Consider a two class classification problem in 2-dimension with 6 data points.

$$\mathcal{D} = \{([0,0]^T, -), ([1,0]^T, -), ([0,1]^T, -), ([1,1], +), ([2,2]^T, +), ([2,0]^T, +)\}$$

We construct a hard margin SVM solution for this problem. The decision boundary is:

(A) **[Ans]** $2x_1 + 2x_2 = 3$

(B) $-2x_1 - 2x_2 = 3$

(C) $2x_1 + 2x_2 = -3$

(D) **[Ans]** $-2x_1 - 2x_2 = -3$

(E) None of the above.

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$$\mathcal{D} = \{([0,0]^T, -), ([1,0]^T, -), ([0,1]^T, -), ([1,1], +), ([2,2]^T, +), ([2,0]^T, +)\}$$

We construct a hard margin SVM solution for this problem. The following is a support vector:

(A) $[0,0]^T$

(B) **[Ans]** $[1,1]^T$

(C) $[2,2]^T$

(D) $[\frac{3}{2},0]^T$

(E) $[0,2]^T$

Consider a two class classification problem in 2-dimension with 6 data points.

$$\mathcal{D} = \{([0,0]^T, -), ([1,0]^T, -), ([0,1]^T, -), ([1,1], +), ([2,2]^T, +), ([2,0]^T, +)\}$$

We construct a hard margin SVM solution for this problem.

(A) If we remove any one of the support vectors from the training data and retrain the SVM, we will get a different solution.

(B) **[Ans]** For this problem, there exists at least one sample, removal of it will lead to a different solution for the SVM.

(C) There exists at least one non-support vector in $\mathcal{D}$, such that removal of it from the training data lead to a different solution.

(D) Given that the problem is in 2D, and binary classification, addition of a new support vector sample will make one of the existing support vectors as non-support vector.

(E) None of the above.

Consider a two class classification problem in 2-dimension with 6 data points.

$$\mathcal{D} = \{([0,0]^T, -), ([1,0]^T, -), ([0,1]^T, -), ([1,1], +), ([2,2]^T, +), ([2,0]^T, +)\}$$

We construct a hard margin SVM solution for this problem.

(A) If we remove $[0,0]^T$ from $\mathcal{D}$, the margin increase.

(B) If we remove $[0,1]^T$ from $\mathcal{D}$, the margin increases.

(C) **[Ans]** If we remove $[1,0]^T$ from $\mathcal{D}$, the margin increases.

(D) **[Ans]** If we remove $[1,1]^T$ from $\mathcal{D}$, the margin increases.

(E) If we remove $[2,2]^T$ from $\mathcal{D}$, the margin increases.

Consider a two class classification problem in 2-dimension with 6 data points.

$$\mathcal{D} = \{([0,0]^T, -), ([1,0]^T, -), ([0,1]^T, -), ([1,1], +), ([2,2]^T, +), ([2,0]^T, +)\}$$

We construct a hard margin SVM solution for this problem.

(A) **[Ans]** Addition of $([0,2]^T, +)$ will change the support vector set, but not the margin.

(B) **[Ans]** Addition of $([0, \frac{3}{2}]^T, +)$ will change the support vector set, and the margin.

(C) Addition of no sample can increase the margin.

(D) **[Ans]** Addition of $([1,2]^T, +)$ does not change the support vector set and the margin.

(E) Addition of $([0, \frac{3}{2}]^T, +)$ will change the support vector set, but the number of support vectors will not change.