

EdX and its Members use cookies and other tracking technologies for performance, analytics, and marketing purposes. By using this website, you accept this use. Learn more about these technologies in the [Privacy Policy](#).

[End My Exam](#)

47:56:56



You are taking "[Midterm Exam 1](#)" as a timed exam. The timer on the right shows the time remaining in the exam. To receive credit for problems, you must select "Submit" for each problem before you select "End My Exam". [Show Less](#)

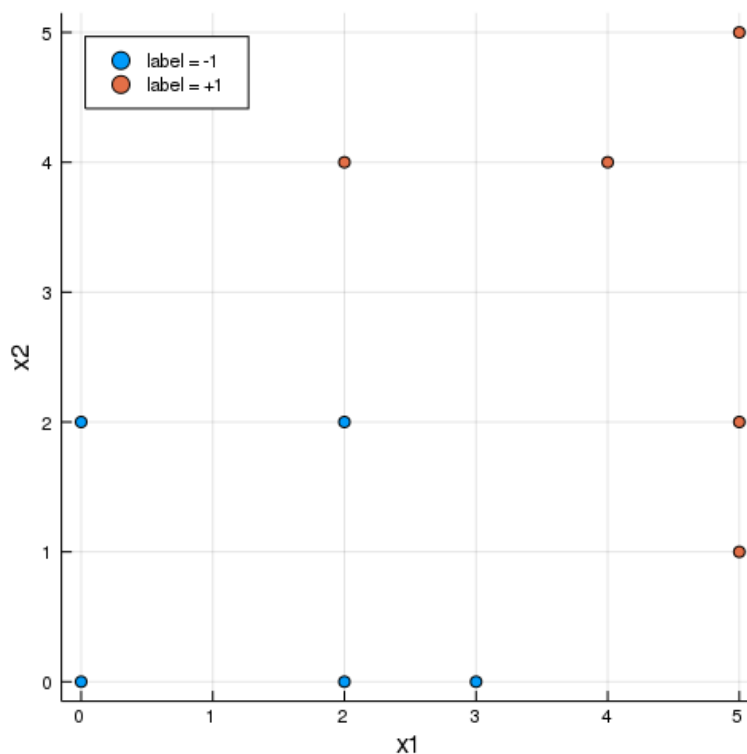
[Course](#) > [Midterm Exam \(1 w...](#) > [Midterm Exam 1](#) > Problem 1

## Problem 1

Midterm due Nov 9, 2020 18:59 EST

### Problem 1. Linear Classification

Consider a labeled training set shown in figure below:



## 1. (1)

2 points possible (graded, results hidden)

We initialize the parameters to all zero values and run the **linear perceptron algorithm** through these points in a particular order until convergence. The number of mistakes made on each point are shown in the table below. (These points correspond to the data point in the plot above)

Label	-1	-1	-1	-1	-1	+1	+1	+1	+1	+1
Coordinates	(0,0)	(2,0)	(3,0)	(0,2)	(2,2)	(5,1)	(5,2)	(2,4)	(4,4)	(5,5)
Perceptron mistakes	1	9	10	5	9	11	0	3	1	1

**Note:** You should be able to arrive at the answer without programming.

What is the resulting offset parameter  $\theta_0$ ?

Enter the numerical value for  $\theta_0$ :

$\theta_0 =$

What is the resulting parameter  $\theta$ ?

(Enter  $\theta$  as a vector, e.g. type  $[0, 1]$  if  $\theta = \begin{bmatrix} 0 & 1 \end{bmatrix}^T$ .)

$\theta =$

STANDARD NOTATION

Submit

You have used 0 of 3 attempts

## 1. (2)

1 point possible (graded, results hidden)

**Setup as above:** We initialize the parameters to all zero values and run the **linear**

**perceptron algorithm** through these points in a particular order until convergence.

The number of mistakes made on each point are shown in the table below. (These points correspond to the data points in the plot above.)

Label	-1	-1	-1	-1	-1	+1	+1	+1	+1	+1
Coordinates	(0,0)	(2,0)	(3,0)	(0,2)	(2,2)	(5,1)	(5,2)	(2,4)	(4,4)	(5,5)
Perceptron mistakes	1	9	10	5	9	11	0	3	1	1

The mistakes that the algorithm makes often depend on the order in which the points were considered. Could the point  $(5, 2)$  labeled  $+1$  have been the first one considered?

☐ yes

☐ no

☐ depends

Submit

You have used 0 of 3 attempts

1. (3)

2 points possible (graded, results hidden)

Suppose that we now find the linear separator that **maximizes** the margin instead of running the perceptron algorithm.

What are the parameters  $\theta_0$  and  $\theta$  corresponding to the **maximum margin separator**?

(Enter  $\theta_0$  accurate to at least 3 decimal places.)

$\theta_0 =$

(Enter  $\theta$  as a vector, enclosed in square brackets, and components separated by commas, e.g. type  $[0, 1]$  for  $\begin{bmatrix} 0 & 1 \end{bmatrix}^T$ .)

 $\theta =$ [STANDARD NOTATION](#)

You have used 0 of 3 attempts

---

1. (4)

1 point possible (graded, results hidden)

What is the value of the margin attained?

(Enter an exact answer or decimal accurate to at least 2 decimal places.)

**Grading note:** Both reasonable answers will be accepted. In case the definition of the margin is not clear, we have accepted both the distance between the separator and the margin, and the distance between the 2 margin boundaries, as correct answers.

You have used 0 of 3 attempts

---

1. (5)

1 point possible (graded, results hidden)

Using the parameters  $\theta_0$  and  $\theta$  corresponding to the **maximum margin separator**, what is the sum of Hinge losses evaluated on each example?

Sum of hinge losses:

You have used 0 of 3 attempts

## 1. (6)

1 point possible (graded, results hidden)

Suppose we modify the maximum margin solution a bit and divide both  $\theta$  and  $\theta_0$  by 2. What is the sum of hinge losses evaluated on each example for this new separator?

Sum of hinge losses:

You have used 0 of 3 attempts

## Error and Bug Reports/Technical Issues

**Topic:** Midterm Exam (1 week):Midterm Exam 1 / Problem 1[Add a Post](#)

Show all posts



by recent activity



	<a href="#">[Staff] Invalid Input: 1.(3)</a>	1
	<a href="#">Clarification: Answer Formatting</a>	1
	<a href="#">[Staff] problem about question 1[1]</a> <a href="#">I ran my programing, got total number of mistakes same as the table show, but the number of mi...</a>	28
	<a href="#">When finding the maximum margin separator, don't we have to consider regularization?</a> <a href="#">When finding the maximum margin separator, isn't there an element of regularization involved? ...</a>	2
	<a href="#">Q(3) unable to submit answer</a> <a href="#">I also have the same issue when trying to submit theta value in question (3) and I get [edited to re...</a>	8
	<a href="#">1(1)</a> <a href="#">Not looking for any hints as this is an exam but I have struggled with question one. Anyone else s...</a>	1
	<a href="#">help for payment</a> <a href="#">It seems i can not pay to get verified course now. Is there another way for me to pay to get verifie...</a>	2

<b>?</b> <u>I only get the figure and no questions?</u> <u>Why can I not see the questions?</u>	1
<b>?</b> <u>Question 3(1) - multiple answers possible?</u>	2
<b>?</b> <u>1.3 Which algorithm are we supposed to use?</u> <u>Shall we find the optimum for the Perceptron, use SVM or use Pegasos? I'm using Pegasos for tha...</u>	3
<b>?</b> <u>Question 1 clarification</u> <u>Hi staff, I am looking for clarification regarding question 1. In the problem statement it says: &gt; run...</u>	3
<b>?</b> <u>Question 3 - Is it allowed to ask clarification for question text?</u> <u>I think that a parameter is missing in the text in order to get a unique answer, is it correct? is ther...</u>	1
<b>✓</b> <u>how do I know my answers are correct and not submitting another set of answer?</u>	2

© All Rights Reserved