

6406531166202. ✔ Both gmail.com and amazon.in are examples of SPA.

Question Number : 161 Question Id : 640653351379 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Select Question

Which of the following statement(s) is/are false regarding token based authentication?

Options :

6406531166203. ✖ The token generated generally expires after a certain time period, and this time period can also be customized according to the application requirements.

6406531166204. ✔ The client must send the token with the first request to authenticate, and need not send the token in the subsequent requests.

6406531166205. ✖ The fetch calls to a flask API will fail due to the CORS error by default.

6406531166206. ✔ If using flask-security for achieving token based authentication, all the API endpoints are protected by default.

MLT

Section Id :	64065322140
Section Number :	10
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	19
Number of Questions to be attempted :	19
Section Marks :	50
Display Number Panel :	Yes
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes

Maximum Instruction Time : 0
Sub-Section Number : 1
Sub-Section Id : 64065350415
Question Shuffling Allowed : No

Question Number : 162 Question Id : 640653351387 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT " MACHINE LEARNING TECHNIQUES"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

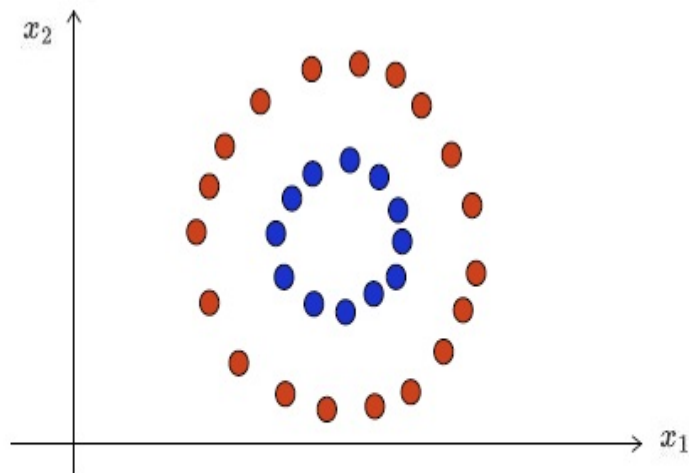
- Options :
- 6406531166235. ✓ Yes
 - 6406531166236. ✗ No

Sub-Section Number : 2
Sub-Section Id : 64065350416
Question Shuffling Allowed : Yes

Question Number : 163 Question Id : 640653351388 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0
Correct Marks : 2

Question Label : Multiple Choice Question

Consider the following dataset in 2D space for a binary classification problem. The red and blue points belong to two different classes:



Each data-point is of the form (x_1, x_2) . A logistic regression classifier with weight vector \mathbf{w} has been learnt on this data which perfectly separates these two classes. Which of the following could be the feature vector \mathbf{x} that was used?

Hint: The equation of a circle centered at (a, b) and radius r is given by $(x_1 - a)^2 + (x_2 - b)^2 = r^2$

Options :

6406531166237. ✖ $\begin{bmatrix} 1 \\ x_1 \\ x_2 \end{bmatrix}$

6406531166238. ✔ $\begin{bmatrix} 1 \\ x_1 \\ x_2 \\ x_1^2 \\ x_2^2 \end{bmatrix}$

6406531166239. ✖ $\begin{bmatrix} 1 \\ x_1^2 \\ x_2^2 \end{bmatrix}$

6406531166240. ✖ $\begin{bmatrix} x_1 \\ x_2 \\ x_1^2 \\ x_2^2 \end{bmatrix}$

Question Number : 164 Question Id : 640653351390 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

A logistic regression model is being trained on a dataset of size $2n$. The first n data-points belong to class-1 and the rest in class-0. Note that we are talking about the true label here.

$$\begin{aligned}\text{Class-1} &= \{x_1, \dots, x_n\} \\ \text{Class-0} &= \{x_{n+1}, \dots, x_{2n}\}\end{aligned}$$

The probability output by the model at any step in the training process is given by:

$$P(y = 1 \mid x_i) = p_i$$

Which of the following expressions is the loss of the model?

NOTE: We use the binary cross entropy loss for logistic regression. Labels are 1 and 0 for the two classes.

Options :

6406531166245. ✓ $\sum_{i=1}^n -\log p_i + \sum_{i=n+1}^{2n} -\log(1 - p_i)$

6406531166246. ✗ $\sum_{i=1}^{2n} -\log p_i$

6406531166247. ✗ $\sum_{i=1}^{2n} -\log(1 - p_i)$

6406531166248. ✗ $\sum_{i=1}^{2n} -p_i \log p_i$

Question Number : 165 Question Id : 640653351392 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following is the weight update rule for logistic regression using gradient descent if you are given the following information:

- w is a m dimensional vector of weights
- X is a feature matrix of shape $n \times m$
- y is a n dimensional label vector
- α is the learning rate
- σ is the sigmoid function

Options :

6406531166253. ✓ $w := w - \alpha X^T [\sigma(Xw) - y]$

6406531166254. ✗ $w := w + \alpha X^T [\sigma(Xw) - y]$

6406531166255. ✗ $w := w - \alpha X^T [Xw - y]$

6406531166256. ✗ $w := w + \alpha X^T [Xw - y]$

6406531166257. ✗ $w := w - \alpha X [\sigma(Xw) - y]$

6406531166258. ✗ $w := w + \alpha X [Xw - y]$

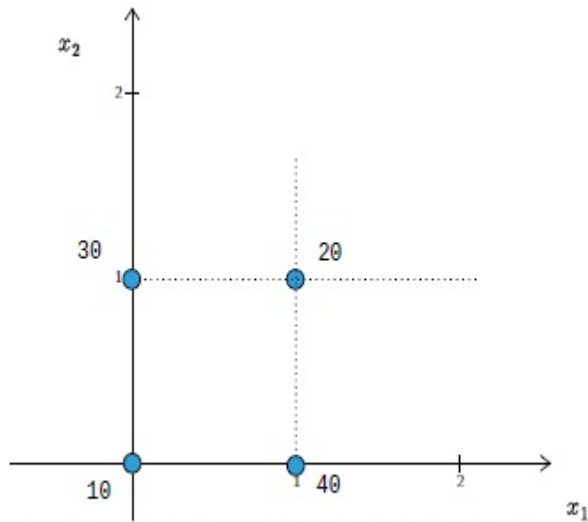
Question Number : 166 Question Id : 640653351394 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

In a binary classification problem, consider the following distribution of data-points from the training data on the unit-square.



For instance, 20 data-points have the feature vector $[1, 1]^T$. The labels for these points is not important now. Which of the following Naive Bayes models would be the best choice for this dataset? Select the most appropriate option.

Options :

6406531166262. ✓ Bernoulli NB

6406531166263. ✗ Categorical NB

6406531166264. ✗ Multinomial NB

6406531166265. ✗ Gaussian NB

Question Number : 167 Question Id : 640653351395 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

$x = [x_1, x_2, x_3]^T$ is a feature vector and y represents the label in a binary classification problem.

Which of the following equations represents the "naive" assumption used in the Naive Bayes algorithm?

Options :

6406531166266. ✗ $P(x, y) = P(y) \cdot P(x | y)$

6406531166267. ✗ $P(x) = P(x_1) \cdot P(x_2) \cdot P(x_3)$

6406531166268. ✗

$$P(y | x) = \frac{P(y) \cdot P(x | y)}{P(x)}$$

6406531166269. ✓ $P(x | y) = P(x_1 | y) \cdot P(x_2 | y) \cdot P(x_3 | y)$

Question Number : 168 Question Id : 640653351409 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

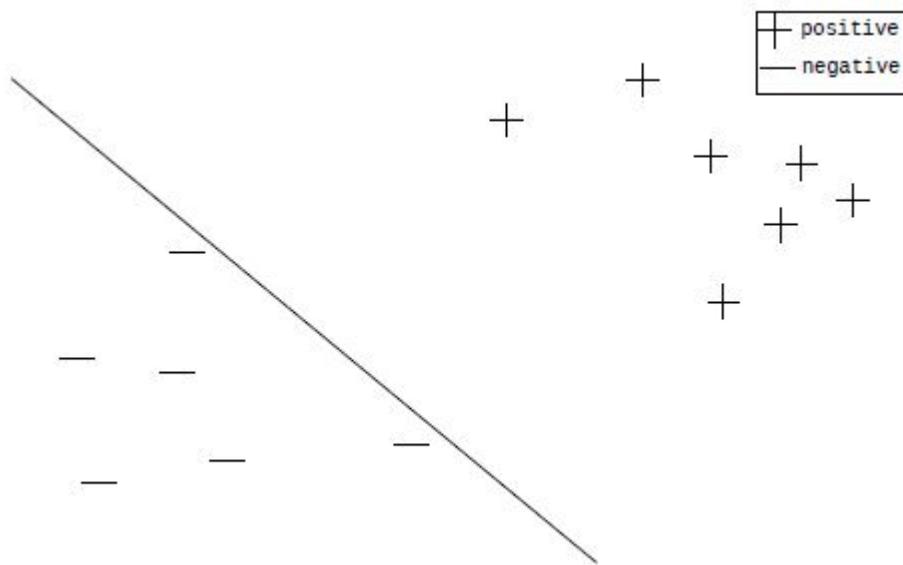
Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following could be the decision boundary learned by a hard-margin SVM? Choose the most appropriate option.

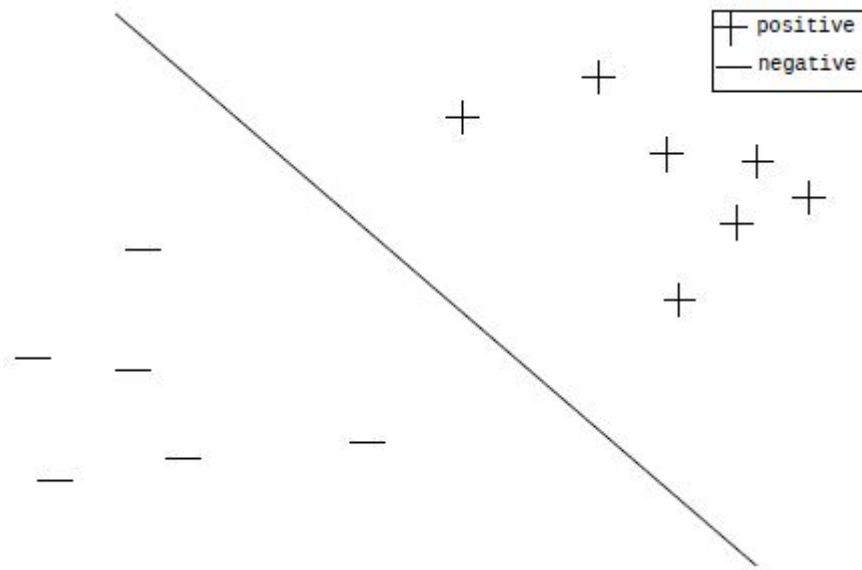
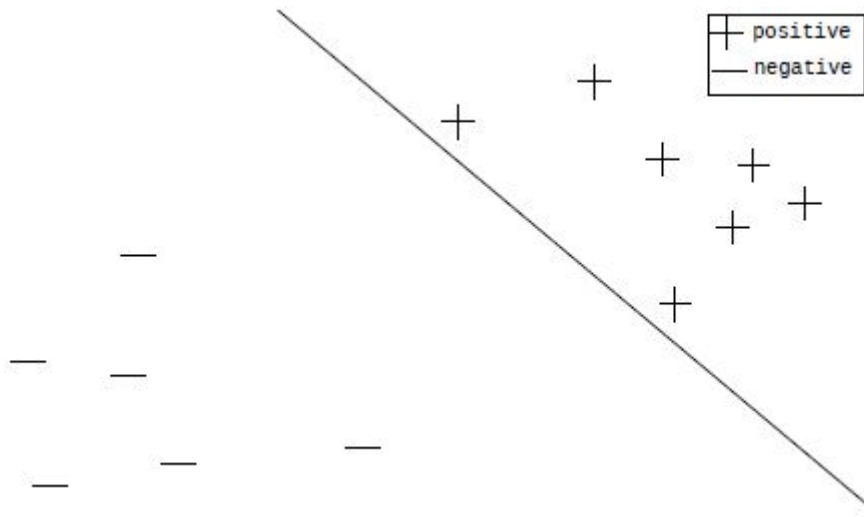
NOTE: The dataset is the same for all four options.

Options :

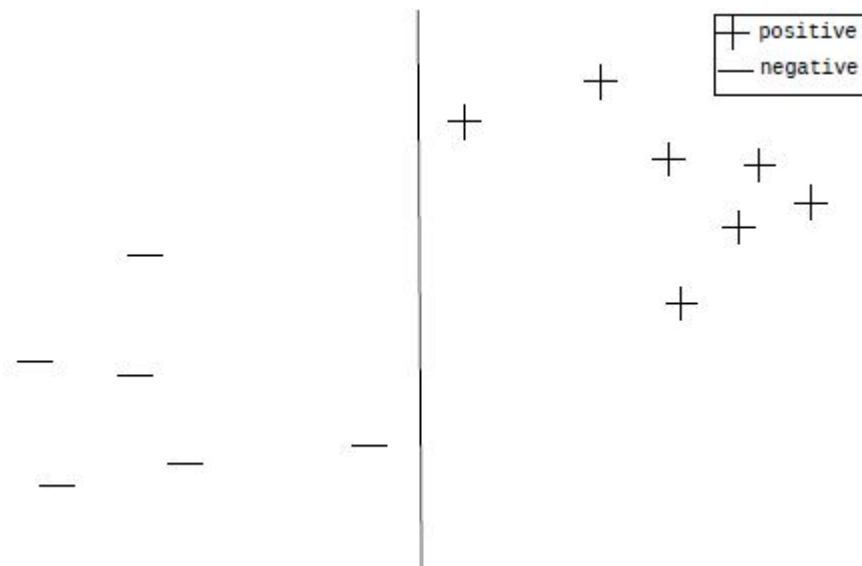


6406531166295. ✖

6406531166296. ✖



6406531166297. ✓



6406531166298. ✗

Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

Given a training dataset $D = \left\{ (x_i, y_i) \right\}_{i=1}^n$, which of the following are the constraints of the optimization problem for a hard-margin SVM, for $1 \leq i \leq n$? w is the weight vector b is the bias of the model. Note that x_i corresponds to the i^{th} feature vector and $y_i \in \{-1, 1\}$.

Options :

6406531166300. ✖ $y_i(w^T x_i + b) = 1$

6406531166301. ✖ $w^T x_i + b = 1$

6406531166302. ✖ $w^T x_i + b \geq 1$

6406531166303. ✔ $y_i(w^T x_i + b) \geq 1$

Sub-Section Number : 3

Sub-Section Id : 64065350417

Question Shuffling Allowed : Yes

Question Number : 170 Question Id : 640653351391 Question Type : MSQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Correct Marks : 2

Question Label : Multiple Select Question

A logistic regression model has been trained on a dataset in a binary classification setup. It is now tested on two separate datasets, each having 14 data-points, 7 from each class. The binary cross-entropy loss of the **same model** on the two test-datasets is L_1 and L_2 . It is also given that the classification accuracy of the model on both these test-datasets is 100%. Now consider the images of the two test datasets along with the decision boundary of the model:

Image for L_1 :

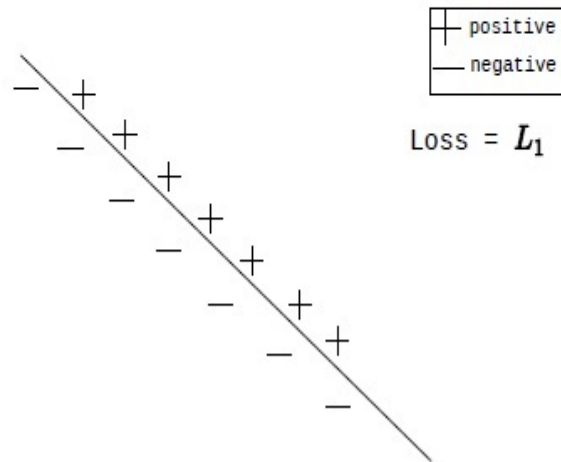
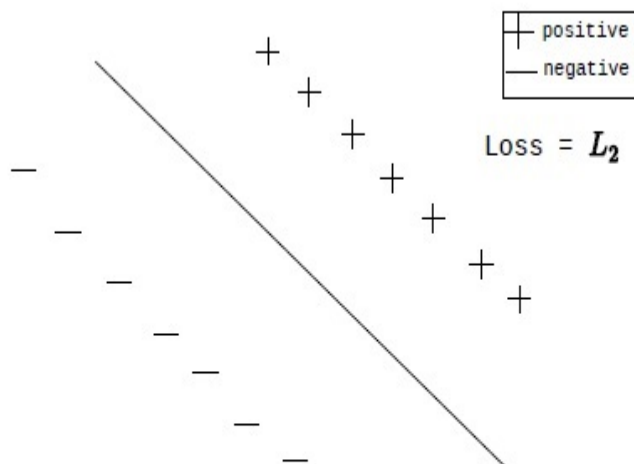


Image for L_2 :



Which of the following statements are true? Assume that the loss is computed mathematically to arbitrary precision. For example, 10^{-20} is not rounded off to 0. The label is 1 for the positive class and 0 for the negative class.

Options :

6406531166249. ✖ The loss of both the models is equal to 0. That is, $L_1 = L_2 = 0$.

6406531166250. ✔ $L_1 > L_2$

6406531166251. ✖ $L_1 < L_2$

6406531166252. ✖ $L_1 = L_2$

Question Number : 171 Question Id : 640653351408 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Select Question

Which of the following could be the vector of probabilities output by a softmax regression model for 5 classes? Note that the options are independent of each other.

Options :

6406531166291. ✔ $[0.2 \ 0.2 \ 0.2 \ 0.2 \ 0.2]$

6406531166292. ✔ $[0.8 \ 0.05 \ 0.05 \ 0.05 \ 0.05]$

6406531166293. ✖ $[0.4 \ 0.5 \ 0.3 \ 0.2 \ 0.1]$

6406531166294. ✖ $[1 \ 1 \ 1 \ 1 \ 1]$

Sub-Section Number : 4

Sub-Section Id : 64065350418

Question Shuffling Allowed : Yes

Question Number : 172 Question Id : 640653351401 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Short Answer Question

You are given a training dataset of 100 data-points for a regression task. You wish to use a k -NN regressor, with $k = 10$.

$d(\mathbf{x}_i, \mathbf{x}_j)$ is a function that returns the distance between two points \mathbf{x}_i and \mathbf{x}_j . Calling d on a pair of points corresponds to a single distance computation.

If you want to predict the label of a new test point, how many distances would you have to compute?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Sub-Section Number : 5

Sub-Section Id : 64065350419

Question Shuffling Allowed : Yes

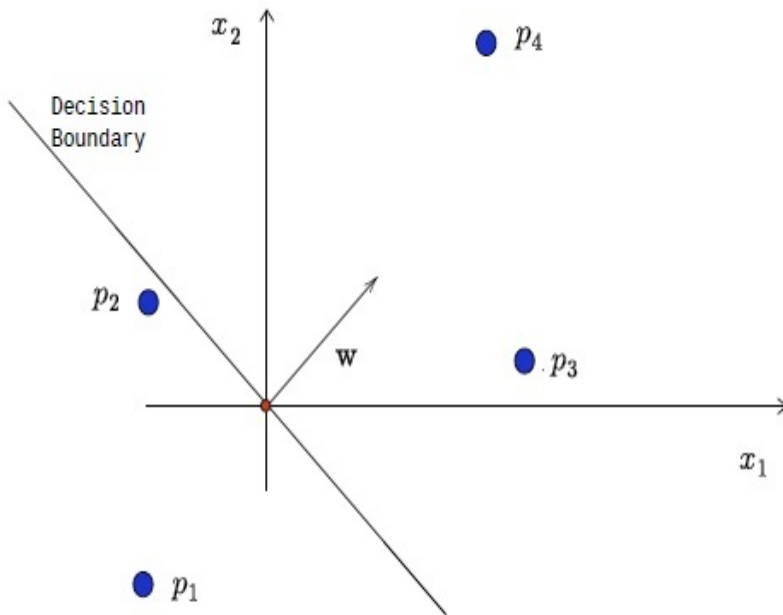
Question Number : 173 **Question Id :** 640653351389 **Question Type :** MCQ **Is Question**

Mandatory : No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

Correct Marks : 3

Question Label : Multiple Choice Question

A logistic regression model has been trained for a binary classification problem with labels 0 and 1. The weight vector and the corresponding decision boundary are displayed in the figure given below:



Now, the model is tested on four points. The probability corresponding to the i^{th} data-point x_i returned by the logistic regression model is given as follows:

$$P(y = 1 | x_i) = p_i$$

We don't know the true labels for any of the four points. We are only talking about the predicted probabilities here. No dummy features were used during the training phase. So, both the weight vector and the feature vector have only two components. Which of the following relationships is correct?

Options :

6406531166241. ✓ $p_1 < p_2 < p_3 < p_4$

6406531166242. ✗ $p_1 > p_2 > p_3 > p_4$

6406531166243. ✗ $p_3 < p_4 < p_2 < p_1$

6406531166244. ✗ $p_1 > p_2$ and $p_4 > p_3$

Question Number : 174 Question Id : 640653351393 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider a logistic regression model that is trained on videos to detect objectionable content. Videos with objectionable content belong to the positive class (label **1**). Harmless videos belong to the negative class (label **0**).

A good detector should be able to correctly identify almost all videos that are objectionable. If it incorrectly classifies even a single video that has inappropriate content in it, that could have serious consequences, as millions of people might end up watching it. In this process the detector may classify some harmless videos as belonging to the positive class. But that is a price we are willing to pay.

How should we choose the threshold (for inference) of this logistic regression model?

Options :

6406531166259. ✔ The threshold should be a low value.

6406531166260. ✖ The threshold should be a high value.

6406531166261. ✖ The performance of the classifier is independent of the threshold.

Sub-Section Number : 6

Sub-Section Id : 64065350420

Question Shuffling Allowed : Yes

Question Number : 175 Question Id : 640653351412 Question Type : MSQ Is Question

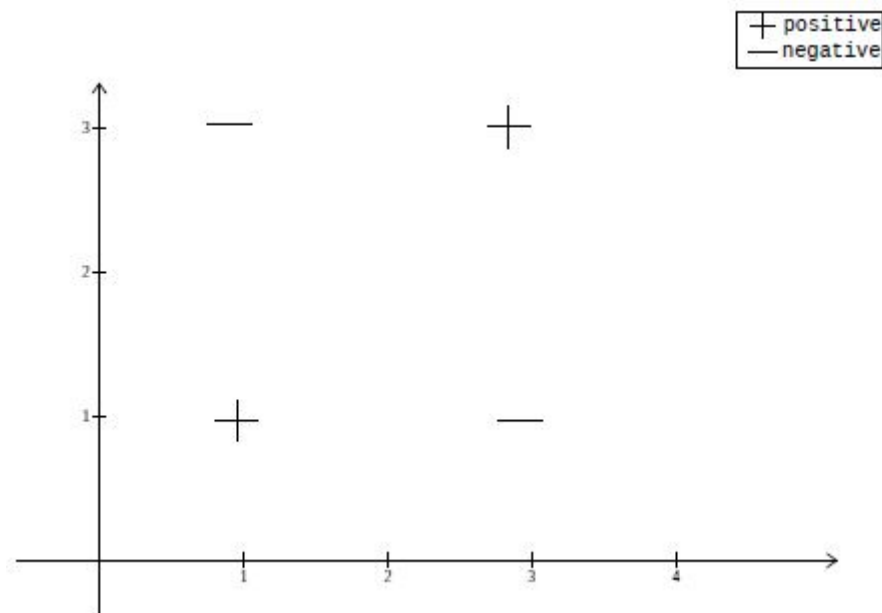
Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Select Question

Consider a binary classification task that has 2 features. Assume that we train a soft-margin, linear SVM (decision boundary is a line in 2D space). We know nothing about the distribution of points in the training set. The points need not be linearly separable.

This model is now tested on the following dataset that has four points.



What are the possible values of the accuracy of the model? All options are independent of each other. Assume that the decision boundary of the model does not pass through any one of the four points.

Options :

6406531166304. ✖ 0

6406531166305. ✔ 0.25

6406531166306. ✔ 0.5

6406531166307. ✔ 0.75

6406531166308. ✖ 1

Sub-Section Number : 7

Sub-Section Id : 64065350421

Question Shuffling Allowed : Yes

Question Number : 176 Question Id : 640653351410 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

An SVM model that has been trained for a binary classification task has the following weight vector and bias:

$$w = \begin{bmatrix} 5 \\ 7 \end{bmatrix}, \quad b = -35$$

This model is tested on a dataset with 10 samples as given below. Here, $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ is a feature vector and y is the true label.

x_1	x_2	y
8	1	1
10	5	1
4	4	1
1	1	1
-1	2	1
4	1	-1
3	6	-1
2	2	-1
1	2	-1
-1	1	-1

Compute the accuracy of the model on this dataset. Enter your answer between 0 and 1.

Hint: The Cartesian coordinate system was named after Rene Descartes.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.69 to 0.71

Sub-Section Number : 8

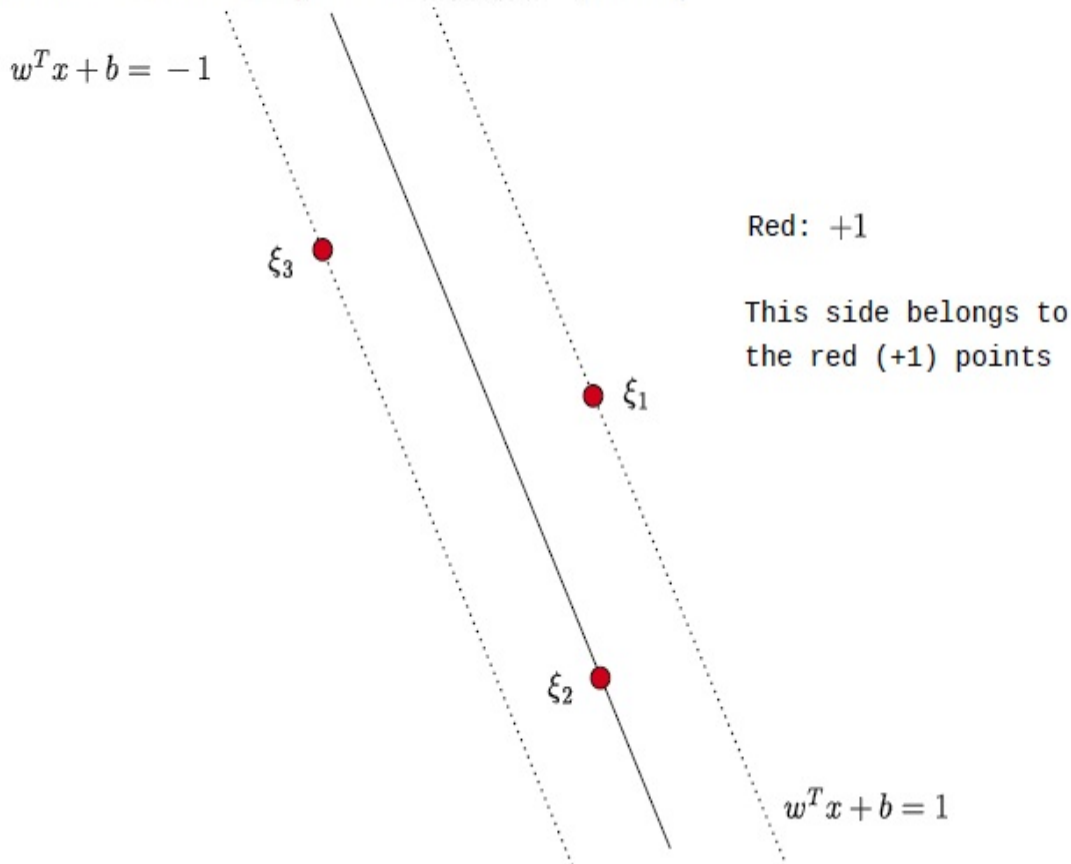
Sub-Section Id : 64065350422

Question Shuffling Allowed : No

Question Id : 640653351413 Question Type : COMPREHENSION Sub Question Shuffling
Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A
Think Time : N.A Minimum Instruction Time : 0
Question Numbers : (177 to 179)

Question Label : Comprehension

Consider a soft-margin, linear SVM that has been trained on a dataset. A subset of three data-points from the positive class (red) from this training dataset is shown below. The decision boundary (solid line) and the bounding planes (dotted lines) are also displayed here. The slack variables for these three points are ξ_1, ξ_2, ξ_3 respectively.



Based on the above data, answer the given subquestions.

Sub questions

Question Number : 177 Question Id : 640653351414 Question Type : SA Calculator : None
Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1

Question Label : Short Answer Question

What is the value of ξ_1 ?

Your answer should be
a non-negative integer.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0

Question Number : 178 **Question Id :** 640653351415 **Question Type :** SA **Calculator :** None

Response Time : N.A **Think Time :** N.A **Minimum Instruction Time :** 0

Correct Marks : 1

Question Label : Short Answer Question

What is the value of ξ_2 ?

Your answer should be
a non-negative integer.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 179 **Question Id :** 640653351416 **Question Type :** SA **Calculator :** None

Response Time : N.A **Think Time :** N.A **Minimum Instruction Time :** 0

Correct Marks : 1

Question Label : Short Answer Question

What is the value of ξ_3 ?

Your answer should be
a non-negative integer.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

Sub-Section Number : 9

Sub-Section Id : 64065350423

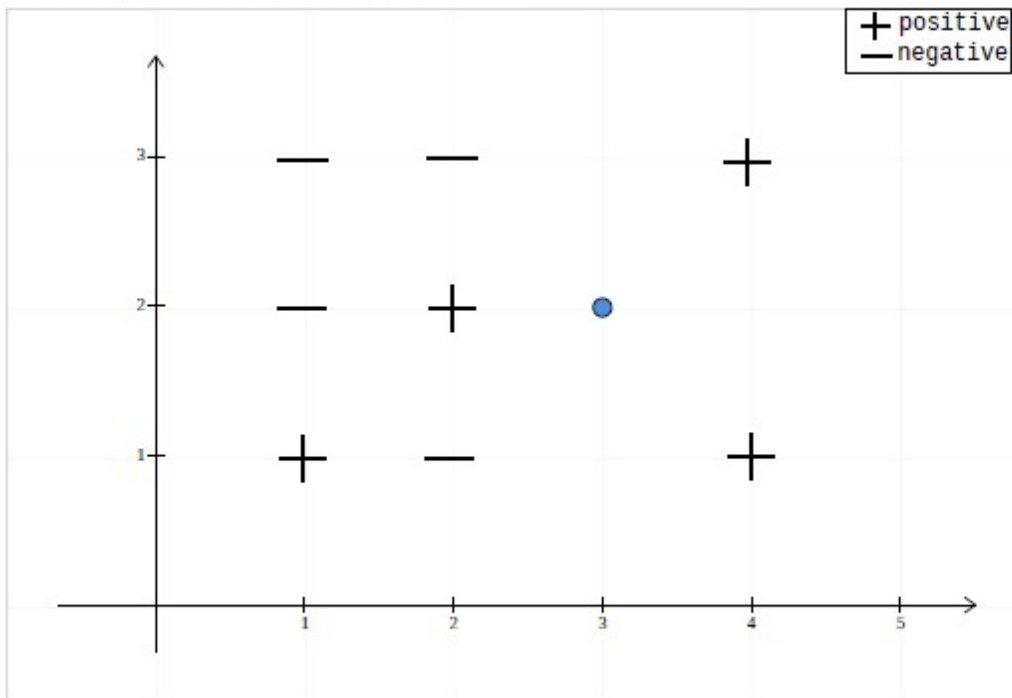
Question Shuffling Allowed : No

Question Id : 640653351402 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

Question Numbers : (180 to 181)

Question Label : Comprehension

Consider the following binary classification task for which we use a k -NN classifier using the **Manhattan distance metric**.



All points are located at integer coordinates. If the test point (blue) is $(3, 2)$, answer the given subquestions:

Sub questions

Question Number : 180 Question Id : 640653351403 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

What is the predicted label of the test point if $k = 1$? The label is 1 for the positive class and -1 for the negative class.

Options :

6406531166275. ✓ 1

6406531166276. ✗ -1

Question Number : 181 Question Id : 640653351404 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Select Question

How many points are at a distance of **2** from the test point?

Note:

(1) We use the Manhattan distance.

(2) We want those points that are exactly **2** units away from the test point.

Options :

6406531166277. ✓ 2 points from the positive class

6406531166278. ✖ 3 points from the positive class

6406531166279. ✖ 2 points from the negative class

6406531166280. ✓ 3 points from the negative class

Sub-Section Number : 10

Sub-Section Id : 64065350424

Question Shuffling Allowed : No

Question Id : 640653351405 Question Type : COMPREHENSION Sub Question Shuffling

Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A

Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (182 to 183)

Question Label : Comprehension

Consider a softmax regression model for a multi-class classification problem that has 10 classes and 20 features. Classes are numbered as $1, 2, \dots, 10$. There are no dummy features as that is taken care of by the bias term.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 182 Question Id : 640653351406 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

What is the dimension of the weight matrix W ?

Options :

6406531166281. ✓ 20×10

6406531166282. ✗ 10×10

6406531166283. ✗ 20×20

6406531166284. ✗ 20×1

6406531166285. ✗ 10×1

Question Number : 183 Question Id : 640653351407 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

What does the 3^{rd} column of the matrix W represent?

Options :

6406531166286. ✓ It is the vector of weights corresponding to the 3^{rd} class.

6406531166287. ✗ The features corresponding to the 3^{rd} training example.

6406531166288. ✗ The matrix W is of size 20×1 and doesn't have a 3^{rd} column.

6406531166289. ✗ The matrix W is of size 10×1 and doesn't have a 3^{rd} column.

6406531166290. ✗ It is the vector of weights corresponding to the 3^{rd} feature.

Sub-Section Number : 11

Sub-Section Id : 64065350425

Question Shuffling Allowed : No

Question Id : 640653351396 Question Type : COMPREHENSION Sub Question Shuffling
Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A
Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (184 to 187)

Question Label : Comprehension

Consider a binary classification problem. The training-data has several features out of which we have access to only two binary features (x_1, x_2) . The labels are 1 and 2 for the two classes. The training dataset has the following distribution of points:

Feature	Number of points	True label
(0, 0)	30	1
(0, 0)	10	2
(0, 1)	10	1
(0, 1)	40	2
(1, 0)	30	1
(1, 0)	10	2
(1, 1)	10	1
(1, 1)	50	2

The table is to be parsed as follows. The first row of the table states that there are 30 points from class 1 that have $x_1 = 0, x_2 = 0$. A Bernoulli Naive Bayes model is fit for this data with the following matrix of probabilities:

$$\begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \end{bmatrix}$$

Each entry in this matrix can be understood as follows. For $i, j \in \{1, 2\}$:

$$w_{ij} = P(x_i = 1 \mid y = j)$$

You can ignore smoothing. For all questions, report the answer up to two decimal places. Do not round-up or round-down the answer.
For example, if you get a value of 0.37914, just report 0.37.

NOTE: If the last row of the table is not clear: for feature vector (1, 1) in class-2, there are fifty points.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 184 Question Id : 640653351397 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1.5

Question Label : Short Answer Question

What is the value of w_{11} ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.49 to 0.51

Question Number : 185 Question Id : 640653351398 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1.5

Question Label : Short Answer Question

What is the value of w_{12} ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.53 to 0.55

Question Number : 186 Question Id : 640653351399 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1.5

Question Label : Short Answer Question

What is the value of w_{21} ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.24 to 0.26

Question Number : 187 Question Id : 640653351400 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1.5

Question Label : Short Answer Question

What is the value of w_{22} ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.80 to 0.82

MLP

Section Id :	64065322141
Section Number :	11
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	50
Display Number Panel :	Yes