Problem Set 4

Oct. 14, 2021

1. Write down the primal form of linear SVM for cases when the samples are not linearly separable, write down the Lagrangian of the problem, and derive the dual problem. Derive $|\boldsymbol{w}_0|^2$ at the solution, and show that $\alpha_i = C$ for samples that are not correctly classified.

2. Consider a Support Vector Machine and the following training data from two categories:

category	x_1	x_2
ω_1	1	1
ω_1	2	2
ω_1	2	0
ω_2	0	0
ω_2	1	0
ω_2	0	1

   (1) Plot these six training points, and construct by inspection the weight vector for the optimal hyperplane, and the optimal margin. Point out the support vectors on the plot.

   (2) Construct the solution in the dual space by finding the Lagrange undetermined multipliers α_i. Compare the result to your results in part (1).

Due date: Oct. 20 (Wednesday) 23:00 Beijing time