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|  | | CSE 6363: MACHINE LEARNING ASSIGNMENT - 2 | | | | |  | |
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1. The Negative $\eta$ Case
   1. Task 1:

To deal with mercer’s theorem violation case , a new compute\_objective() function has been introduced and by evaluating the objective function at each end of the line segment positive progress can be made. From eq.19 of the SMO paper the objective function has been calculated.

* 1. Task 2:

Given, if more than one training example has the same input vector then the kernel matrix is not positive semidefinite.

Consider 2 input vectors

x1 = [1, 0]

x2 = [0, 1]

a custom kernel function K(x, y) is defined as follows:

K(x, y) = x^T \* y – 2

Kernel matrix

K = [ -1 -2 ]

[ -2 -1 ]

Eigen values will be, λ1 = -3.73 and λ2 = 1.73, since it has a negative eigen value it is not positive semi definite.

1. Non-Linear SVM:

The code from smo has been adapted for non-linear svm and this has been tested on make\_circles dataset with 10% test data. This has been compared to the sklearn svm model and the accuracies have been calculated. the output has also been plotted.

1. Multiclass SVM:

The non-linear SVM code has been modified to add multi class to it following a one-vs-all approach. This results have been compared to that of sklearn SVM. Though the custom model didn’t give a similar accuracy it has performed a bit similarly.