ESE 546, FALL 2022

HOMEWORK 1

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Solution 1 (Time spent: 1 hour)**.**

Part (a): The slack variable formulation allows some data points to violate the margin constraint. To minimize these violations while still maximizing the margin, we add a penalty term to the objective function.

One common formulation is:

$$\begin{aligned} \text{minimize} \quad & \frac{1}{2}\|\theta\|^2 + \frac{1}{n}\sum_{i=1}^{n}\xi_i \\ \text{subject to} \quad & y_i(\theta^T x_i + \theta_0) \geq 1 - \xi_i, \quad \forall i = 1, \ldots, n \\ & \xi_i \geq 0, \quad \forall i = 1, \ldots, n \end{aligned}$$

where $\frac{1}{n}\sum_{i=1}^{n}\xi_i$ is a normalized penalty by the number of samples.

Solution 2 (Time spent: 1 hour)**.** Your solution goes here.

Solution 3 (Time spent: 1 hour)**.** Your solution goes here.