Completed Lab C

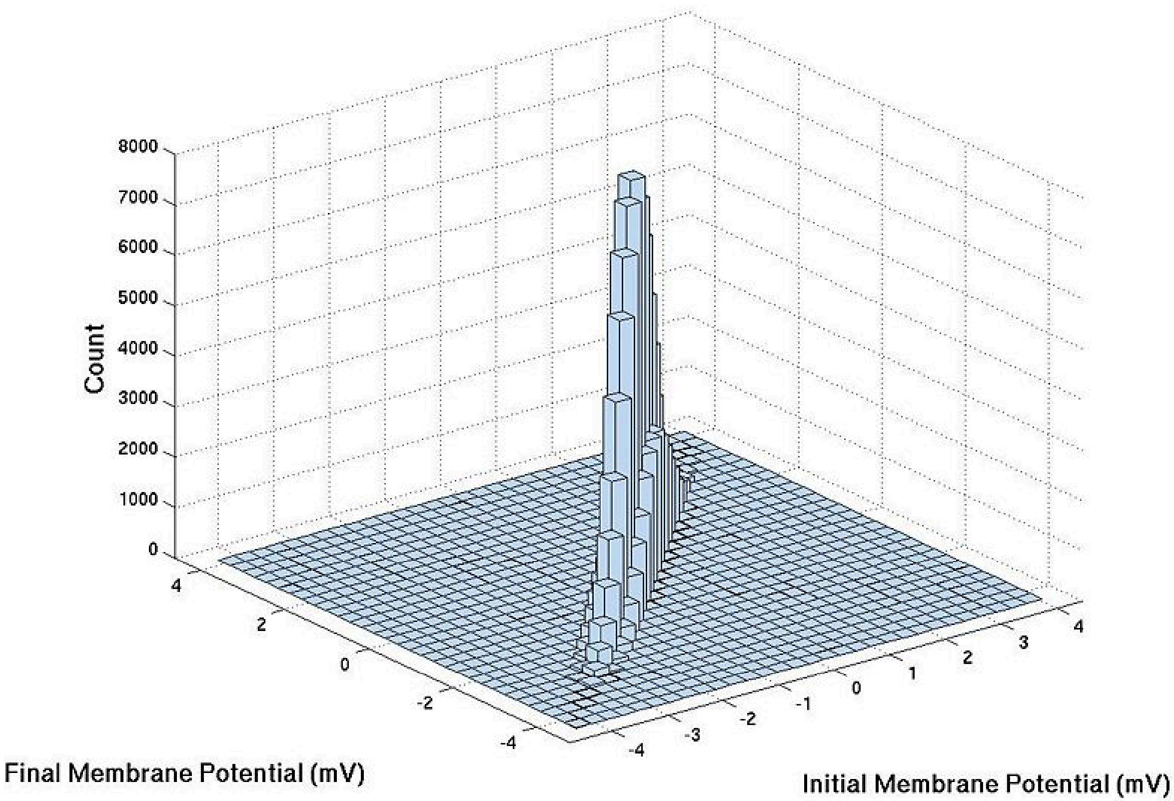
And A Sampling of the Bonus Work

Problem C1.

-The joint density of independent random variables is the product of the marginal densities of the random variables.

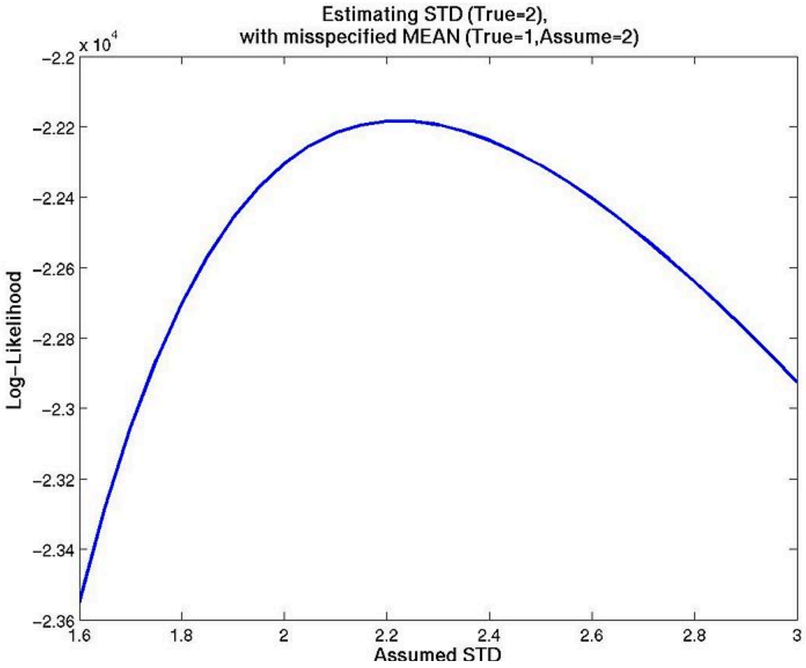
- The joint density has the following symmetry: sweeping across rows and/or columns produces restrictions of the joint density that are scalings of each other. When normalized these cross-sections are identical (conditional densities p(X1|X2) and p(X2|X1) do not depend on second (conditioned on) variable.

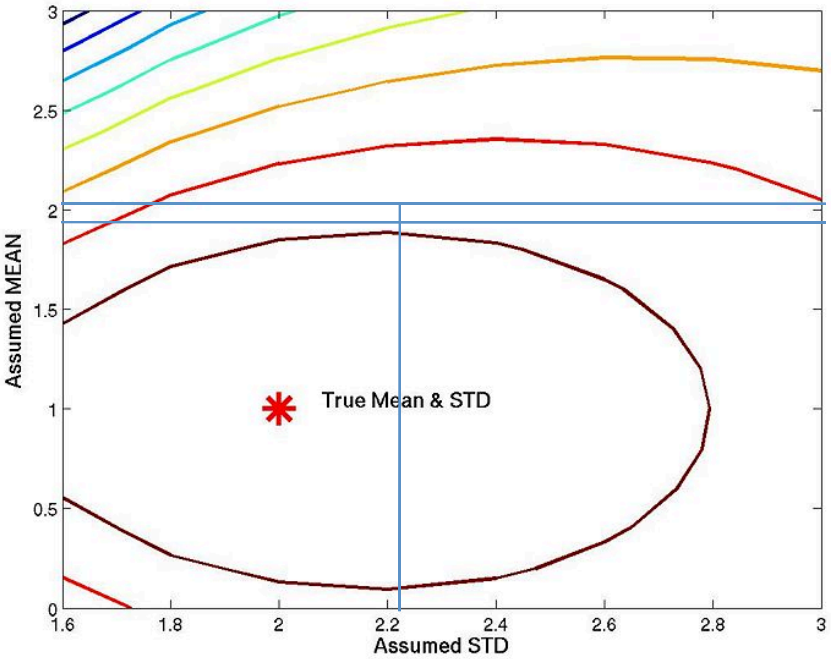
-The Hodgkin-Huxley shifts the conditional densities including their peaks, these are not independent.



Problem C2

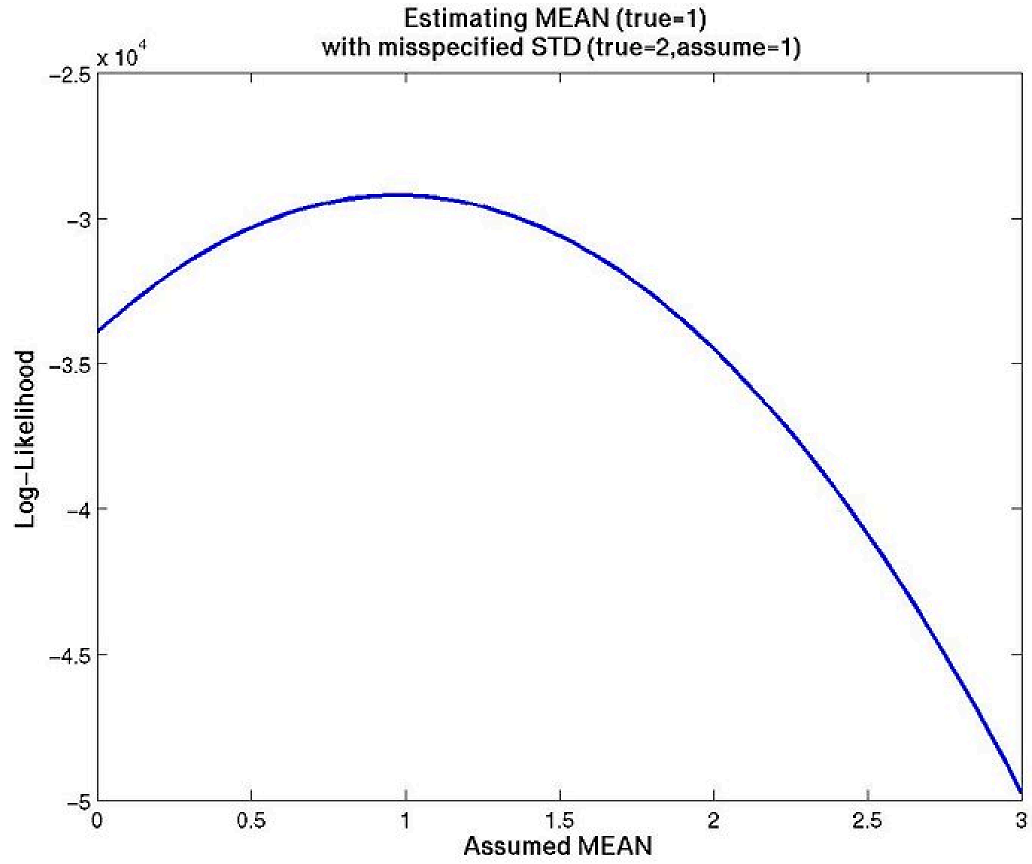
The estimate of the STD is about 2.2, off from the true value by 10%. One-independent-variable plot is the restriction of the two-independent-variable to the line ASSUMED_MEAN = 2.





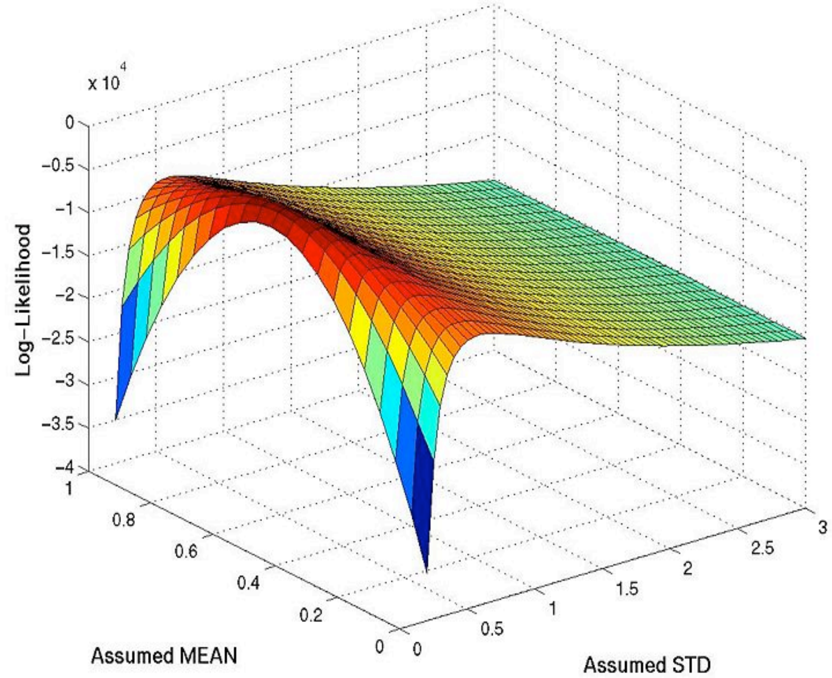
Problem C3

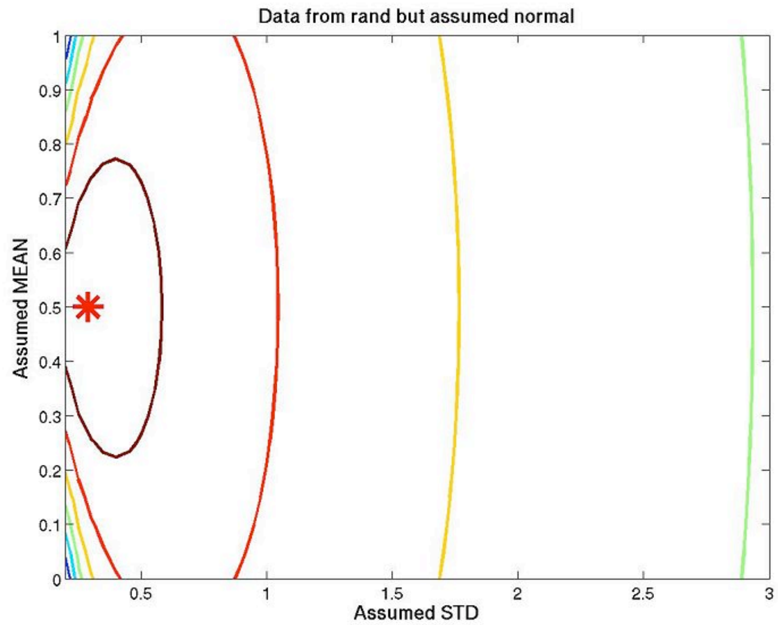
Misspecifying the STD produces an estimate that is, as far as I can tell, still spot on. The estimation problem was more sensitive to errors in the MEAN.



Problem C4

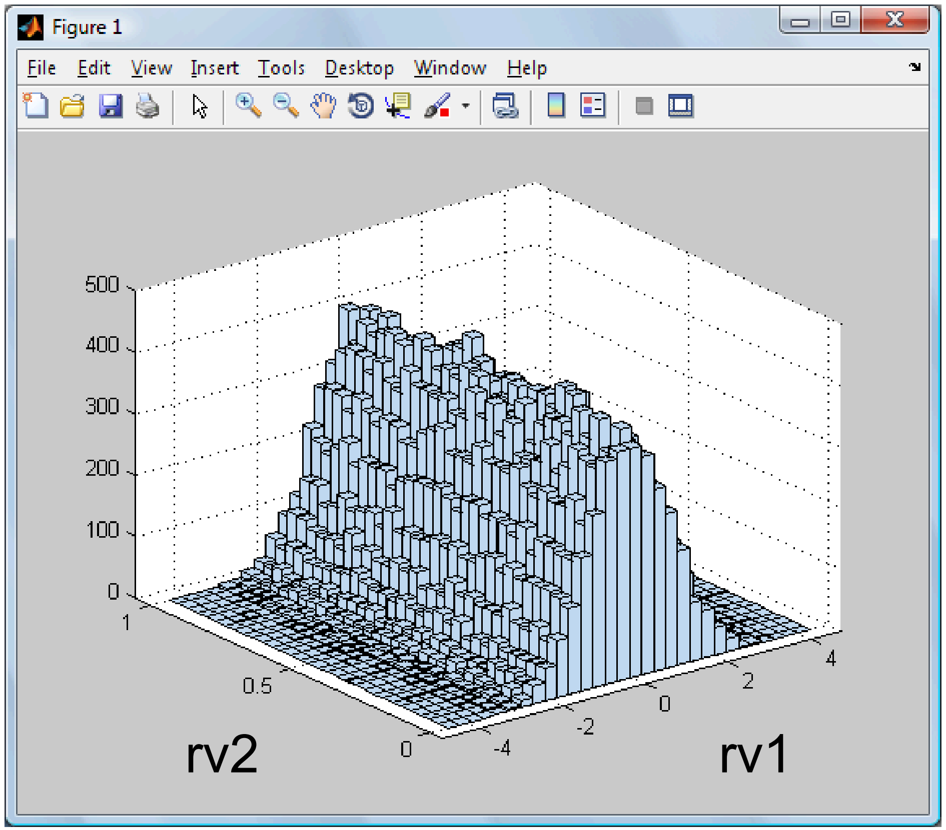
Incorrectly assuming the data were generated by randnms, when they in fact were generated by rand does not seem to affect the quality of the estimate. The MLE (Maximum Likelihood Estimate) assuming randnms of the mean and std is (to my eye) very close to the true mean and std of rand (asterisk).





Bonus Work

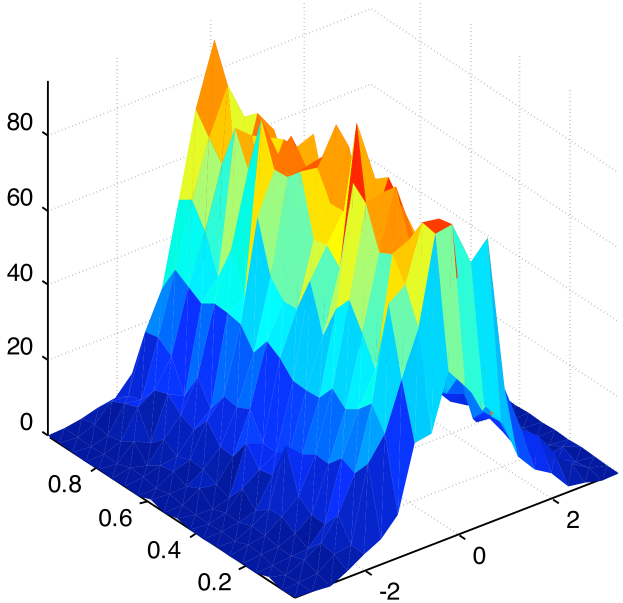
Bonus Problem

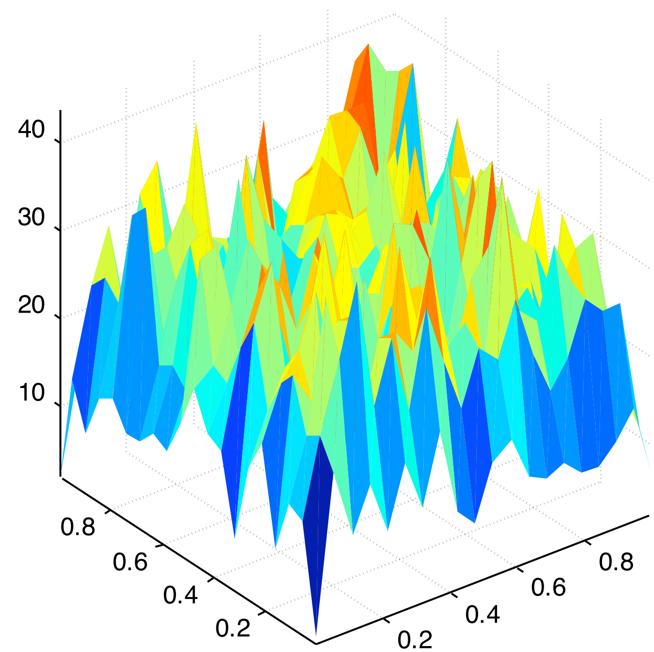


- RV1 from randn
- RV2 from rand
- For the joint distribution of RV1 and RV2, rv1-z section shows normal distribution while rv2-z section shows uniform distribution.

Independent Variables

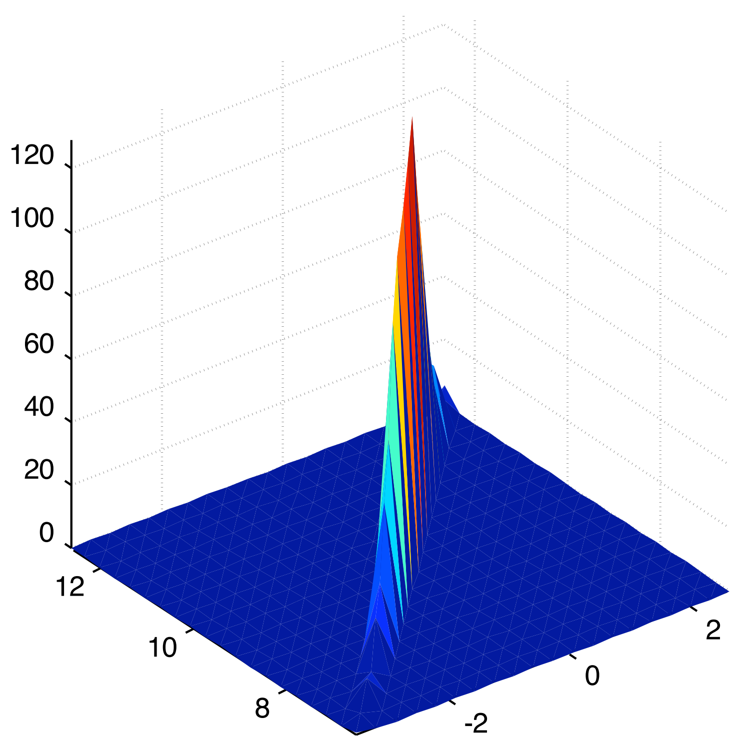
hist2d([randn(1,10000);rand(1,10000)])

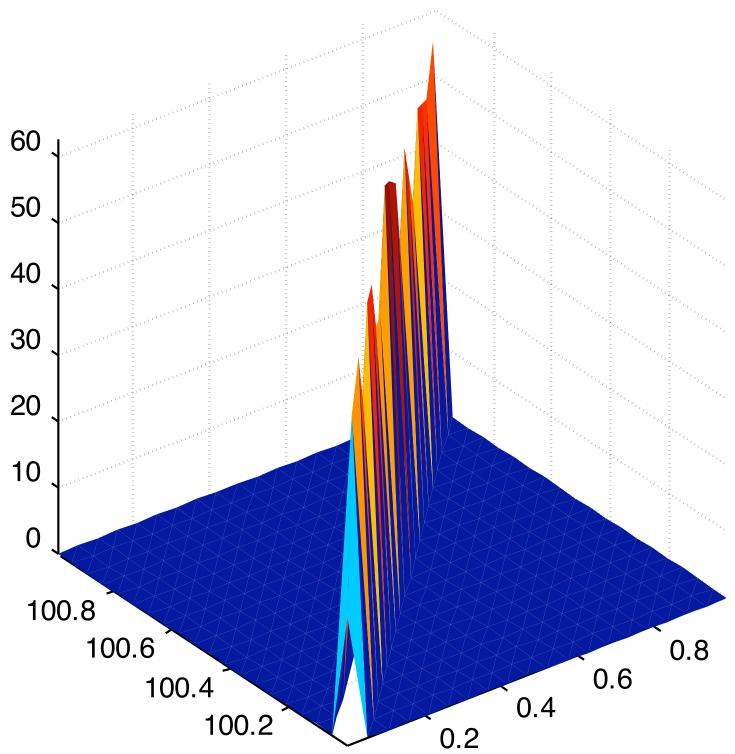




hist2d([rand(1,10000);rand(1,10000)])

Dependent Variables





- a=randn(1000,1)
- x=[a,a+10]
- hist2d(x)

- b=rand(1000,1)
- y=[b,b+100]
- hist2d(y)