

Homework: SVM

1. (individual task)

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Homework SVM1: SVM1a, SVM1b

Solve the SVM problem for following: Find W and b .

X1: (1, 1), $y = +1$
X2: (-1, 1), $y = +1$
X3: (0, -1), $y = -1$

X1: (1, 1, +1)
X2: (-1, 1, +1)
X3: (0, -1, -1)
X4: (0, -2, -1)

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2. Programming task, sklearn or any other library is allowed. (Group task)

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Homework SVM2:

Generate 200 data points in 2 dimension, each class has 100.
Make the 2 classes close enough so that they are non-separable.
Run SVM solver on the data. Set $C=0.01$ or 0.1
Find out the data points where $\alpha_i = 0$ or $\alpha_i = C$.
Find data point with $\text{ksi}_i > 0$.

Plot the lines $f(x)=1, 0, -1$. adding red circles to the data where $\alpha_i = 0$. Adding squares to data point where $\alpha_i = C$.

Explain what $\text{ksi}_i > 0$ data points are ?

See example in SVM slides.

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3. (individual task)

Homework SVM3:
Derive the dual problem from the prime problem, using quadratic penalty on ξ_i 's.

Derive the dual Lagrangian for the linear SVM with nonseparable data where the objective function is

$$f(\mathbf{w}) = \frac{\|\mathbf{w}\|^2}{2} + C \left(\sum_{i=1}^N \xi_i \right)^2.$$