

Computer Science and Engineering

Course work portal

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Machine Learning

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Started on Thursday, 18 November 2021, 12:11 PM

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Time taken 59 mins 9 secs

Grade 60.00 out of 80.00 (75%)

Question 1

Complete

Mark 6.00 out of 6.00

 Flag question

Which of the following points belong to the set of support vectors for an SVM classifying them. CLASS 1: (1,1),(2,2),(4,1),(4,2)

CLASS 2: (2,-2), (3,-1), (3,-3), (4,-2)

Select one or more:


- ☐ a. (2,-2)
- ☒ b. (1,1)
- ☐ c. (3,-3)
- ☐ d. (4,-2)

Question 2

Complete

Consider a linear discriminant function $g(x_1, x_2, x_3, x_4) = 4x_1 - 5x_2 + 3x_3 + 8x_4 - 5$ for classifying a feature vector $X = (x_1, x_2, x_3, x_4)$. Which of the following statements are true

Mark 6.00 out of 6.00

 Flag question

with respect to this classifier?


Select one or more:

- ☐ a. If $g(x)$ classifies a set of labeled training examples without any error, there does not exist any other linear discriminant function with the same performance.
- ☒ b. The class boundary is a hyperplane in a 4-D real space whose normal is $(8, -10, 6, 16)$
- ☒ c. If a feature point lies on $g(x)$, its class label is ambiguous.
- ☒ d. The class labels of the NULL feature vector (i.e. $x_1 = x_2 = x_3 = x_4 = 0$) and $(1, 1, 1, 1)$ are different.

Question 3

Complete

Mark 6.00 out of 6.00

 Flag question


Consider a multilayer feed forward network which takes a 12-D feature vector as input and produces a 3-D output vector. The network has two hidden layers with number of neurons 13 and 5 for the first and second hidden layers, respectively. Please note that the input vector is the input to the first hidden layer. What is the dimension of the parametric space over which the optimization process would be carried out to train the network?

Answer:

Question 4

Complete

Mark 4.00 out of 4.00

 Flag question

Given set of five features $\{x_1, x_2, x_3, x_4, x_5\}$. Consider Sequential Forward Selection method. We have selected $S_1 = \{x_1, x_2\}$ till now. Let the validation error on a selected set of features S be denoted by $E(S)$. Consider below information regarding validation set error and answer

which feature should be added next.

$$E(S \cup \{x_1\}) = 0.2$$

$$E(S \cup \{x_3\}) = 0.25$$

$$E(S \cup \{x_4\}) = 0.30$$

$$E(S \cup \{x_5\}) = 0.35$$


Select one:

- ☒ a. None
- ☐ b. x5
- ☐ c. x3
- ☐ d. x4

Question 5

Complete

Mark 0.00 out of 4.00

 Flag question

While training a Adaboost algorithm on a binary classification dataset, the first base learner incurs a 30% error on the training data. What will the weight of the base learner in the final prediction of the ensemble classifier?


answer upto 4 decimal places.

Answer:

Question 6

Complete

Mark 4.00 out of 4.00

 Flag question

Which of the following can be true for selecting base learners for an ensemble?

1. Different learners can come from same algorithm with different hyper parameters.
2. Different learners can come from different algorithms.
3. Different learners can come from different sets of training samples.
4. Different learners can perform different tasks.


Select one:

- ☐ a. only 1
- ☒ b. 1, 2, 3 and 4
- ☐ c. 1, 2 and 3
- ☐ d. 1 and 2

Question 7

Complete

Mark 4.00 out of 4.00

 Flag question

If each base-learner is an i.i.d. and correct with probability 0.75, what is the probability that a majority vote over 5 classifiers gives the correct answer?


answer upto 5 decimal places.

Answer:

Question 8

Complete

Mark 6.00 out of 6.00

 Flag question

Which of the following statements are true for a sigmoid activation function?


Select one or more:

- ☒ a. Its functional value can solely provide the value of logit function at that point.
- ☐ b. It is not defined at every point.
- ☐ c. It is not differentiable at every point.
- ☒ d. Its functional value can solely provide the value of its differentiation at that point.

Question 9

Complete

Mark 4.00 out of 6.00

 Flag question

Which of the following statements are NOT true for principal component analysis (PCA)?

Select one or more:


- ☐ a. It computes a component along the direction providing maximum variance among all possible projections.

- ☐ b. It computes minimum dimensional space sufficient to represent the data.
- ☒ c. It provides a direction of projection of a feature vector for optimum separation of data points belonging to two classes.
- ☒ d. It provides a transformation of points preserving distances among them in the transformed space.

Question 10

Complete

Mark 0.00 out of 6.00

 Flag question


While exploring a nondeterministic environment, an agent maintains running averages of reward values of states for every action. Consider the agent takes an action a at state s to move at state q and obtains a reward 50. The present reward value of the state action pair (s, a) is 100, and the maximum possible discounted reward at q is estimated at 80. Given the learning rate 0.3, what would be the updated reward value at (s, a) ?

Answer:

Question 11

Complete

Mark 4.00 out of 4.00

 Flag question

Consider the covariance matrix of a 3-D feature space is given by the following.

Table 1: Covariance Matrix

2.32	5.34	-4.23
5.34	6.75	-1.35
-4.23	-1.35	3.12

What is the sum of eigen values of the covariance matrix.


Answer upto 2 decimal places

Answer:

Question 12

Complete

Mark 4.00 out of 4.00

 Flag question

Generally, an ensemble method works better, if the individual base models have?


Select one:

- ☒ a. Less correlation among predictions
- ☐ b. High correlation among predictions
- ☐ c. Correlation does not have any impact on ensemble output
- ☐ d. None of the above

Question 13

Complete

Mark 6.00 out of 6.00

 Flag question

Which of the following statements are true for an Artificial Neural Network?

Select one or more:

- ☐ a. A single neuron with two inputs and the signum activation function can implement an XOR gate.
- ☒ b. A single neuron with two inputs and the signum activation function can implement an OR gate.
- ☒ c. A single neuron with multiple inputs and the signum activation function acts as a linear discriminator in a multidimensional feature space for two linearly separable classes.
- ☒ d. A single neuron with multiple inputs and the sigmoid activation function may compute posterior of a class for a two-class classification problem in a multidimensional feature space.

Question 14

Complete

Mark 6.00 out of 6.00

Consider the below statements about the kernel in SVM. Which of them are true?

Select one or more:

Flag question

- ☒ a. Any distance function satisfying properties of a metric can be used in defining a kernel function.
- ☒ b. Given the feature space X , a kernel function f may be mathematically denoted by $f : X \times X \rightarrow \mathbb{R}$, where \mathbb{R} is the set of real numbers.
- ☐ c. A kernel function explicitly maps low dimensional points to high dimensional space.
- ☐ d. A kernel function may provide negative values.

Question 15

Complete

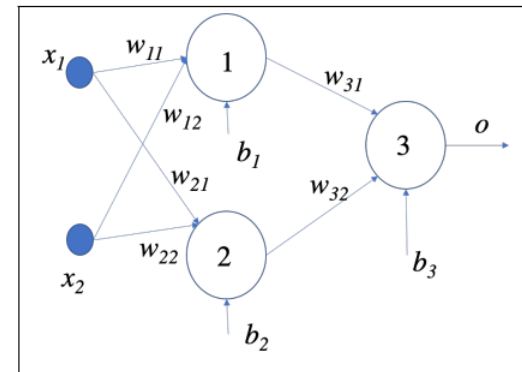
Mark 0.00 out of 8.00

Flag question

QUESTION 7:

Type: Numeric

Consider a neural network shown in the figure with two inputs denoted by x_1 , and x_2 and its output o . The weights are shown for each edges and b_i denotes the bias of the i th neuron. The activation function at each neuron is the *sigmoid function*. The error function is given by $E = \frac{1}{2}(t - o)^2$, where t is the target value. Consider that a training sample is given as $x_1 = 1$, $x_2 = -1$, and $t = 1$. Compute $\frac{\partial E}{\partial w_{11}}$ at that point, given $w_{11} = 1$, $w_{12} = 2$, $w_{21} = 2$, $w_{22} = 1$, $w_{31} = w_{32} = 1$, $b_1 = 1$, $b_2 = 2$, and $b_3 = -1$. [8]



Answer upto 4 decimal places

Answer: 1.0000

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