Problem Set 8

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Primal versus Dual Problem

1. [d] a quadratic programming problem with $d+1$ variables

In the primal problem, we aim to minimize $\frac{1}{2}\boldsymbol{w^T w}$ with the constraint $y_n(\boldsymbol{w^T} x_n + b) \geq 1$ for $n = 1, 2, \ldots N$. Because y_n and x_n are given as input data, our variables are $\boldsymbol{w}$ and b. Note that in this scenario, $\boldsymbol{w} = (w_1, w_2, \ldots w_d)$, and $b = w_0$. Thus, we have $d+1$ variables.

Polynomial Kernels

2. [a] 0 versus all
See attached code.

3. [a] 1 versus all
See attached code.

4. [c] 1800
See attached code.

5. [d] Maximum C achieves the lowest E_in
See attached code.

6. [b] When $C = 0.001$, the number of support vectors is lower at $Q = 5$.
See attached code.

Cross Validation

7.

8.

RBF Kernel

9.

10.