CP3252 Machine Learning Lab – Week 8

Date: 04.03.25

IMPLEMENTATION AND ANALYSIS OF SVM TASKS

1.Given the binary Classification Problem

$$\text{Class -1: } \begin{bmatrix} 2 & 2 \\ 3 & 3 \\ 4 & 4 \\ 5 & 5 \\ 4 & 6 \\ 3 & 7 \\ 4 & 8 \\ 5 & 9 \\ 6 & 10 \end{bmatrix}, \quad \text{Class +1: } \begin{bmatrix} 6 & 2 \\ 7 & 3 \\ 8 & 4 \\ 9 & 5 \\ 8 & 6 \\ 7 & 7 \\ 7 & 8 \\ 7 & 9 \\ 8 & 10 \end{bmatrix}.$$

a) Sketch and find the mean values and the decision boundary you would get with a Gaussian classifier with covariance matrix $\Sigma=\sigma^2 I$, where I is the identity matrix.

b) What is the error rate of the Gaussian classifier on the training data set?

c) Sketch on the plot the decision boundary you would get using a SVM with linear kernel and a high cost of misclassifying training data. Indicate the support vectors and the decision boundary on the plot.

d) What is the error rate of the linear SVM on the training data set?

e) Change kernel to a RBF (Radial Basis Function) and find the error rate.