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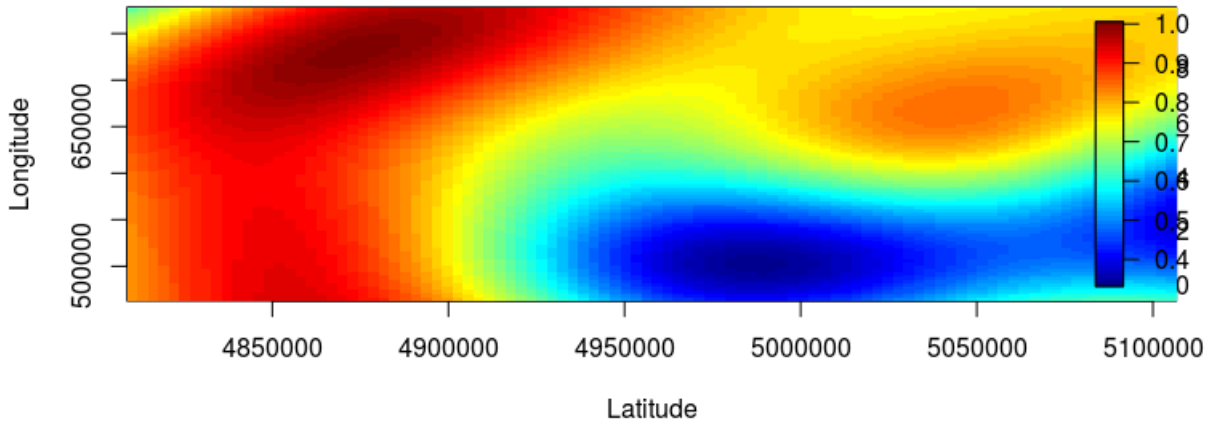
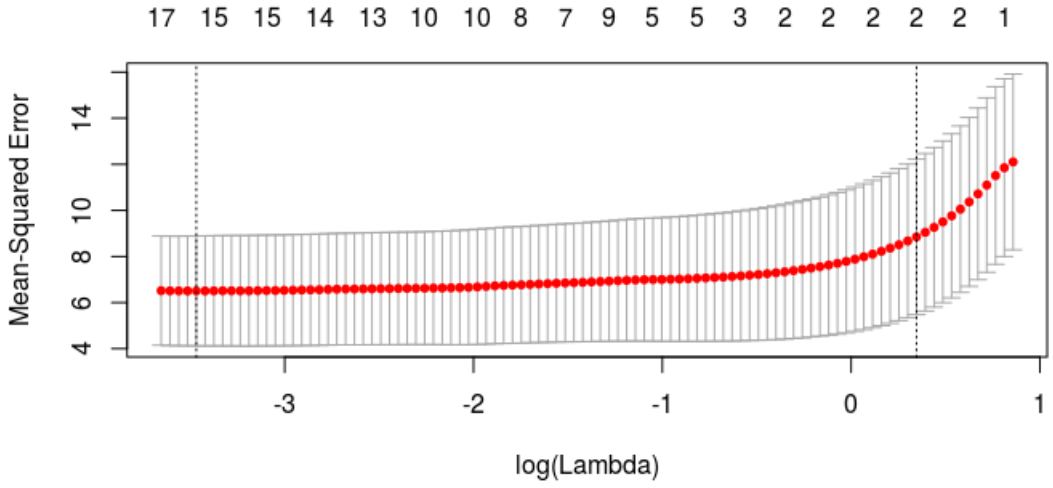
CS 498: Applied Machine Learning
Homework 7 Report

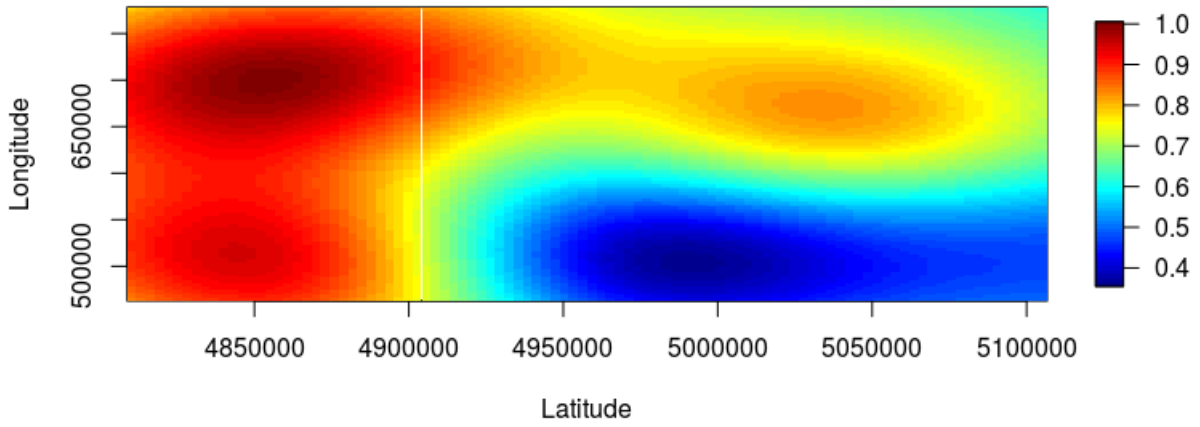
Problem 1 (Regression):
Scale values: `65000 100000 135000 170000 205000 240000`
Best Scale: `100000`
MSE: `6.431392`
Heat Map:



Problem 2 (Lasso):
Scale values: `65000 100000 135000 170000 205000 240000`
Best Lambda: `0.03117453`
Number of Predictors: `14`
MSE: `6.504469`
Plot of MSE by lambda value:



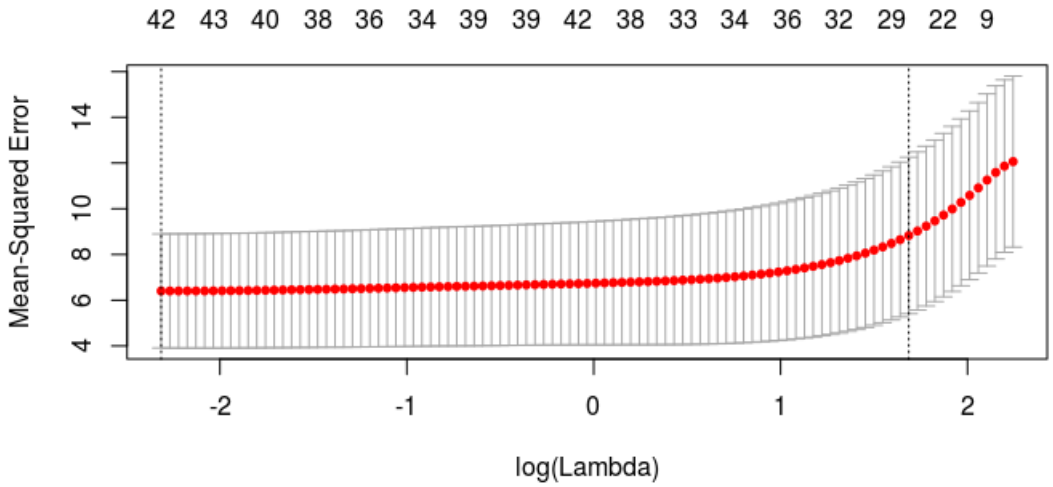
Heat Map:



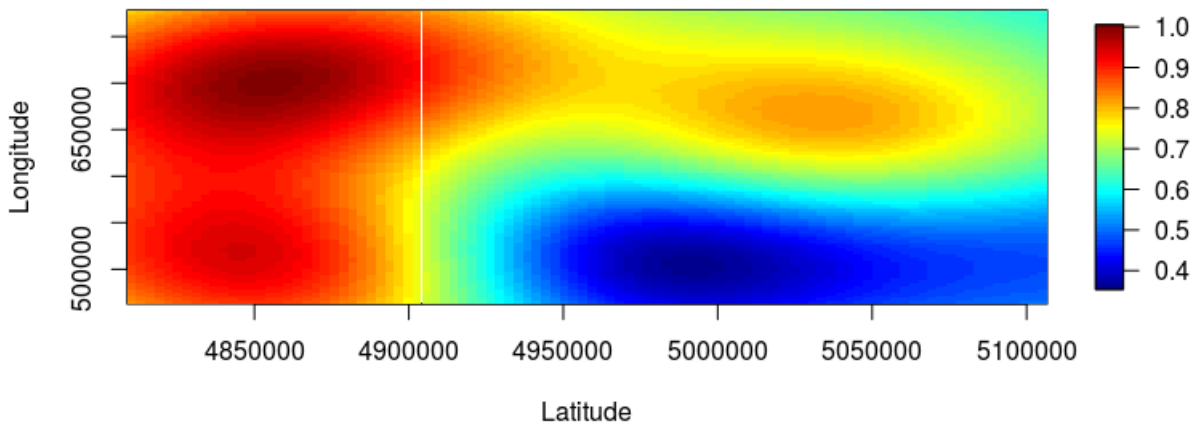
It appears as though the prediction error goes down the more predictors that are used (seen from the MSE and lambdas plot). As the number of predictors increase (going to lower values of lambda), the prediction error seems to decrease.

Problem 3 (Elastic Net):

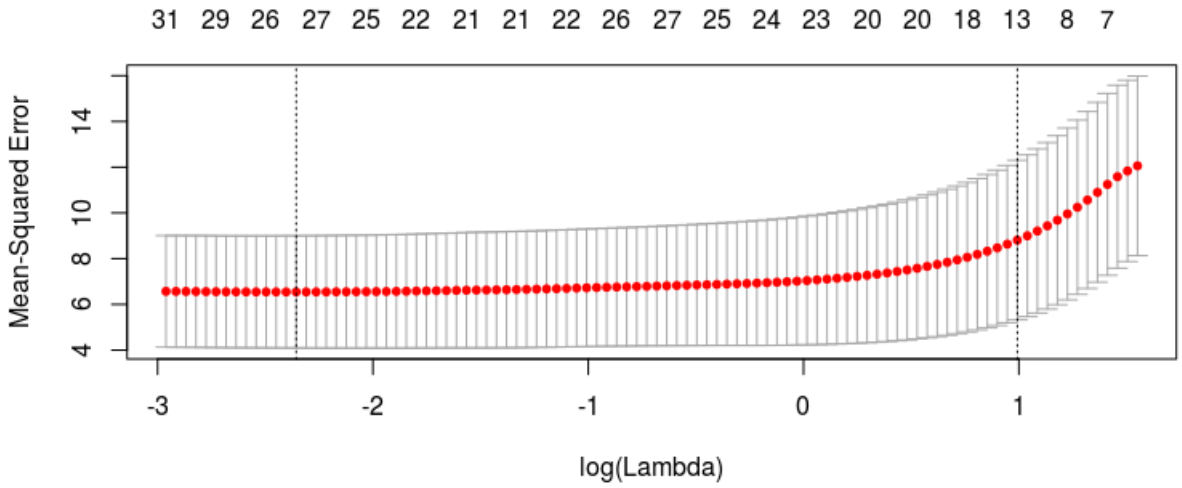
Scale values: `65000 100000 135000 170000 205000 240000`
Best Lambda: `0.09882114`
Alpha: `0.25`
Number of Predictors: `42`
MSE: `6.40573`
Plot of MSE by lambda value:



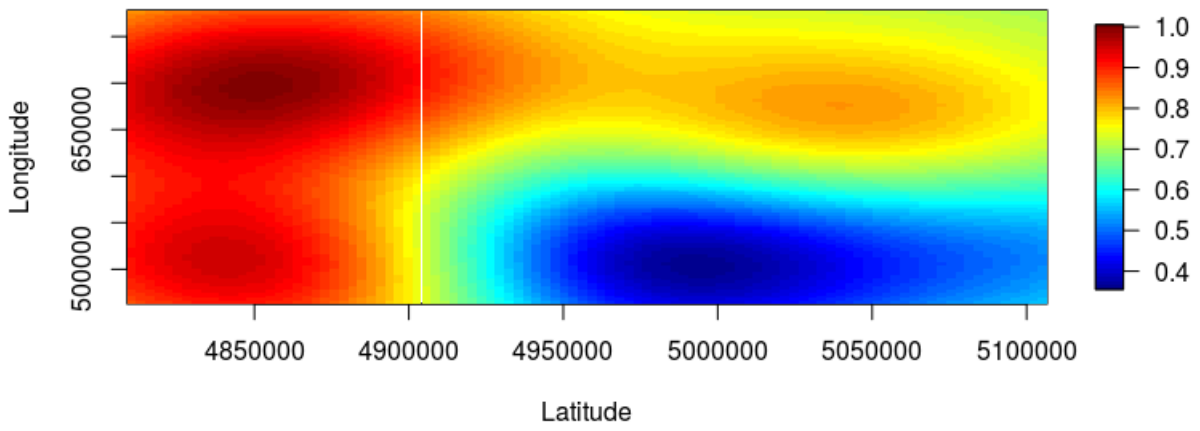
Heat Map:



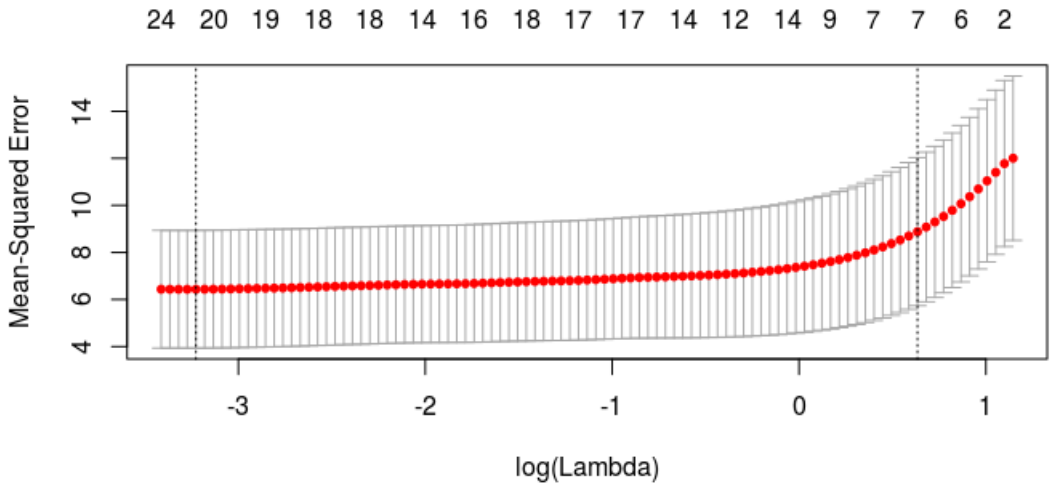
Scale values: `65000 100000 135000 170000 205000 240000`
Best Lambda: `0.09476504`
Alpha: `0.5`
Number of Predictors: 27
MSE: `6.54443`
Plot of MSE by lambda value:



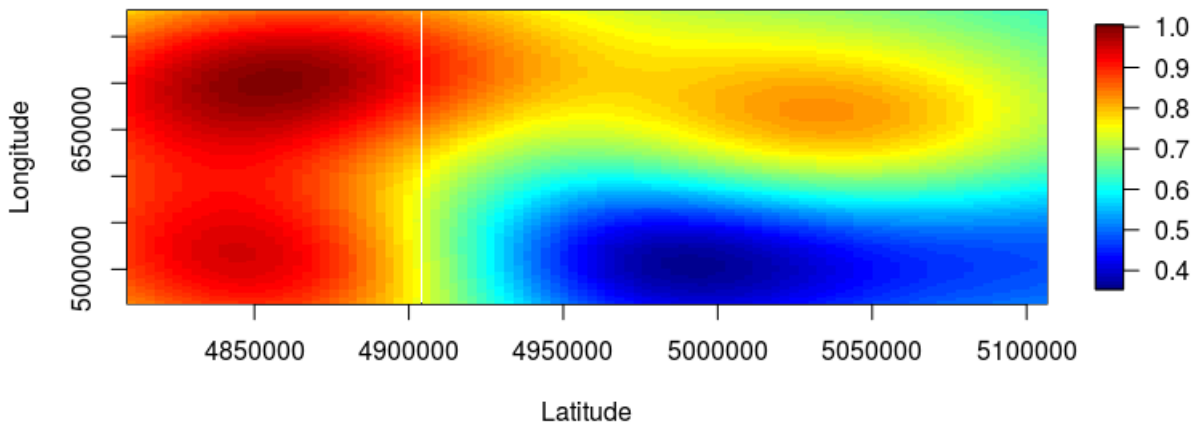
Heat Map:



Scale values: `65000 100000 135000 170000 205000 240000`
Best Lambda: `0.03967681`
Alpha: `0.75`
Number of Predictors: 20
MSE: `6.435446`
Plot of MSE by lambda value:



Heat Map:



It appears that an alpha value of .25 produces the best model as this model produces the lowest cross-validated mean squared error. The choice of alpha changes the model but does not significantly change the images or the mean squared errors.