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NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Deep Learning - IIT Ropar (course)

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Course
outlineAbout
NPTEL ()How does an
NPTEL
online
course
work? ()

Week 0 ()

Week 1 ()

- Biological Neuron (unit? unit=17&lesson=18)
- From Spring to

Week 1 : Assignment 1

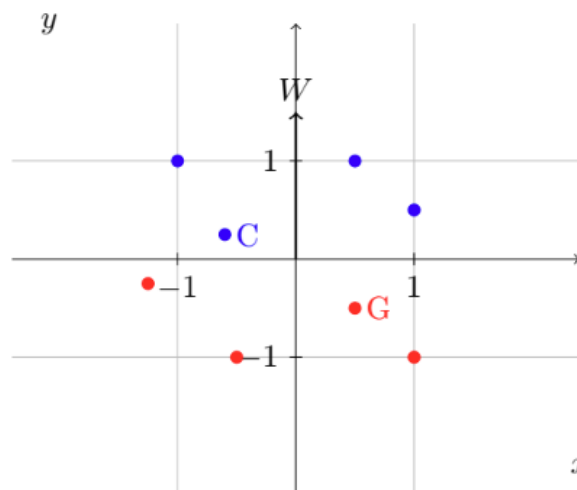
The due date for submitting this assignment has passed.

Due on 2025-02-05, 23:59 IST.

Assignment submitted on 2025-01-31, 14:59 IST

Common data for questions 1,2 and 3

In the figure shown below, the blue points belong to class 1 (positive class) and the red points belong to class 0 (negative class). Suppose that we use a perceptron model, with the weight vector w as shown in the figure, to separate these data points. We define the point belongs to class 1 if $w^T x \geq 0$ else it belongs to class 0.

1) The points G and C will be classified as?

1 point

Note: the notation $(G, 0)$ denotes the point G will be classified as class-0 and $(C, 1)$ denotes the point C will be classified as class-1

☐ $(C, 0), (G, 0)$
☒ $(C, 0), (G, 1)$

Winter of AI
(unit?
unit=17&lesso
n=19)

• The Deep
Revival (unit?
unit=17&lesso
n=20)

• From Cats to
Convolutional
Neural
Networks
(unit?
unit=17&lesso
n=21)

• Faster, higher,
stronger (unit?
unit=17&lesso
n=22)

• The Curious
Case of
Sequences
(unit?
unit=17&lesso
n=23)

• Beating
humans at
their own
games
(literally) (unit?
unit=17&lesso
n=24)

• The Madness
(2013-) (unit?
unit=17&lesso
n=25)

• (Need for)
Sanity (unit?
unit=17&lesso
n=26)

• Motivation
from Biological
Neurons (unit?
unit=17&lesso
n=27)

• McCulloch
Pitts Neuron,
Thresholding
Logic (unit?
unit=17&lesso
n=28)

☐
(C, 1), (G, 1)
☐
(C, 1), (G, 0)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(C, 1), (G, 0)

2) The statement that “there exists more than one decision lines that could separate these data points with zero error” is, **1 point**

☒ True
☐ False

Yes, the answer is correct.
Score: 1

Accepted Answers:
True

3) Suppose that we multiply the weight vector w by -1 . Then the same points G and C will be classified as? **1 point**

☐
(C, 0), (G, 0)
☐
(C, 0), (G, 1)
☐
(C, 1), (G, 1)
☒
(C, 1), (G, 0)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(C, 0), (G, 1)

4) Which of the following can be achieved using the perceptron algorithm in machine learning? **1 point**

☐ Grouping similar data points into clusters, such as organizing customers based on purchasing behavior.
☐ Solving optimization problems, such as finding the maximum profit in a business scenario.
☒ Classifying data, such as determining whether an email is spam or not.
☐ Finding the shortest path in a graph, such as determining the quickest route between two cities.

Yes, the answer is correct.
Score: 1

Accepted Answers:
Classifying data, such as determining whether an email is spam or not.

5) Consider the following table, where x_1 and x_2 are features and y is a label. **1 point**

● Perceptrons
(unit?
unit=17&lesso
n=29)

● Error and Error
Surfaces (unit?
unit=17&lesso
n=30)

● Perceptron
Learning
Algorithm
(unit?
unit=17&lesso
n=31)

● Proof of
Convergence
of Perceptron
Learning
Algorithm
(unit?
unit=17&lesso
n=32)

● Lecture
Material for
Week 1 (unit?
unit=17&lesso
n=33)

● Week 1
Feedback
Form:Deep
Learning - IIT
Ropar!! (unit?
unit=17&lesso
n=35)

● Quiz: Week 1
: Assignment
1
(assessment?
name=301)

● Week 1 :
Solution (unit?
unit=17&lesso
n=311)

Week 2 ()

Week 3 ()

week 4 ()

Week 5 ()

x_1	x_2	y
0	0	1
0	1	1
1	0	1
1	1	0

Assume that the elements in \mathbf{w} are initialized to zero and the perceptron learning algorithm is used to update the weights \mathbf{w} . If the learning algorithm runs for long enough iterations, then

- ☐ The algorithm never converges
- ☒ The algorithm converges (i.e., no further weight updates) after some iterations
- ☐ The classification error remains greater than zero
- ☒ The classification error becomes zero eventually

Yes, the answer is correct.

Score: 1

Accepted Answers:

The algorithm converges (i.e., no further weight updates) after some iterations

The classification error becomes zero eventually

6) We know from the lecture that the decision boundary learned by the perceptron is a **1 point** line in \mathbb{R}^2 . We also observed that it divides the entire space of \mathbb{R}^2 into two regions, suppose that the input vector $x \in \mathbb{R}^4$, then the perceptron decision boundary will divide the whole \mathbb{R}^4 space into how many regions?

- ☒ It depends on whether the data points are linearly separable or not.
- ☐ 3
- ☐ 4
- ☐ 2
- ☐ 5

No, the answer is incorrect.

Score: 0

Accepted Answers:

2

7) Choose the correct input-output pair for the given MP Neuron.

1 point

$$f(x) = \begin{cases} 1, & \text{if } x_1 + x_2 + x_3 < 2 \\ 0, & \text{otherwise} \end{cases}$$

- ☒ $y = 1$ for $(x_1, x_2, x_3) = (0, 0, 0)$
- ☐ $y = 0$ for $(x_1, x_2, x_3) = (0, 0, 1)$
- ☒ $y = 1$ for $(x_1, x_2, x_3) = (1, 0, 0)$
- ☐ $y = 1$ for $(x_1, x_2, x_3) = (1, 1, 1)$
- ☒ $y = 0$ for $(x_1, x_2, x_3) = (1, 0, 1)$

Yes, the answer is correct.

Score: 1

Week 6 ()

Week 7 ()

Week 8 ()

Week 9 ()

week 10 ()

Week 11 ()

Week 12 ()

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Session -
Jan 2025 ()

Accepted Answers:

$$y = 1 \text{ for } (x_1, x_2, x_3) = (0, 0, 0)$$

$$y = 1 \text{ for } (x_1, x_2, x_3) = (1, 0, 0)$$

$$y = 0 \text{ for } (x_1, x_2, x_3) = (1, 0, 1)$$

8) Consider the following table, where x_1 and x_2 are features (packed into a single vector $\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$) and y is a label: **1 point**

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	1

Suppose that the perceptron model is used to classify the data points. Suppose further that the weights \mathbf{w} are initialized to $\mathbf{w} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$. The following rule is used for classification,

$$y = \begin{cases} 1 & \text{if } \mathbf{w}^T \mathbf{x} > 0 \\ 0 & \text{if } \mathbf{w}^T \mathbf{x} \leq 0 \end{cases}$$

The perceptron learning algorithm is used to update the weight vector \mathbf{w} . Then, how many times the weight vector \mathbf{w} will get updated during the entire training process?

- ☒ 0
☐ 1
☐ 2
☐ Not possible to determine

Yes, the answer is correct.

Score: 1

Accepted Answers:

0

9) Which of the following threshold values of MP neuron implements AND Boolean function? Assume that the number of inputs to the neuron is 3 and the neuron does not have any inhibitory inputs. **1 point**

- ☐ 1
☐ 2
☒ 3
☐ 4
☐ 5

Yes, the answer is correct.

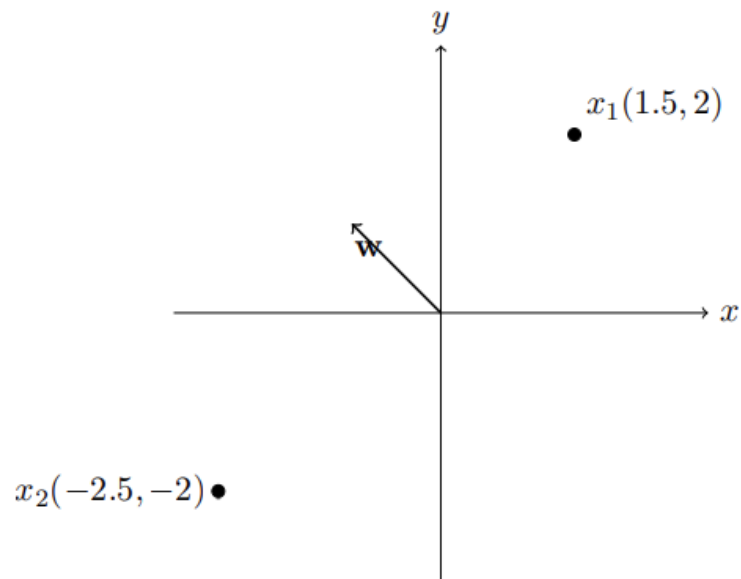
Score: 1

Accepted Answers:

3

10) Consider points shown in the picture. The vector $\mathbf{w} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$. As per this weight vector, the Perceptron algorithm will predict which classes for the data points x_1 and x_2 . **1 point**

NOTE: $y = \begin{cases} 1 & \text{if } \mathbf{w}^T \mathbf{x} > 0 \\ 0 & \text{if } \mathbf{w}^T \mathbf{x} \leq 0 \end{cases}$

☐

$x_1 = -1$

☒

$x_1 = 1$

☐

$x_2 = -1$

☒

$x_2 = 1$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$x_1 = 1$

$x_2 = 1$