ECE532 - Final Project Update 1

Mike Hagenow, mhagenow@wisc.edu

November 17, 2020

1 Update and Revised Timeline

Since the project proposal, I have implemented the first and second classifiers: regularized least-squares and linear support vector machines. I have also developed code to preprocess the fault dataset and properly arrange the data to be consumed by numpy in Python. Finally, I have implemented a class of scripts that performs 'one' vs 'all' testing for a given dataset. This includes functionality to downsample the training data sets to make the training have approximately equal samples in each class and functionality that scores for the multiclassification and determines the overall accuracy. I have run a series of preliminary tests on the 'faults' dataset. Even the basic linear classifier (LSQ) appears to perform reasonably well at binary classification between two fault classes, however, I believe the multiclassification code still needs some tuning and further bug-testing as part of the upcoming evaluation milestone (currently returning 48 percent accuracy).

As part of the classifier implementation stage which is occurring currently, I have also designed some unit tests that I can use to validate the least squares and SVM methods. This has been particularly helpful when adjusting SVM parameters such as exit tolerance, maximum number of iterations, and step size. An example result is shown in Figure 1.

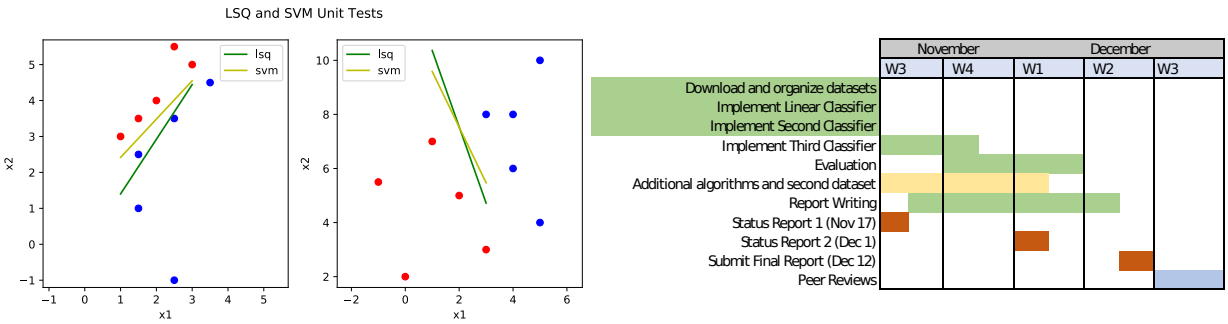

Figure 1: Example results from unit testing and updated Gantt chart

As far as general project progress, the project is still largely on track. The main tasks in the short term are to continue different preprocessing and early evaluation of the faults dataset, finish implementing a high-level cross validation routine that interfaces with the 'one' vs 'all' routines, and to implement the neural network approach. I would also like to implement a gradient descent version of the least squares to allow for a more direct comparison to the numerical approach used in the SVM (as opposed to the analytical closed form solution). Finally, I would also like to run a comparison of the current multi-class downsampling (which is done by randomly selecting a subset of the 'all' class) versus both unequal class samples and a weighted approach (e.g., weighted least squares).

The gantt chart has been updated to reflect the remaining project time, however, none of the milestones have been shifted at this time. The gantt chart is also shown in Figure 1. All of the relevant work related to this final project is being updated in the following github: Repository.