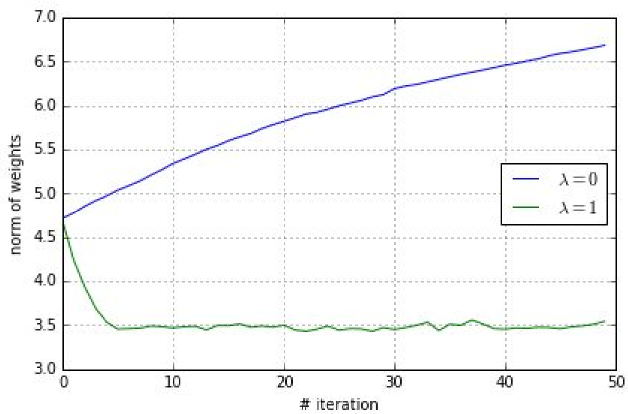
6.867 Homework 2

Logistic Regression

1.1 Unregularized Logistic Regression

We started by implementing logistic regression with stochastic gradient descent and plotting the norm of the weight vector over time for both the unregularized (λ = 0) and L2 regularized (λ=1) objective.



As shown in the above plot, the unregularized weight vector keeps growing while the regularized weight vector converges. This can be explained by the fact that their is no penalty for large weights in the unregularized case, allowing them to grow indefinitely.

Weight vectors with larger magnitudes will drive the predictions towards 1.0 and 0.0 for positive and negative samples respectively, resulting in a more confident predictor which maximizes the objective function.

Note, however, that a more confident predictor is not necessarily better; in fact, in many cases such as medical applications, a model that is both confident and incorrect on some inputs is worse than a model that is uncertain.

1.2 Hyperparameters for Logistic Regression

1.3 Model Selection with Validation Error

Support Vector Machine

Pegasos

MNIST

INITIAL DRAFT

Evaluate the effect of the choice of regularizer (L1 vs L2) and the value of λ on (a) the weights, (b) the decision boundary and (c) the classification error rate in each of the training data sets.

- Plot norm of weights, decision boundaries, and error rate for various λ values for each regularizer.

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Use the training and validation sets to pick the best regularizer and value of λ for each data set: data1, data2, data3, data4. Report the performance on the test sets.

- Plot λ vs validation error for each regularizer and data set.

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	L, λ	Train	Validation	Test
Data1				
Data2				
Data3				
Data4				

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