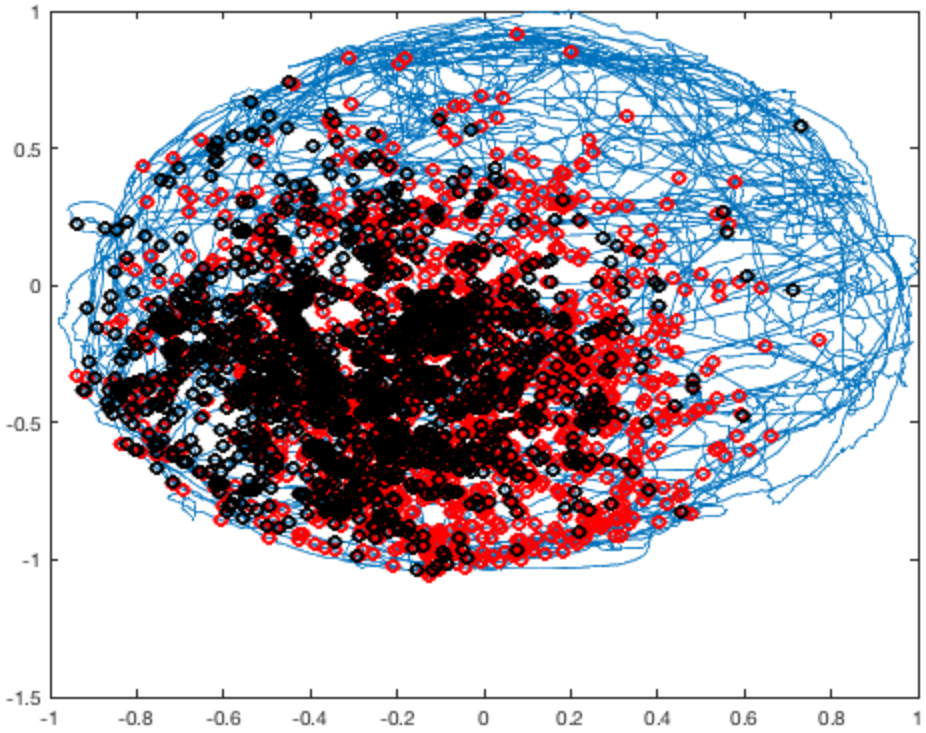
Table of Contents


```
load('hipp_data.mat');
```

plot trajectory and spikes

```
figure;
plot(xN,yN);
hold on;
% get positions at spikes
[x_1, y_1] = selectTime(xN,yN, spikes);
[x_2, y_2] = selectTime(xN,yN, spikes2);
scatter(x_1,y_1,'red')
hold on;
scatter(x_2,y_2,'k')

fprintf("The spikes for both seem to be concentrated more towards
 the")
fprintf("negative spatial region (ex. values close to x = -.2 y=-.5 to
 -1)")
```

```
The spikes for both seem to be concentrated more towards thenegative
 spatial region (ex. values close to x = -.2 y=-.5 to -1)
```



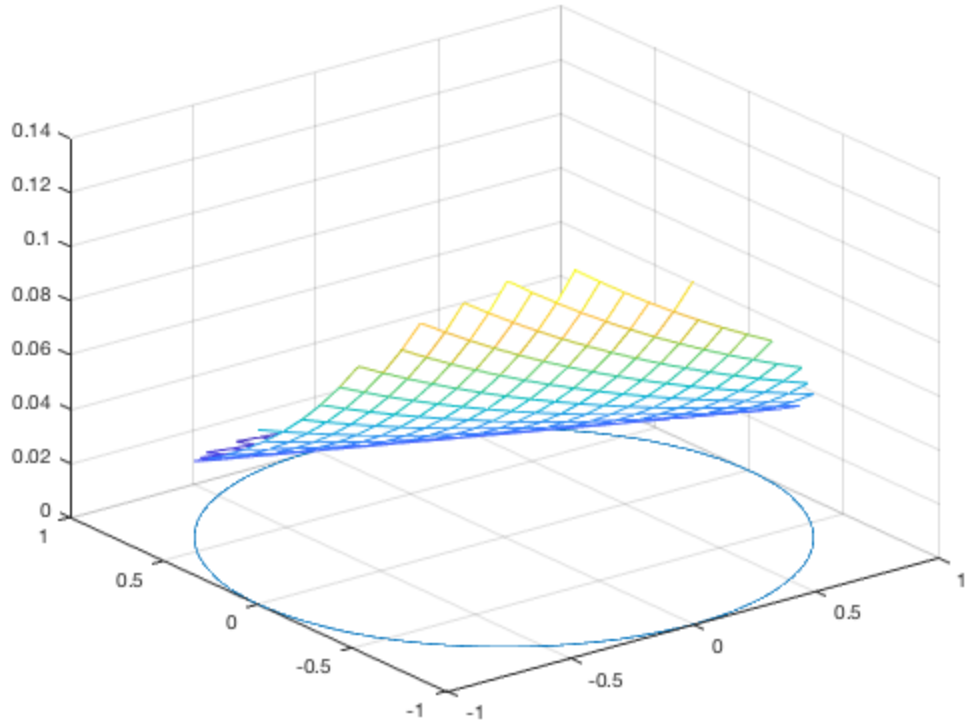
2

run the script

```
hipp_glm
```

```
sig = sum(stats.p<.05);
aic_lin = dev + 2*2;
% all are significant
fprintf("All are significant")
fprintf("This generally captures the spatial firing properties, but
 does not")
fprintf("capture the degree of shift befween low firing areas and high
 firing areas")
fprintf("and the low area around the high")

% check the fit of the graph and write it down
```

```
All are significantThis generally captures the spatial firing
 properties, but does notcapture the degree of shift befween low
 firing areas and high firing areasand the low area around the high
```



quadratic = xN,yN,xN^2,yN^2, xNyN

```
[b,dev,stats] = glmfit([xN yN xN.*yN xN.^2 yN.^2],spikes,'poisson');

% put all of the below into a function
aic_quad = dev + 2*5;

% comput AIC
fprintf("The AIC value for the linear model is %1.8f\n", aic_lin)
fprintf("The AIC value for the quadratic model is %1.8f", aic_quad)
```

```
The AIC value for the linear model is 11392.16328211
The AIC value for the quadratic model is 9151.21971810
```

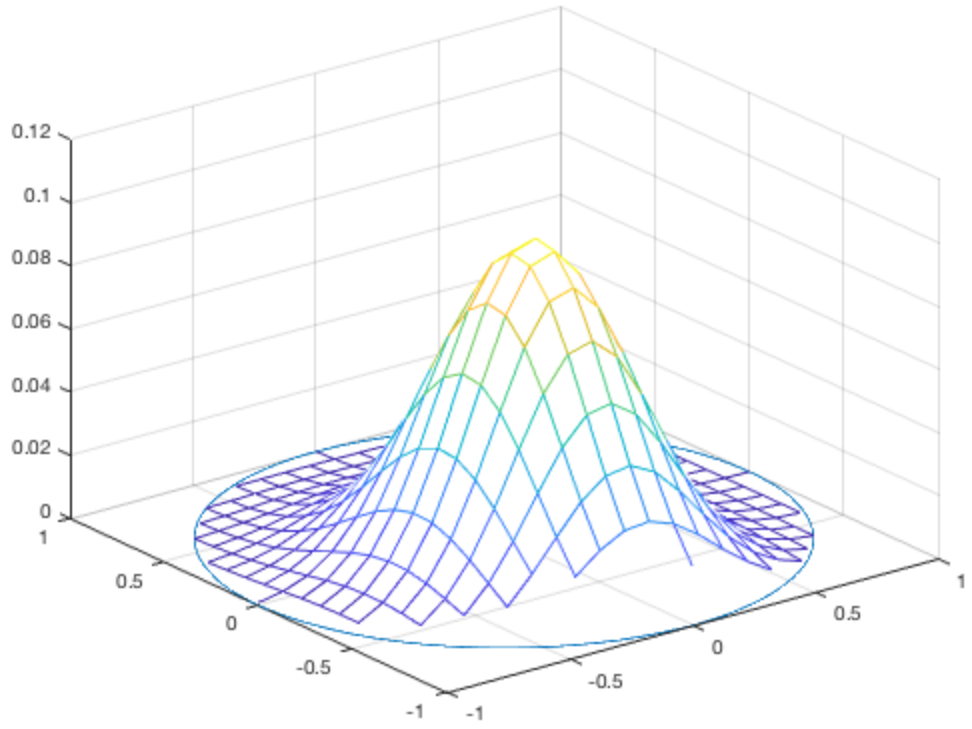
plot

doesn't make sense to write a new function to handle both graphs

```
figure;
[x_new,y_new]=meshgrid(-1:.1:1);

% compute lambda for each point on this grid using the GLM model
lambda = exp( b(1) + b(2)*x_new + b(3)*y_new + b(4)*x_new*y_new +
 b(5)*x_new.^2 + b(6)*y_new.^2);
lambda(find(x_new.^2+y_new.^2>1))=nan;
```

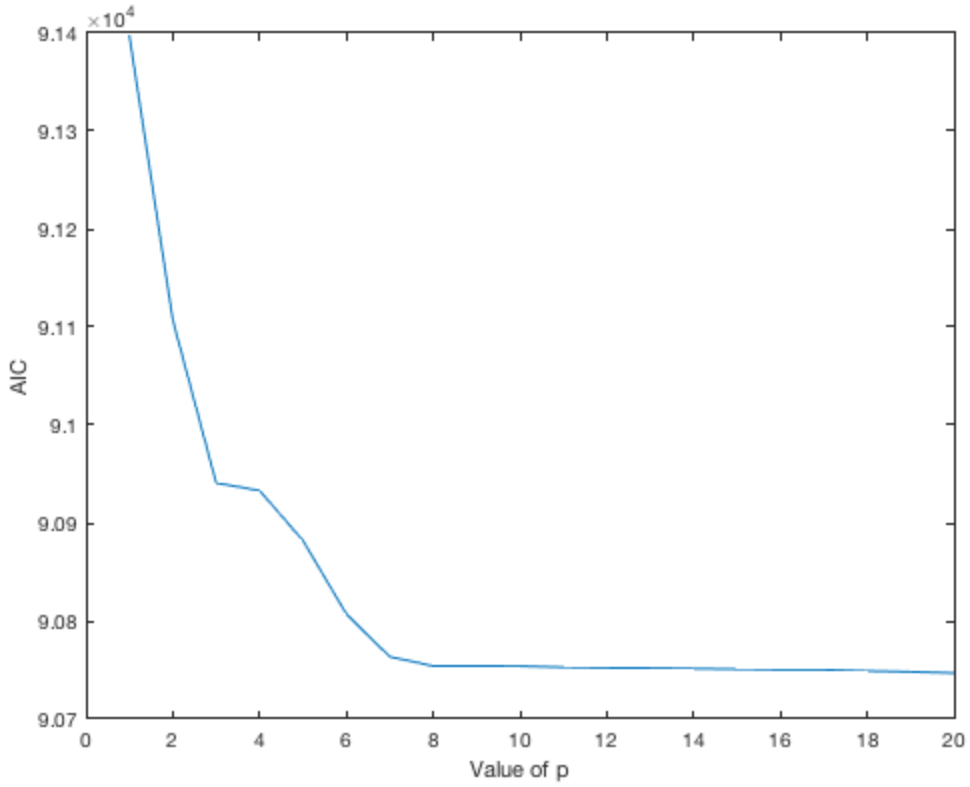
```
%plot lambda as a function of position over this grid
h_mesh = mesh(x_new,y_new,lambda,'AlphaData',0);
hold on;
plot3(cos(-pi:1e-2:pi),sin(-pi:1e-2:pi),zeros(size(-pi:1e-2:pi)));

fprintf("The quadratic model describes the data better")
```

The quadratic model describes the data better



Spikes Hist

```
model = [xN yN xN.*yN xN.^2 yN.^2];
[b, dev, stats, aics, new_model] = addHistory(model, spikes_hist,
 spikes);
figure;
plot(aics)
xlabel("Value of p")
ylabel("AIC")
```



add other history

```
[new_b, new_dev, new_stats, new_aics, add_model] =
 addHistory(new_model, spikes2_hist, spikes);

num_sig = length(new_stats.p(new_stats.p(26:46) <= .05));

% set significance as .05
fprintf("There are %2f parameters that are significant", num_sig)

% the model with all spike_hist and one spike2_hist is most
 parsimonious
fprintf("The model will all the spikes_hist and one value for
 spikes2_hist")
fprintf("is the most parsimonious because the AIC does not drop
 significantly")
fprintf("when adding the other spikes2_hist but the number of
 parameters increases")
```

```
There are 0.000000 parameters that are significantThe model will
 all the spikes_hist and one value for spikes2_histis the most
 parsimonious because the AIC does not drop significantlywhen adding
 the other spikes2_hist but the number of parameters increases
```

```
m = [spikes_hist(:,1:20) spikes2_hist(:,1:20)];
```

```
[final_b final_dev final_stats] = glmfit(m, spikes, 'poisson');


sig = sum(final_stats.p(21:41) <= .05);

fprintf("There are %2f network interaction parameters that are
 significant", sig)

fprintf("Theinteraction terms may be significant in this case because
 previously")
fprintf("the spatial location may have been triggering activity in the
 other neuron")
fprintf("which may have lead to the response in the modelled neuron.
\n")
fprintf("As a result, the newtwork interactions would not be
 significant unless")
fprintf("the location was not included")
```

```
There are 18.000000 network interaction parameters that are
 significantTheinteraction terms may be significant in this case
 because previouslythe spatial location may have been triggering
 activity in the other neuronwhich may have lead to the response in
 the modelled neuron.
As a result, the newtwork interactions would not be significant
 unlessthe location was not included
```

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