CS7641 ML Practice Quiz
Module SL 6: Kernel Methods and SVMs
Created by Kyle Nakamura with the help of ChatGPT

Question 1

Which statements correctly reflect the concepts discussed in the lectures on Support Vector Machines (SVMs) and Kernel Methods?

A. The goal of SVMs is to find a decision boundary that minimizes the distance between the boundary and the data points.

B. In SVMs, the equation of the decision boundary is defined as $w^T x + b = 0$, where w represents the parameters of the plane.

C. The best line for separating two classes is always the one closest to the positive or negative data points.

D. Support vectors are data points that are farthest from the decision boundary and have the least influence on its placement.

E. The kernel function in SVMs is used to transform data into a higher-dimensional space, facilitating linear separability.

Question 2

Regarding the application and properties of SVMs, which of the following are true?

A. Maximizing the margin in SVMs is equivalent to maximizing the equation $\frac{2}{||w||}$.

B. In SVMs, the optimal decision boundary is found by minimizing $\frac{1}{2} \times ||w||^2$.

C. Support vectors in SVMs are usually a small subset of the data points that define the maximum margin separator.

D. The kernel trick in SVMs only applies to polynomial and radial basis functions.

E. The Mercer Condition is not a significant consideration when choosing kernel functions in SVMs.

Question 3

Concerning the concept of boosting in relation to SVMs, which statements are correct?

A. Boosting focuses on misclassified examples by decreasing their importance in each iteration.

B. In boosting, the final output is a simple average of weak hypotheses.

C. Boosting increases the margin between positive and negative examples, helping to minimize overfitting.

D. Boosting tends to overfit when the weak learner is an artificial neural network with many layers and nodes.

E. The effectiveness of boosting is independent of the length of training time.

Question 4

What are the key aspects and implications of kernel methods in SVMs?
A. Kernel methods can only represent similarity between vectors in a geometric sense.
B. The use of a kernel function is restricted to cases where the data is already linearly separable.
C. Kernel functions in SVMs allow for the incorporation of domain knowledge without computing points in a higher-dimensional space.
D. The squared dot product is the only kernel function used in SVMs.
E. Different types of kernels, like polynomial and radial basis kernels, are used in SVMs to capture domain knowledge and measure similarity.

Question 5

Regarding the theoretical aspects and implications of SVMs, which of the following statements are accurate?
A. The concept of margins in SVMs is unrelated to generalization and overfitting.
B. SVMs always require a large number of support vectors to define the maximum margin separator.
C. SVMs are connected to instance-based learning and ensemble methods through the concept of margins.
D. The optimization problem in SVMs is formulated as a quadratic program to find the maximum margin separator.
E. In SVMs, the dot product in the kernel trick is irrelevant to the concept of similarity between data points.

Answer Key

1. B, E
2. A, B, C
3. C, D
4. C, E
5. C, D