Quiz 1

This is a preview of the published version of the quiz

Started: Oct 21 at 8:12pm

Quiz Instructions

You will get two attempts at this quiz. You will get a chance to change your answers in the second attempt. After the second try you cannot update it again.

Question 1

1 pts

Let $f(x) = 5x^2 + 10x + 6$

What value of x will minimize the function $f(x)$? Please input your answer as a decimal number.

Question 2

1 pts

Assume you have three training instances, each with 3 features:

example id	input features x	label y
0	[1, 0, 1]	1
1	[0, 1, 1]	0
2	[1, 0, 0]	1

You will apply the Gradient algorithm with the LMS loss, to an initial $w = [0,\ 0,\ 0]$. That is, you will find a w that minimizes the error $E(w) = \frac{1}{2} \sum_{d \in D} (y_d - w \cdot x_d)^2$, where D is the dataset above.

Consult the class notes for the update rule of the algorithm, and use a step size R = 1. What is the first update vector Δw you will add to $w = [0,\ 0,\ 0]$?

- [2, 0, 1]
- [-1, 0, 1]
- [3, 1, 3]
- [1, 0, 2]

Question 3

1 pts

Which of the following are true about gradient descent? (select all statements that are true.)

- After each iteration, we modify the weight vector in the direction of the gradient.
- We have to choose a non-variable learning rate.
- After each iteration, we modify the weight vector in the direction of the negative gradient.
- In the gradient descent algorithm each update of the weight vector depends on all the training examples.

Question 4

1 pts

Suppose we have an instance space consisting of 4 features X_1, X_2, X_3, X_4, and a label y such that y is determined by a function of x, y = f(X_1, X_2, X_3, X_4). X_1 and X_2 can take 3 different values, while X_3 and X_4 can take 4 different values. The label y can take 2 different values. What is the number of possible functions?

- 2^144

- 2^14
- 2^81
- 2^56

Question 5

1 pts

As seen in question 4 the space of all possible functions is far too large! To deal with this, learners usually consider only a subset of all the possible functions. This is called the **hypothesis space H**.

Suppose the hypothesis space we are considering is the space of all conjunctions over 4 Boolean input features, X_1 , X_2 , X_3, X_4. For example, $X_1 \wedge X_3$ is an element in the hypothesis space. $X_2 \vee X_3$ is not. What is the cardinality of the hypothesis space **H**?

- 4
- 8
- 16
- 256

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