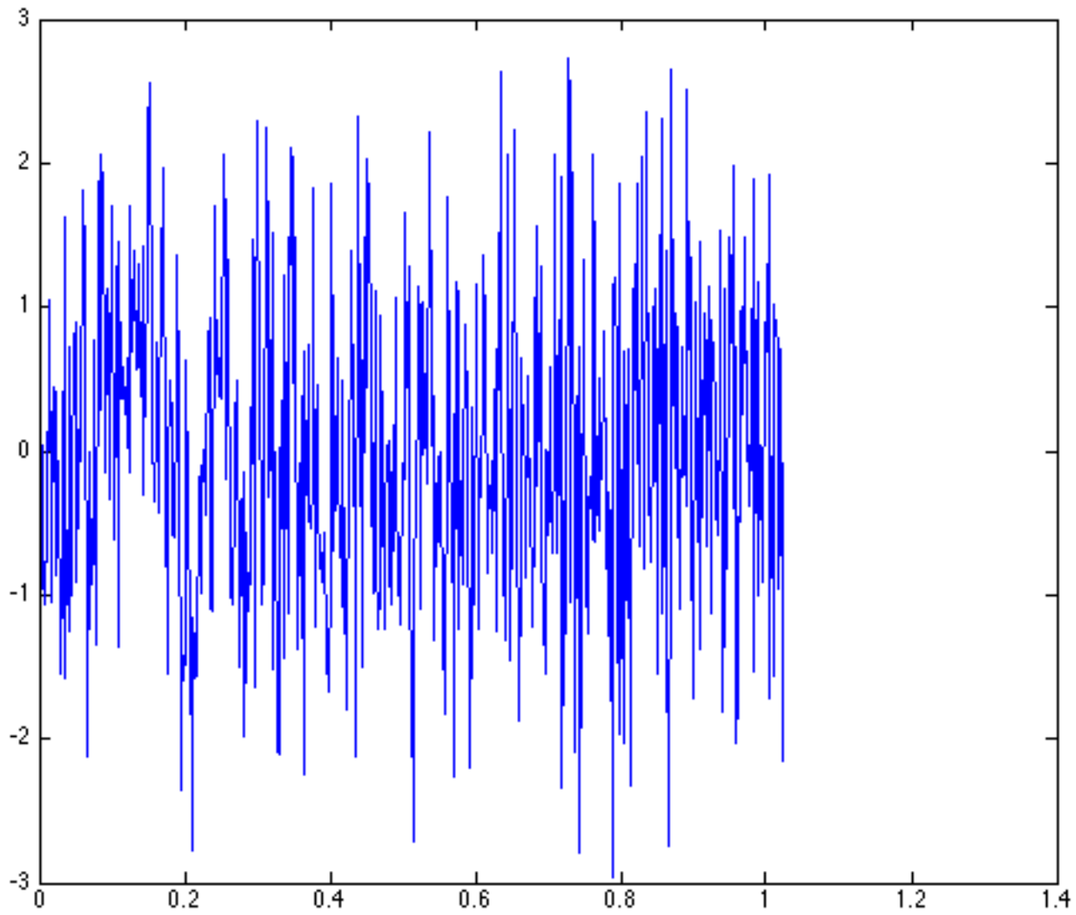
A few signals suffer from high noise - try to spot them (hint, it's trials 3 and 5)

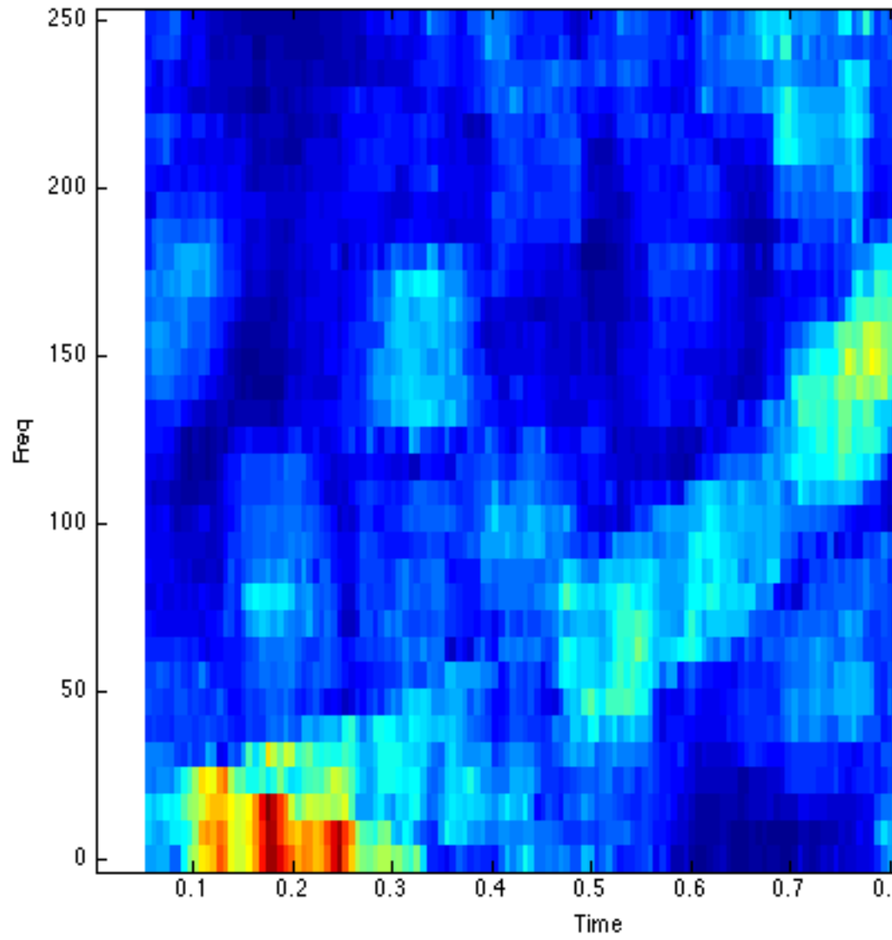
```
figure;
plot_ani_pairs(X(:,:,1),@plot_fs,X(:,:,2),@plot_fs,X(:,:,3), ...
    @plot_fs,X(:,:,4),@plot_fs,'plotargs',{'fs',Fs});
```



plot_ani: Animated spectrogram plots to identify bad trials

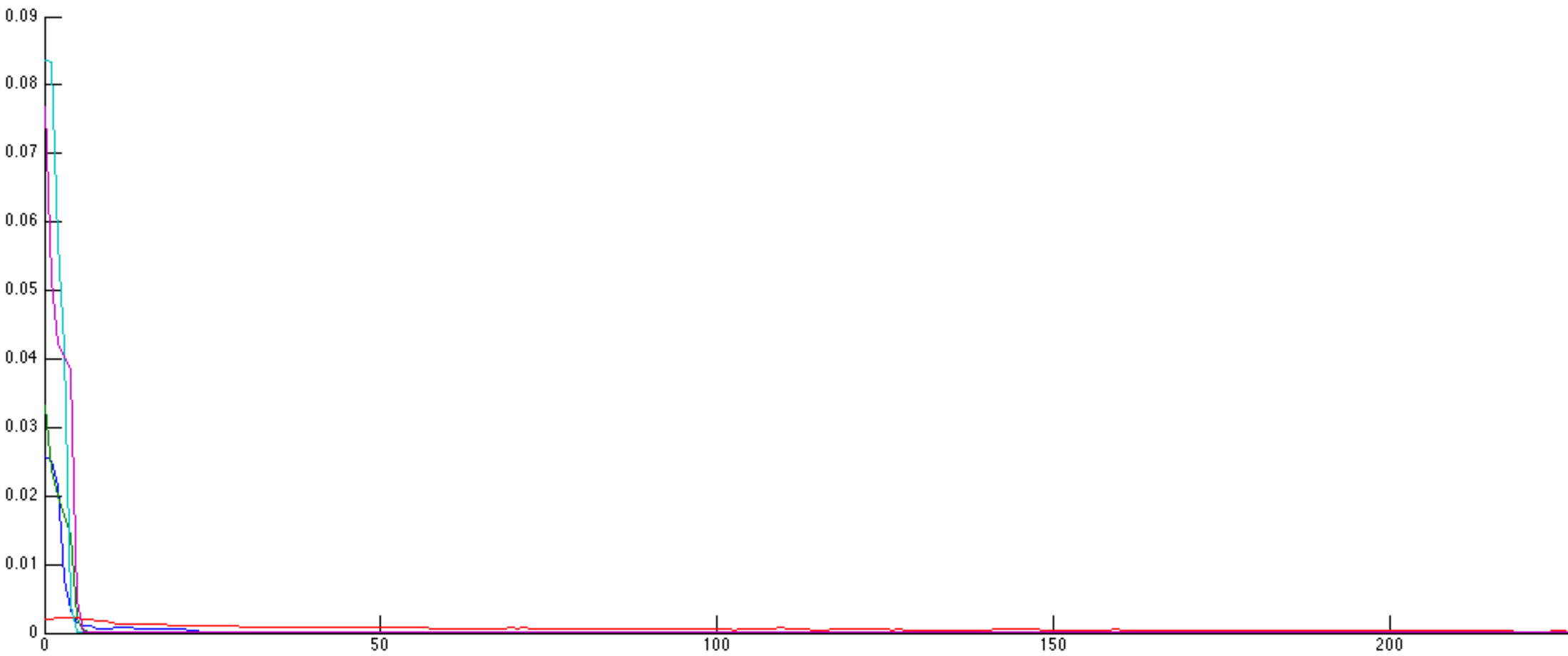
```
figl;   % Large figure
plot_ani(X(:,:,3),'fs',Fs,'fname',{@plot_fs,@plot_spect});


% Remove the bad trials
ind = true(1,size(X,2)); ind([3,5]) = 0;
X = X(:,ind,:);
```





plot_ani: Plot all powerspectra

```
plot_ani(X,'fname',@(X) plot_psd(X,'fs',Fs,'params',params));
% figure; hl= plot_psd(X,'fs',Fs); ylabel('Power');
```



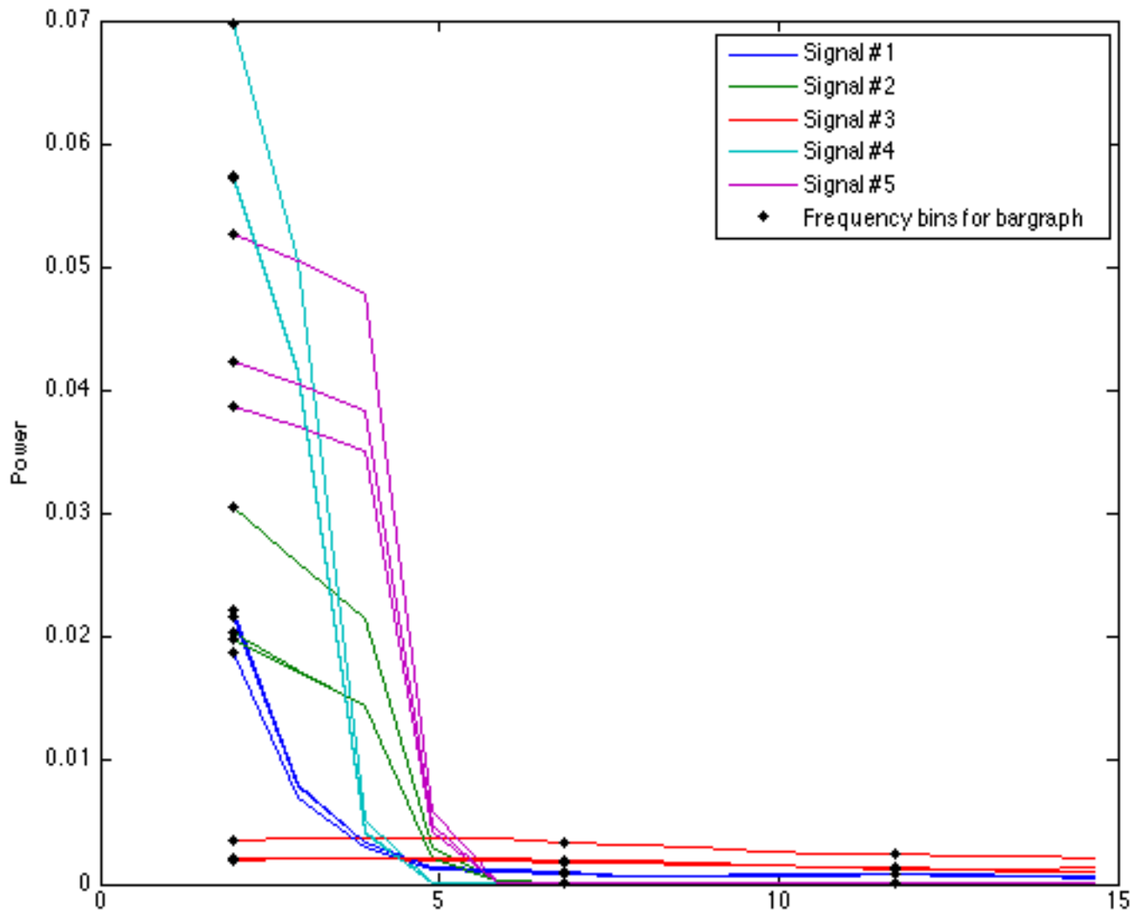
Set up data for plotting some statistics

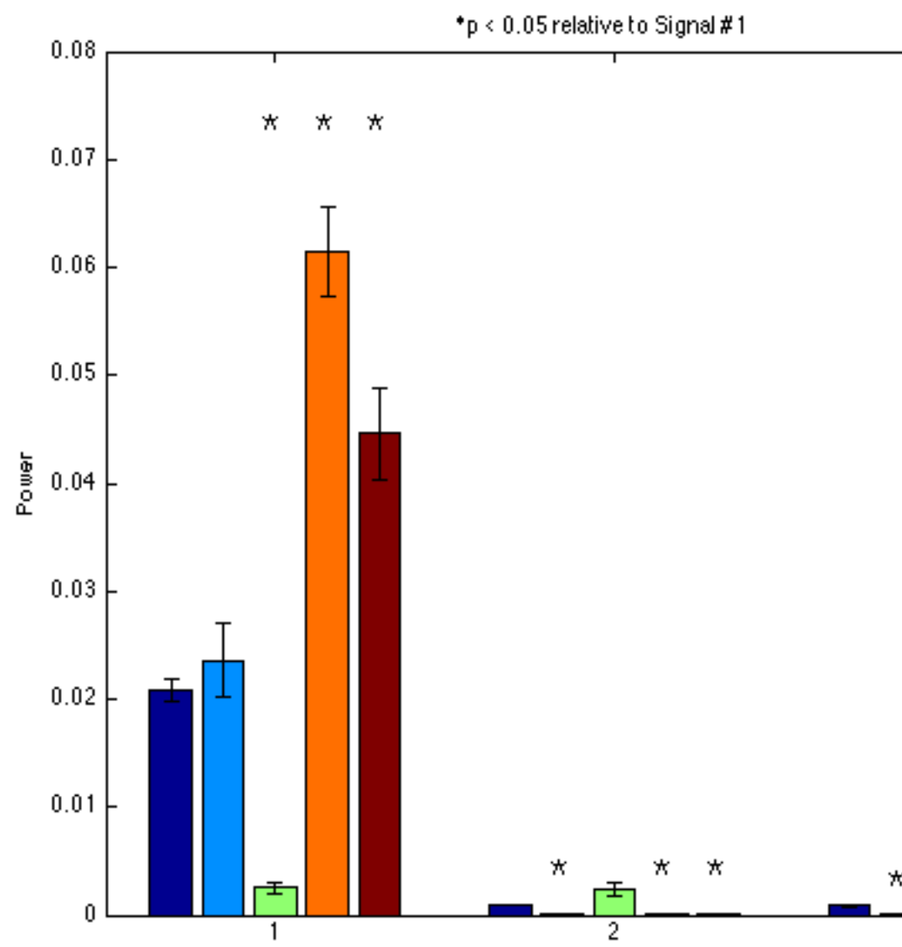
```
% Take the PSDs of this 3D matrix. Need to do some cell arrays to handle 3D matrix, unfortunately
sz = size(X);
Xcell = mat2cell(X,[sz(1)],[sz(2)],[ones(1,sz(3))]);
[P,f] = cellfun(@(X) psd_wrapper(X,'fs',Fs,'params',params),Xcell,'UniformOutput',0);
f = f{1};
P = cell2mat(P);

% Take segment of data from 1 - 4Hz.
index = find(f >= 1 & f < 15);
Y = P(index,:,:);
f2 = f(index);
```

bar_matrix3D: Test for significant difference in three frequency bins

```
figl;
subplot(1,2,1); hl1 = plot_matrix3D(f2,Y,'showErrorbars',0,'do_mean',0);
legend(hl1{1},signames);
Ysparse = Y(1:5:end,:,:); f_sparse = f2(1:5:end);
hold on; hl2 = plot_matrix3D(f_sparse,Ysparse,'showErrorbars',0,'do_mean',0,'LineSpec',{'k.','MarkerSize',10,'LineWidth',2});
```

```
legend([hl1{1}; hl2{1}(1)],signames,'Frequency bins for bargraph');
xlabel('Freq (Hz)'); ylabel('Power');
subplot(1,2,2); hl = bar_matrix3D(Ysparse,'active_dim',2); xlabel('Frequency bin'); ylabel('Power'); ylim([0 0.08])
title('*p < 0.05 relative to Signal #1');
legend(hl,signames{:})
```





Published with MATLAB® R2013a