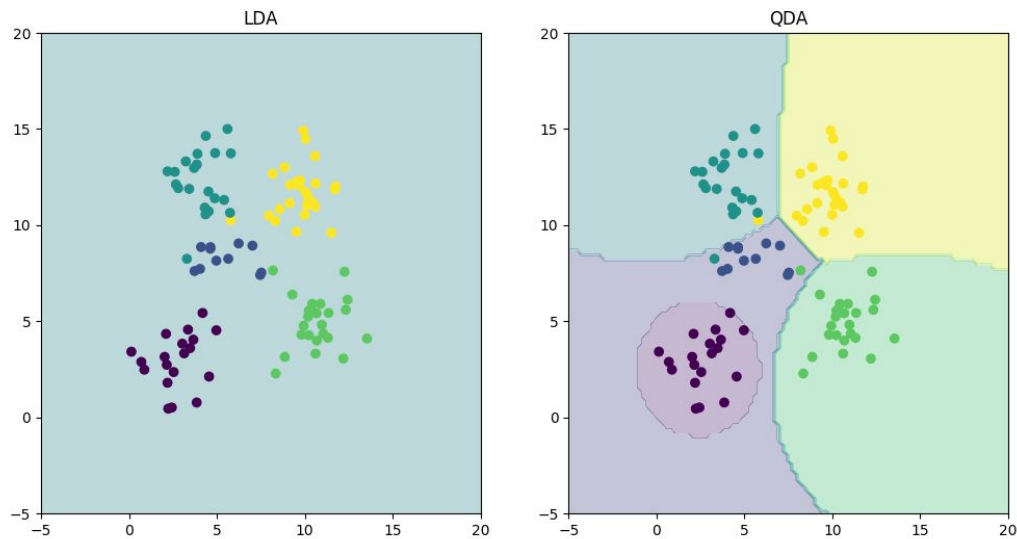


CSE 474 Programming Assignment 2

Report 1:



LDA Accuracy = 0.94

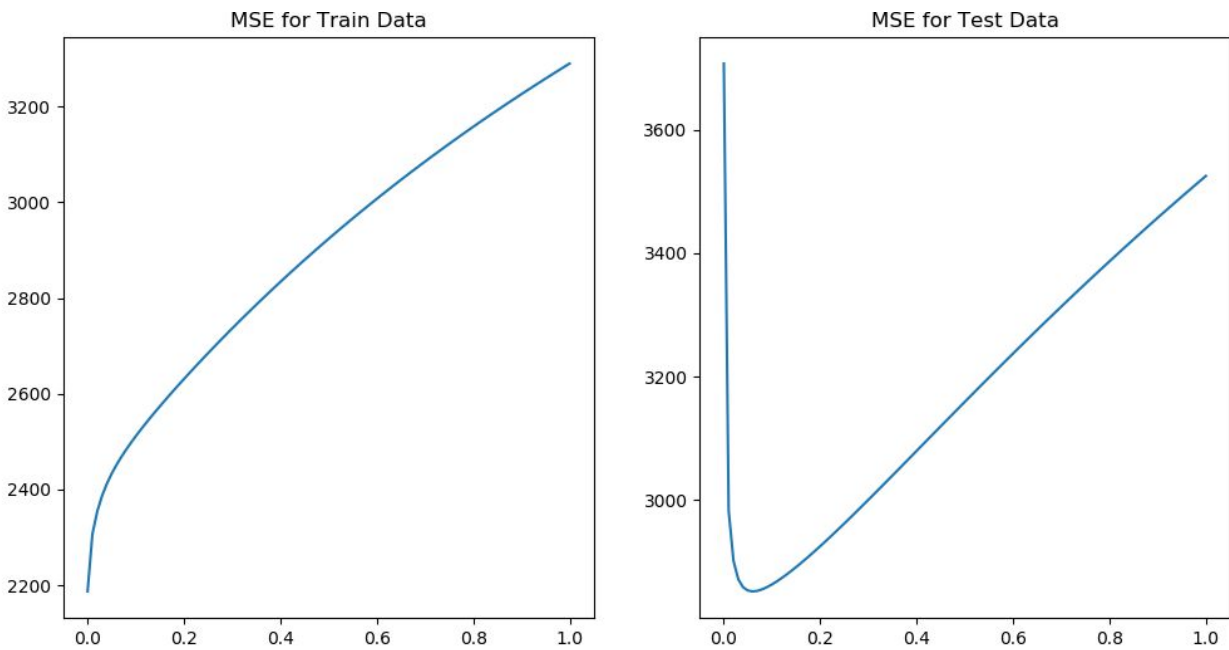
QDA Accuracy = 0.97

The LDA Accuracy was 0.94 and the QDA Accuracy was 0.97. The classification graphically for QDA was more accurate than LDA because QDA can use curved lines as boundaries between the points, but LDA can only use lines and therefore cannot classify the points correctly.

Report 2:

The Mean Squared Error or MSE represents how well a line fits a body of data. The MSE for the equation without the intercept is 106775, while the MSE for the equation with the intercept is 3707. The MSE with the intercept is lower, so the equation with the intercept is more accurate

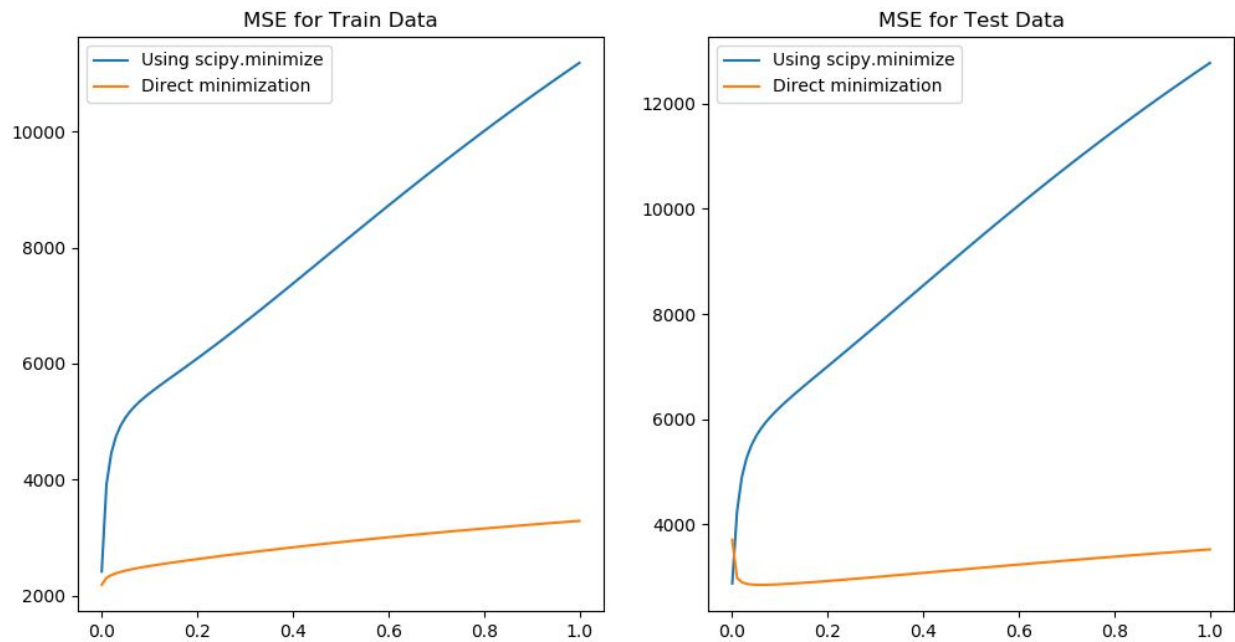
Report 3:



The error on the training data starts out lower than both MSE with and without intercept. and as λ increases from 0 to 1, the error stays lower than both.

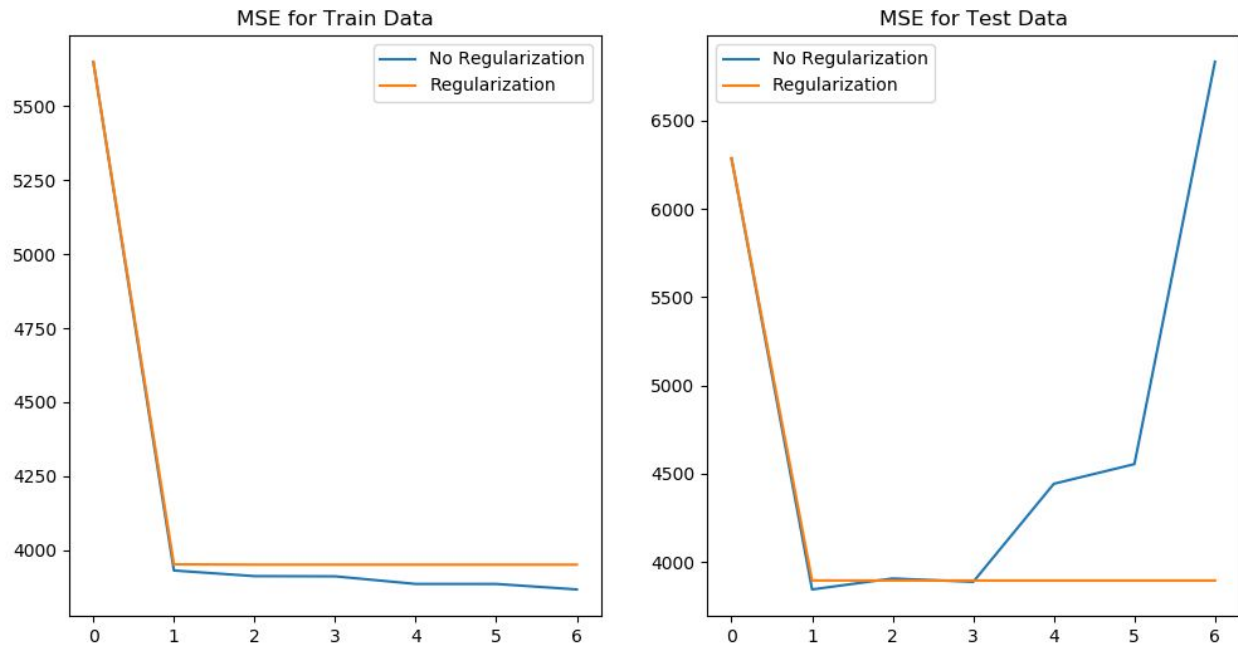
While the test data is less accurate than the MSE without intercept, it only becomes more and more accurate until $\lambda = 0.06$. After that, it gradually loses accuracy. The optimal value for λ is 0.06, since it has the lowest MSE on the test data.

Report 4:



Direct minimization is significantly more accurate in both cases. When measuring MSE for the training data, using `scipy.minimize` hit 5000 almost right off the bat, and then linearly trended upwards. Direct minimization on the other hand, seems to stay low and taper at the 3000 range. In regards to the test data, using `scipy.minimize` immediately skyrockets the MSE to the 6000 range, while Direct minimization's MSE even decreases for a bit in the beginning before settling around the 3000 range.

Report 5:



The regularization we used for optimal accuracy was $\lambda = 0.06$.

For the training data, no regularization proved to be more accurate than regularization. While both methods yielded identical accuracies in the beginning, when p hit 1, no regularization's MSE decreased to below 4000 whereas regularization's accuracy stayed the same with an MSE of about 4000.

For the test data, regularization was more accurate than no regularization. Just like the training data, both methods showed identical accuracies in the beginning. However, when p hit 1 this time, no regularization's MSE began soaring until it peaked at 7000 when $p = 6$. Meanwhile, the Training Data's MSE remained consistent in the 4000 range.

Report 6:

After completing the assignment, we have determined the following to be the optimal parameters. According to the accuracy difference in classification between LDA and QDA, we have seen that QDA is most accurate. In terms of regularization, a lambda value set to .06 proved to be more accurate than no regularization or regularization with a different parameter. In terms of minimization, direct minimization came out as the unquestionable winner against `scipy.minimize`.