DSA 5303
Summer 2018

Homework 6

Please show all relevant work when you upload the assignment.

Chapter 5, Problem 5.

Q5. Given the three points $\mathbf{x}_1 = (2.5, 1)^T$, $\mathbf{x}_2 = (3.5, 4)^T$, and $\mathbf{x}_3 = (2, 2.1)^T$.

(a) Compute the kernel matrix for the Gaussian kernel assuming that $\sigma^2 = 5$.

(b) Compute the distance of the point $\phi(\mathbf{x}_1)$ from the mean in feature space.

(c) Compute the dominant eigenvector and eigenvalue for the kernel matrix from (a).

Chapter 21, Problem 1.

Q1. Consider the dataset in Figure 21.9, which has points from two classes c_1 (triangles) and c_2 (circles). Answer the questions below.

(a) Find the equations for the two hyperplanes h_1 and h_2.

(b) Show all the support vectors for h_1 and h_2.

(c) Which of the two hyperplanes is better at separating the two classes based on the margin computation?

(d) Find the equation of the best separating hyperplane for this dataset, and show the corresponding support vectors. You can do this witout having to solve the Lagrangian by considering the convex hull of each class and the possible hyperplanes at the boundary of the two classes.

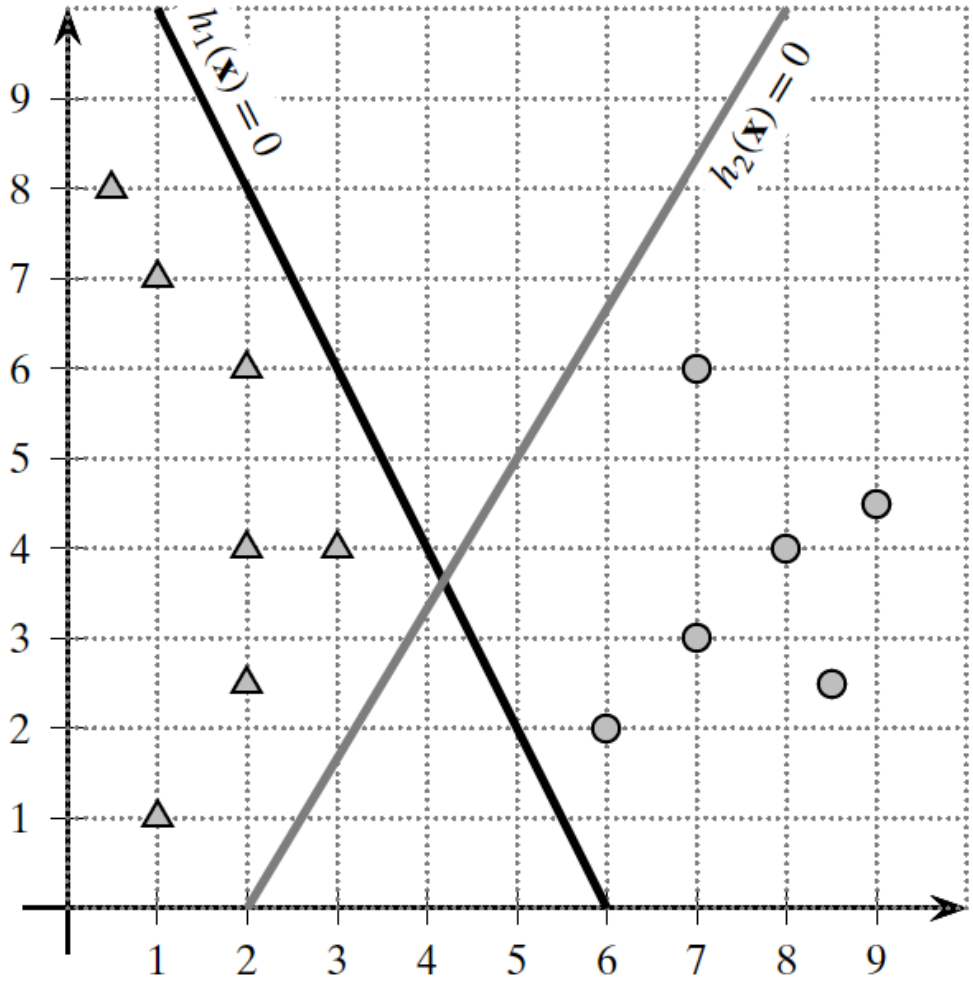

Figure 21.9. Dataset for Q1.