**CSE 512-HW2: Machine Learning Report and README**

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# 1 Programming

## 1.1 Results

The dataset was split into 80-20. 80 points was used to train the svm model and the model was tested on the remaining 20 points.

| Total number of points tested | Miss-classified points |
|---|---|
| 20 | 0 |

## 1.2 Observations and Plot

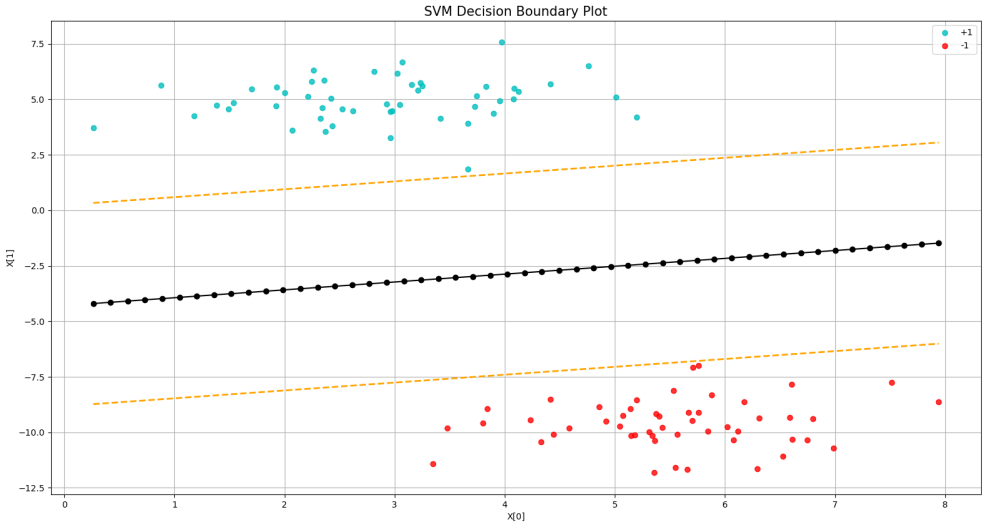


Figure 1: SVM Decision Boundary Plot

The best results was obtained when i used $\lambda = 0.3$ and the learning rate was set to $\eta = \frac{1}{t}$.

Also I have used the **most recent weight vector** as my final weights instead of using the average value. On each iteration a **single random sample** is picked from the training set and the weights are updated.

There was a good increase in width of the decision boundary when i trained the model using alternative values of $y$. That is on the first iteration if i randomly sample a point which has $y = 1$ then on the second iteration i train the model using a random sample which has the label $y = -1$.

Further i noticed that if i decrease the number of iteration, then we have to increase the value of $\lambda$

The above figure 1 shows a decision boundary for,

- T = 1000. T = number of iterations
- $\eta = \frac{1}{t}$ where t = iteration
- $\lambda = 0.3$

# 2 README

## 2.1 SVM-Stochastic Gradient Descent

To run the svm code execute,

**python svm.py**