Technische Universität Berlin

Problem Set 4: Support Vector Machines

Report Machine Learning Lab Course
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Part 1: Implementation

In this part, the pseudocode of the SMO from the handbook and the class *svm_qp* that solves the SVM dual optimization problem as a quadratic programming problem were implemented. Furthermore, a function to plot the SVM 2D was also implemented.

Assignment 1: SMO

The SVM SMO should be implemented in this assignment. The implementation was pretty straight forward and the pseudocode in the handbook was really helpful to implement the SMO. All of the tests provided for this assignment were passed. Figure shows the 2D plot of the SVM SMO applied to the test data.
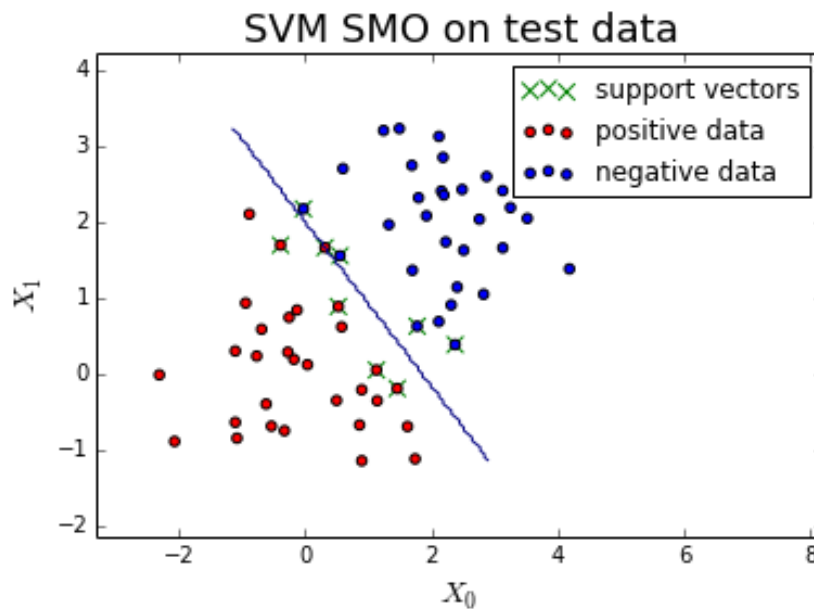

Figure 1: SVM SMO applied to the test data

Assignment 2: Plot SVM 2D

This function was implemented to plot the 2D data points and its corresponding support vectors. In addition, the separating hyperplane is also plotted. The positive data points are drawn as red circles whereas the negative data points are drawn as blue circles. The support vectors on the other hand are drawn as green crosses.

Assignment 3: SVM QP

In this assignment, the SVM dual optimization problem should be solved as a quadratic programming problem. The method *cvxopt.solvers.qp* from the package *cvxopt* was used to solve the QP problem. It is pretty straight forward to implement this method. We only have to figure out how to put the SVM dual optimization problem in the form of QP problem. Figure 2 shows the 2D plot of the SVM QP applied to the test data.
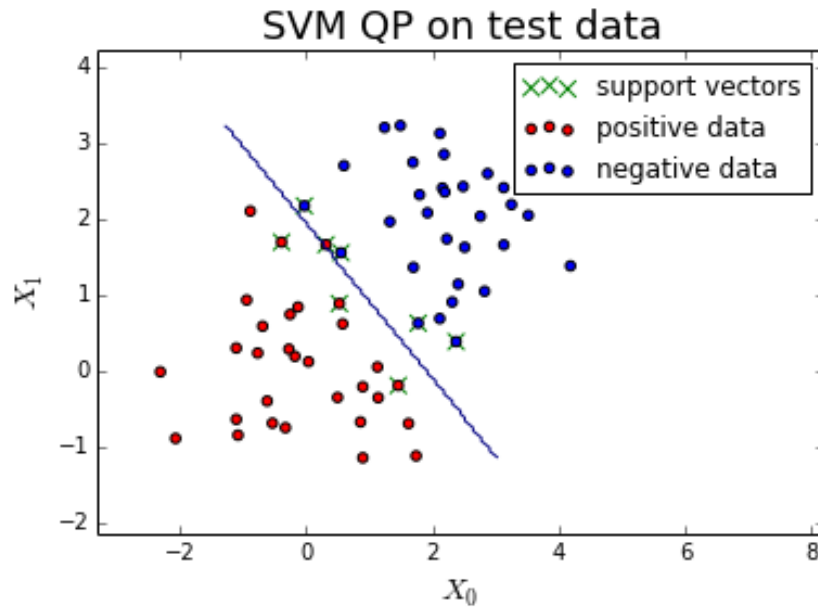
Figure 2: SVM QP applied to the test data

Part 2: Application

In this part, the SVM SMO implementation should be applied to the *Easy_2D* and *UCI Iris* datasets. In addition to that, the running time of the *svm_qp* implementation should be compared to the properly implemented SMO routine *svm_sklearn*.

Assignment 4: Easy_2D Dataset

Assignment 5: Sklearn

Assignment 6: UCI Iris Dataset