

Project N. 4

Given the dataset **dataset4.mat**, where X is the matrix whose rows contain the points to be classified and y is the array of the corresponding class labels, perform a **spherical separation**, aimed at separating the set \mathcal{A} from the set \mathcal{B} , on the basis of the following guidelines:

1. Use the Gaussian kernel with $\sigma = 1$.
2. Choose the sets \mathcal{A} and \mathcal{B} at your convenience, between the two sets of points (positive with label +1 and negative with label -1).
3. Perform a bilevel 10-fold cross validation, using, for the model selection, a 5-fold cross validation. In fixing the grid of C , consider only the cases such that

$$C \geq \frac{1}{2r},$$

with $r = \min\{m, k\}$, where $m = |\mathcal{A}|$ and $k = |\mathcal{B}|$.

4. Each time, fix the center x_0 of the separating sphere

$$S(x_0, R) \triangleq \{x \in R^n \mid \|x - x_0\|^2 = R^2\}$$

as the barycenter of the set \mathcal{A} .

5. Compute the following performance indexes:

- the average training correctness;
- the average training sensitivity;
- the average training specificity;
- the average training F-score;
- the average testing correctness (accuracy);
- the average testing sensitivity;
- the average testing specificity;
- the average testing F-score.