

MVA "Kernel methods"

Homework 3

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1 2-SVM

The 2-SVM algorithm is a method for supervised binary classification. Given a training set $(x_i, y_i)_{i=1, \dots, n}$ of training patterns x_1, \dots, x_n in a space X endowed with a positive definite kernel K , and a set of corresponding labels $y_1, \dots, y_n \in \{-1, 1\}$, it solves the following problem:

$$\min_{f \in H_K} \left\{ \frac{1}{n} \sum_{i=1}^n L(f(x_i), y_i) + \lambda \|f\|^2 \right\},$$

where $\|f\|$ is the norm of f in the RKHS H_K of the kernel K , and L is the *square hinge loss function*:

$$L(u, y) = \max(1 - uy, 0)^2.$$

Write the primal and dual problems associated to the 2-SVM, and compare the result with the SVM studied in the course.