Question Number : 40 Question Id : 640653677222 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

Construct the savings tour using B as the base city. The savings for including the pairs of cities AC, AD and AE are 88, 48 and 61, respectively. Compute the savings for the remaining three pairs of cities, and use them to simulate the algorithm. Enter the path representation of the tour starting from city B.

Enter a comma separated list of city names.
NO SPACES, TABS, DOTS, BRACKETS, PARENTHESIS OR UNWANTED CHARACTERS.
Answer format: B,X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Set

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

B,D,C,E,A

Deep Learning

Section Id :	64065345339
Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	7

Number of Questions to be attempted :	7
Section Marks :	50
Display Number Panel :	Yes
Section Negative Marks :	0
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 :	64065396983
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 41 Question Id : 640653677223 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 "DEGREE LEVEL : DEEP LEARNING (COMPUTER BASED EXAM)"

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 :

6406532267610. YES

6406532267611. NO

Sub-Section Number :	2
Sub-Section Id :	64065396984

Question Shuffling Allowed : Yes

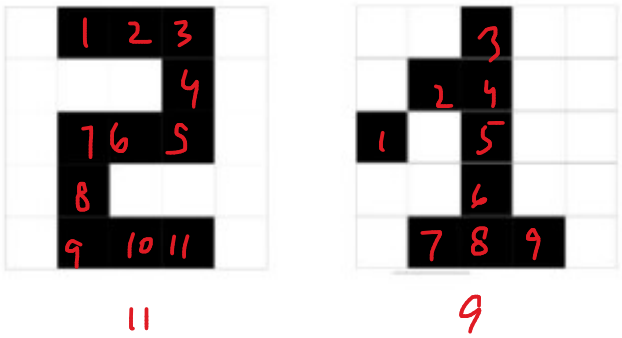
Is Section Default? : null

Question Number : 42 Question Id : 640653677224 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 5 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider the two binary images shown below. The white square represents 0 and the black square represents 1. Suppose we use MP neuron to classify these two images by flattening the image of size 5 × 5 into a vector of length 25 × 1.



Which of the following threshold θ will help the MP neuron classify these two images correctly with the following decision rule? Assume the image of number two belongs to class (1) and the image of number one belongs to class (0)

$$y = \begin{cases} 1, & \text{if} \sum_{i=1}^{25} x_i \geq \theta \\ 0, & \sum_{i=1}^{25} x_i < \theta \end{cases}$$

Options :

6406532267612. 10

6406532267613. 9

6406532267614. 11

6406532267615. 14

6406532267616. 16

6406532267617. None of these

Sub-Section Number :	3
Sub-Section Id :	64065396985
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653677225 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (43 to 44)

Question Label : Comprehension

Consider a dataset

$$X = \begin{bmatrix} 1 & 0 & 0 & 0 & -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & -1 \end{bmatrix}$$

Each column x_i of X represents a data point. The first four data points (x_1, x_2, x_3, x_4) belong to a positive class and the next four data points (x_5, x_6, x_7, x_8) belong to the negative class. The perceptron uses the following decision rule,

$$y = \begin{cases} 1, & \text{if } w^T x_i \geq 0 \\ 0, & \text{if } w^T x_i < 0 \end{cases}$$

Based on the above data, answer the given subquestions.

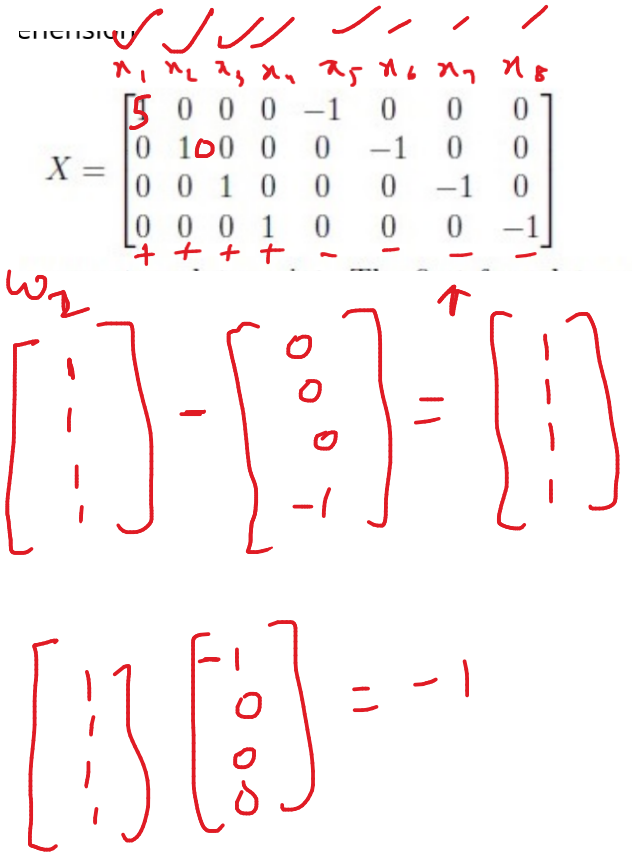
Sub questions

Question Number : 43 Question Id : 640653677226 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 5

Question Label : Short Answer Question

Suppose we use the perceptron to classify the data points. The initial weights w_0 is given by $w_0 = \sum_{i=1}^{8} x_i$. For each iteration, the algorithm visits a single data point in the following order (that is, $x_1, x_2, x_3, \cdots, x_8$) and updates the weights, if required. Update the weights until the algorithm converges (that is, it classifies all the data points correctly). If the algorithm converges in a finite number of iterations, enter the sum of the elements of the final updated weight vector. If the algorithm doesn't converge, then enter -1.



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

Question Number : 44 Question Id : 640653677227 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

The statement that the perceptron update rule works only for Boolean inputs and Boolean output is

Options :

6406532267619. TRUE

6406532267620. FALSE

Sub-Section Number : 4

Sub-Section Id : 64065396986

Question Shuffling Allowed : No

Is Section Default? : null

Question Id : 640653677228 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (45 to 46)

Question Label : Comprehension

The logistic sigmoid neuron $\sigma(x)$ is defined as follows

$$\sigma(x) = \frac{1}{1 + exp(-(wx + b))}$$

where $w, b \in \mathbb{R}$ are learnable parameters. We generate an input-output pair $x = 1, y = 0.62$ for setting $w = -0.5$ and $b = 1$. Take Mean Square Error loss where required

$$L = 0.5 * (\hat{y} - y)^2$$

Based on the above data, answer the given subquestions.

Sub questions

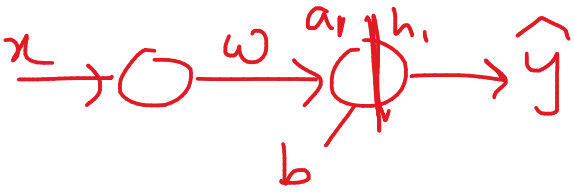
Question Number : 45 Question Id : 640653677229 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 5

Question Label : Short Answer Question

$y = 0.62$, $\hat{y} = 0.31$, $\eta = 2$

Suppose we use the sigmoid function to fit the pair $x = 1, y = 0.69$, where x is an input and y is the ground truth. Suppose that w is initialized to $w = -0.8$ and b is initialized to zero $b = 0$. The prediction $\hat{y}$ by the model for the current w, b is, $\hat{y} = 0.31$ Update the parameter once by keeping $\eta = 2$ and compute the loss. Enter the loss value. Note: Enter the loss value to three significant digits. That is, if your answer is 0.06134, then enter it as 0.061



$$w_{t+1} = w_t - \eta \nabla w$$

$$b_{t+1} = b_t - \eta \nabla b.$$

$$\frac{\partial L}{\partial w} = \frac{\partial L}{\partial \hat{y}} \cdot \frac{\partial \hat{y}}{\partial a} \cdot \frac{\partial a}{\partial w}$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

(1) $L = \frac{1}{2}(y - \hat{y})^2 \Rightarrow \frac{\partial L}{\partial \hat{y}} = \frac{2}{2}(\hat{y} - y) = \hat{y} - y$

$$\Rightarrow \frac{\partial L}{\partial w} = -0.31$$

Text Areas : PlainText

Possible Answers :

(2) $\hat{y} = \frac{1}{1 + e^{-(wx)}} \Rightarrow \frac{\partial \hat{y}}{\partial a} = \hat{y}(1 - \hat{y})$

$$= 0.31(0.69) = 0.2139$$

Question Number : 46 Question Id : 640653677230 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

(3) $a = wx + b. \Rightarrow \frac{\partial a}{\partial w} = x \Rightarrow \frac{\partial a}{\partial w} = 1$

Correct Marks : 5

Question Label : Multiple Choice Question

$$\frac{\partial L}{\partial w} = -0.31 \times 0.2139 \times 1 = -0.066$$

Suppose we run the model on the single input-output pair (x = 1, y = 0.062) for a few iterations by randomly initializing w and b. Moreover, the loss value is recorded for each iteration. We observe that the loss becomes zero after some iterations. This implies that the model has captured the true value of w and b that generated the pair x, y. The implication is

Options :

$$\frac{\partial L}{\partial b} = \frac{\partial L}{\partial \hat{y}} \cdot \frac{\partial \hat{y}}{\partial a} \cdot \frac{\partial a}{\partial b} = -0.31 \times 0.2139 \times 1 = -0.066.$$

6406532267622. TRUE

6406532267623. FALSE

Sub-Section Number : 5

Sub-Section Id : 64065396987

Question Shuffling Allowed : No

$w_{t+1} = -0.8 - 2 \times (-0.066) = -0.668$

$b_{t+1} = 0 - 2(-0.066) = 0.132$

$a = -0.668 \times 1 + 0.132 = -0.536$

$\hat{y} = \sigma(a) = 0.369.$

$L = \frac{1}{2}(0.369 - 0.62)^2 = 0.5(-0.251)^2$

$= 0.031$

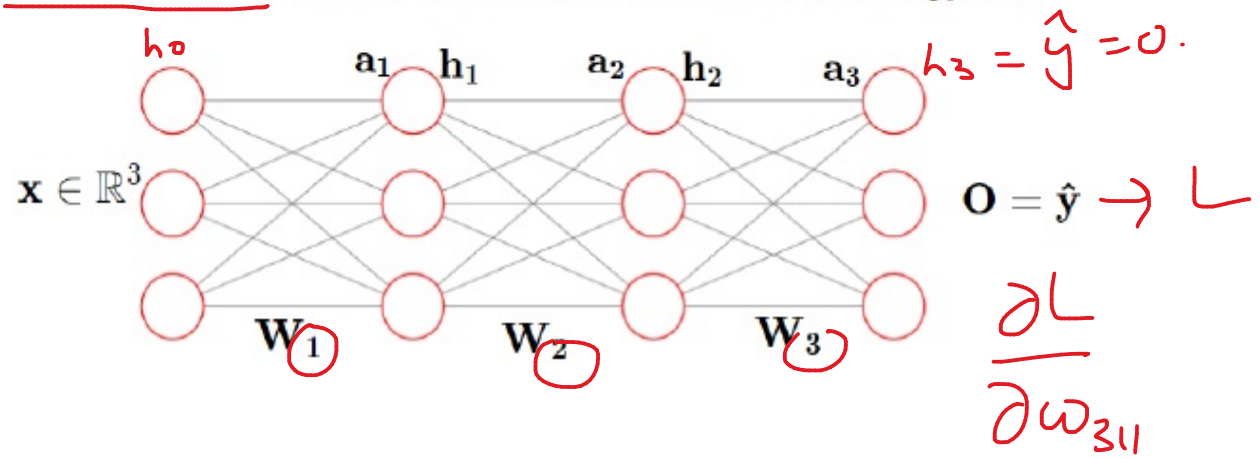
Is Section Default? : null

Question Id : 640653677231 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (47 to 52)

Question Label : Comprehension

Consider a feed-forward neural network shown below where, $\mathbf{x}$ is an input vector. The vectors a_l, h_l correspond to pre-activation and activation at layer l. The matrices $\mathbf{W}_l$ are weights that connect neurons from layer $l-1$ to layer l. The index of the weight matrices starts at zero. For example, W_{100} denotes the element at the zeroth row and zeroth column of the weight matrix $\mathbf{W}_1$. Finally, the vector $\mathbf{o}$ is an output vector $\mathbf{o} = \mathbf{h_3} = \hat{y}$. All neurons in the hidden layer use the logistic activation function, and neurons in the output layer use the softmax function. Further, the network minimizes cross-entropy loss.



Based on the above data, answer the given subquestions.

Sub questions

$$\frac{\partial L}{\partial w_{311}} = \frac{\partial L}{\partial \hat{y}} \cdot \frac{\partial \hat{y}}{\partial a_3} \cdot \frac{\partial a_3}{\partial w_{301}}$$

Question Number : 47 Question Id : 640653677232 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

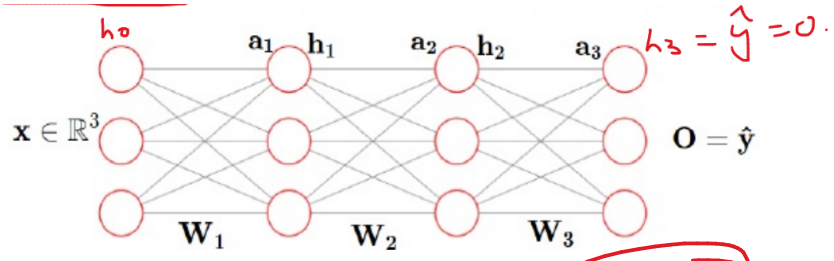
Question Label : Multiple Select Question

Choose the vector(s) which is (are) inappropriate given in the network

Options :

6406532267624.

$$\mathbf{h_2} = \begin{bmatrix} 0.1 \\ 0 \\ 0.25 \end{bmatrix}$$

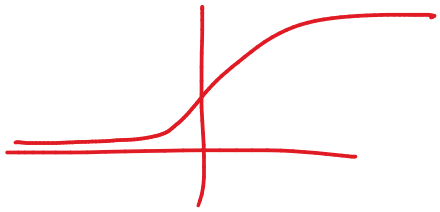


$$\mathbf{h_1} = \begin{bmatrix} 0 \\ -0.25 \\ 0.1 \end{bmatrix}$$

sigmoid(a). = $\frac{1}{1+e^{-x}}$

6406532267625.

$$\hat{\mathbf{y}} = \begin{bmatrix} 0.2 \\ 0.8 \\ 0.1 \end{bmatrix}$$ = Softmax = !



6406532267626.

$$\hat{\mathbf{y}} = \begin{bmatrix} 0.3 \\ 0.8 \\ 0.1 \end{bmatrix}$$

6406532267627.

Question Number : 48 Question Id : 640653677233 Question Type : SA Calculator : None

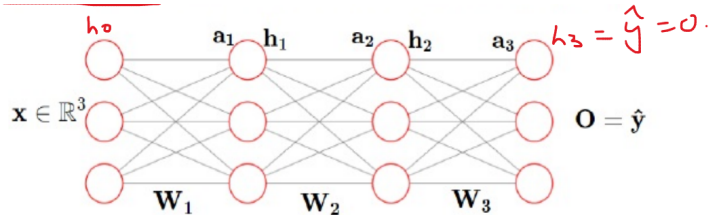
Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Compute the vector $\mathbf{a_3}$ and enter the sum of the elements of $\mathbf{a_3}$. If your answer is −1.2437, then enter it as −1.24.

$$\mathbf{h_2} = \begin{bmatrix} 1.92 \\ 1.89 \\ 1.92 \end{bmatrix} \quad \mathbf{W_3} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}, \quad \mathbf{b_3} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$



Response Type : Numeric Row of W with h2

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Softmax(a_3) = h_3

$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix} \times \begin{bmatrix} 1.92 \\ 1.89 \\ 1.92 \end{bmatrix} = \begin{matrix} a_{30} \\ a_{31} \\ a_{32} \end{matrix} \begin{bmatrix} 3.84 \\ 3.81 \\ 3.81 \end{bmatrix}$$

Possible Answers :

11.46

Question Number : 49 Question Id : 640653677234 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

Compute $\hat{y}$ (choose the answer that is closest to the given options)

$$\hat{y}_0 = \frac{e^{a_{30}}}{e^{a_{30}} + e^{a_{31}} + e^{a_{32}}}$$

$$\hat{y}_1 = \frac{e^{a_{31}}}{D}$$

$$\hat{y}_2 = \frac{e^{a_{32}}}{D}$$

Options :

6406532267629. $\hat{y} = [0.73, 0.09, 0.18]^T$

6406532267630. $\hat{y} = [0.34, 0.33, 0.33]^T$

6406532267631. $\hat{y} = [0.15, 0.75, 0.1]^T$

6406532267632. $\hat{y} = [0.73, 0.18, 0.09]^T$

$$\begin{matrix} a'_{30} \\ a_{31} \\ a_{32} \end{matrix} \begin{bmatrix} 3.84 \\ 3.81 \\ 3.81 \end{bmatrix}$$

Question Number : 50 Question Id : 640653677235 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

Suppose that the true one-hot encoded label is $y = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$. Compute the loss (use natural log) and truncate the answer to two decimal points (that is, if your answer is 40.2345, then enter it as 40.23)

$$\begin{bmatrix} 0.34 \\ 0.33 \\ 0.33 \end{bmatrix}$$

$$-\sum_{i=0}^{n} y_i \ln(\hat{y}_i)$$

$$-\ln(0.33)$$

Response Type : Numeric

Evaluation Required For SA : Yes

1.1086

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

Question Number : 51 Question Id : 640653677236 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

Compute the gradient of loss with respect to the output $\hat{y}$, that is, $\nabla_{\hat{y}} L$ and Enter the sum of the elements of $\nabla_{\hat{y}} L$

$$\frac{\partial L}{\partial \hat{y}} = \frac{\partial}{\partial \hat{y}}(-\ln(\hat{y}))$$

$$= -\frac{1}{\hat{y}} = \frac{-1}{0.33}$$

$$= \frac{\partial}{\partial \hat{y}}\left(\sum_{i=0}^{n} y_i \ln(\hat{y}_i)\right)$$

Options :

6406532267634. 0.41

6406532267635. -0.41

6406532267636. -11.11

6406532267637. -3.03

Question Number : 52 Question Id : 640653677237 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Compute the gradient of loss with respect to w_3 (that is, ∇w_3) and enter the value of ∇w_{311}.

$$\frac{\partial L}{\partial \hat{y}} \cdot \frac{\partial \hat{y}}{\partial a_3} \cdot \frac{\partial a_3}{\partial w_3}$$

$$[\hat{y} - y] \times [h_2]^T$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

$$\begin{bmatrix} 0.34 - 0 \\ 0.33 - 1 \\ 0.33 - 0 \end{bmatrix} = \begin{bmatrix} 0.34 \\ -0.67 \\ 0.33 \end{bmatrix} \times \begin{bmatrix} 1.92 & 1.89 & 1.92 \end{bmatrix}$$

$$\begin{bmatrix} 0.34 \times 1.92 & 0.34 \times 1.89 & \cdots \\ -0.67 \times 1.92 & -0.67 \times 1.89 & \\ 0.33 \times 1.92 & & \end{bmatrix}$$

-1.2633

Text Areas : PlainText

Possible Answers :

Sub-Section Number : 6

Sub-Section Id : 64065396988

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 53 Question Id : 640653677238 Question Type : SA Calculator : None

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

Correct Marks : 5

Question Label : Short Answer Question

Consider a training set that contains 10 samples to train a neural network. Further, mini-batch GD algorithm has been chosen to update the parameters of the network with a batch size of 2. Suppose that we use an exponentially decaying learning rate scheme $\eta_t = 2\exp(-\frac{t}{4})$ and train the model for 2 epochs. What will be the value of the learning rate η_t at the end of training? Assume, t starts from zero.

Enter the answer upto 3 decimal points (that is, if your answer is -0.12145, then enter it as -0.121)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

Sub-Section Number : 7

Sub-Section Id : 64065396989

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 54 Question Id : 640653677239 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 team has a data set that contains 10000 samples for training a feed-forward neural network. Suppose they decided to use a mini-batch gradient descent algorithm with a batch size of 100 to update the weights. How many times do the weights get updated after training the network for 10 epochs?

$N = 10k \quad MB = 100$

$TMB = \frac{10000}{100} = 100 \times 10 = 1000$

Options :

6406532267640. 1000

6406532267641. 10000

6406532267642. 100000

6406532267643. 10

Financial Forensics

Section Id :	64065345340
Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	12
Number of Questions to be attempted :	12
Section Marks :	25
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0