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**NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Introduction To Machine Learning (course)**


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## Course outline

**How does an  
NPTEL  
online  
course  
work? ()**

**Week 0 ()**

**Week 1 ()**

**Week 2 ()**

**Week 3 ()**

**Week 4 ()**

- ☐ Separating  
Hyperplane  
Approaches -  
Perceptron  
Learning

# Week 4: Assignment 4

The due date for submitting this assignment has passed.

**Due on 2023-08-23, 23:59 IST.**

**Assignment submitted on 2023-08-23, 08:32 IST**

1) Consider the data set given below.

**1 point**

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

Claim: PLA (perceptron learning algorithm) can learn a classifier that achieves zero misclassification error on the training data. This claim is:

- ☒ True  
☐ False  
☐ Depends on the initial weights  
☐ True, only if we normalize the feature vectors before applying PLA.

No, the answer is incorrect.

Score: 0

Accepted Answers:

False

2) Which of the following loss functions are convex? (Multiple options may be correct) **1 point**

- ☐ 0-1 loss (sometimes referred as mis-classification loss)  
☒ Hinge loss  
☒ Logistic loss  
☒ Squared error loss

(unit?  
unit=51&lesso  
n=52)

☐ Support  
Vector  
Machines I -  
Formulation  
(unit?  
unit=51&lesso  
n=53)


☐ Support  
Vector  
Machines II -  
Interpretation  
and Analysis  
(unit?  
unit=51&lesso  
n=54)

☐ SVMs for  
Linearly Non  
Separable  
Data (unit?  
unit=51&lesso  
n=55)

☐ SVM Kernels  
(unit?  
unit=51&lesso  
n=56)

☐ Hingle Loss  
formulation  
of SVM  
Objective  
(unit?  
unit=51&lesso  
n=57)

☐ Practice:  
Week 4:  
Assignment 4  
(Non Graded)  
(assessment?  
name=179)

 **Quiz: Week 4:  
Assignment 4**  
(assessment?  
name=212)

☐ Week 4  
Feedback  
Form :  
Introduction  
To Machine  
Learning

Yes, the answer is correct.

Score: 1

Accepted Answers:

*Hinge loss*

*Logistic loss*

*Squared error loss*

3) Which of the following are valid kernel functions?

**1 point**



$$(1 + \langle x, x' \rangle)^d$$



$$\tanh(K_1 \langle x, x' \rangle + K_2)$$



$$\exp(-\gamma \|x - x'\|^2)$$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$$(1 + \langle x, x' \rangle)^d$$

$$\tanh(K_1 \langle x, x' \rangle + K_2)$$

$$\exp(-\gamma \|x - x'\|^2)$$

4) Consider the 1 dimensional dataset:

**1 point**

$x$	$y$
-1	1
0	-1
2	1

(Note:  $x$  is the feature, and  $y$  is the output)

State true or false: The dataset becomes linearly separable after using basis expansion with the

following basis function  $\phi(x) = \begin{bmatrix} 1 \\ x^3 \end{bmatrix}$

☒ True

☐ False

No, the answer is incorrect.

Score: 0

Accepted Answers:

*False*

5) State True or False:

**1 point**

SVM cannot classify data that is not linearly separable even if we transform it to a higherdimensional space.

☐ True

☒ False

Yes, the answer is correct.

Score: 1

Accepted Answers:

*False*

(unit?  
unit=51&lesso  
n=192)

☐ Week 4:  
Solution (unit?  
unit=51&lesso  
n=214)

**Week 5 ()**

**Week 6 ()**

**Week 7 ()**

**Week 8 ()**

**Week 9 ()**

**Text  
Transcripts ()**

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**Problem  
Solving  
Session -  
July 2023 ()**

6) State True or False:

**1 point**

The decision boundary obtained using the perceptron algorithm does not depend on the initial values of the weights.

- ☐ True  
☒ False

Yes, the answer is correct.

Score: 1

Accepted Answers:

*False*

7) Consider a linear SVM trained with  $n$  labeled points in  $R^2$  without slack penalties and resulting in  $k = 2$  support vectors, where  $n > 100$ . By removing one labeled training point and retraining the SVM classifier, what is the maximum possible number of support vectors in the resulting solution? **1 point**

- ☐ 1  
☐ 2  
☒ 3  
☐  $n - 1$   
☐  $n$

No, the answer is incorrect.

Score: 0

Accepted Answers:

*$n - 1$*

8) Consider an SVM with a second order polynomial kernel. Kernel 1 maps each input data point  $x$  to  $K_1(x) = \begin{bmatrix} x \\ x^2 \end{bmatrix}$ . Kernel 2 maps each input data point  $x$  to  $K_2(x) = \begin{bmatrix} 3x \\ 3x^2 \end{bmatrix}$ . Assume the hyper-parameters are fixed. Which of the following option is true? **1 point**

- ☒ The margin obtained using  $K_2(x)$  will be larger than the margin obtained using  $K_1(x)$ .  
☐ The margin obtained using  $K_2(x)$  will be smaller than the margin obtained using  $K_1(x)$ .  
☐ The margin obtained using  $K_2(x)$  will be the same as the margin obtained using  $K_1(x)$ .

Yes, the answer is correct.

Score: 1

Accepted Answers:

*The margin obtained using  $K_2(x)$  will be larger than the margin obtained using  $K_1(x)$ .*