

Unit 5 - Week 2 - Rosenblatt's Perceptron

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Assignment 02

The due date for submitting this assignment has passed. **Due on 2019-08-21, 23:59 IST.**
As per our records you have not submitted this assignment.

Instructions:

- Attempt all questions.
- Submission deadline: 14th August 2019 23:59 IST
- Solutions to be posted: 15th August 2019
- Older browsers might show unnecessary vertical bars at the end of math equations.

1) During classification of a linearly separable dataset using the perceptron algorithm, as the value of learning rate (η) is increased, then **2 points**

The number of steps required for convergence decreases.
 The number of steps required for convergence increases.
 Number of steps required for convergence is independent of the learning rate.
 The number of steps required for convergence decreases exponentially with the learning rate.

No, the answer is incorrect.
Score: 0
Accepted Answers: Number of steps required for convergence is independent of the learning rate.

2) Suppose a student wants to identify whether a given high dimensional data is linearly separable or not. A simple way he can do so is by **2 points**

Visualizing three randomly chosen coordinates from the high dimensional data.
 Retaining only those components having high energy and visualizing the data.
 There is no way to know whether the dataset is linearly separable or not.
 Running perceptron algorithm and checking for convergence.

No, the answer is incorrect.
Score: 0
Accepted Answers: Running perceptron algorithm and checking for convergence.

3) The minimum value of $2x + y - 2z$ subject to the constraint $x^2 + y^2 + z^2 = 1$ is **2 points**

9
 3
 -3
 -1

No, the answer is incorrect.
Score: 0
Accepted Answers: -3

4) Consider four corners of a unit square where each corner can be colored by either red or blue. Out of the 2^4 possible combinations, how many combinations can a single perceptron be able to separate corners with same colors? **2 points**

16
 14
 10
 4

No, the answer is incorrect.
Score: 0
Accepted Answers: 14

5) (True/False) The linear decision boundary realized by perceptron learning algorithm must pass through the origin. **2 points**

True
 False

No, the answer is incorrect.
Score: 0
Accepted Answers: False

6) For each of the following tasks (**a** → Recommending a book to a user in an online bookstore, **b** → Playing tic tac toe, **c** → Clustering movies into different types, **d** → Learning to play music), identify which type of learning is involved (1 → supervised, 2 → reinforcement, or 3 → unsupervised) **2 points**

a → 1, **b** → 2, **c** → 3, **d** → 1.
 a → 2, **b** → 3, **c** → 1, **d** → 1.
 a → 3, **b** → 1, **c** → 1, **d** → 2.
 a → 1, **b** → 2, **c** → 3, **d** → 2.

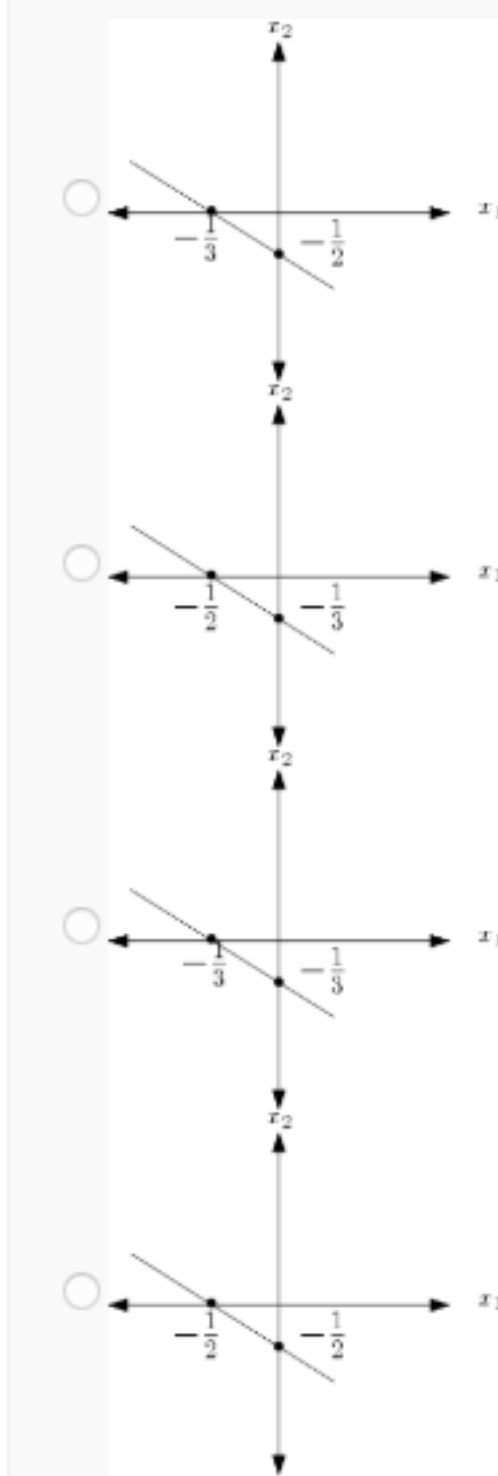
No, the answer is incorrect.
Score: 0
Accepted Answers: a → 1, b → 2, c → 3, d → 1.

7) Consider the perceptron in two dimensions: $h(x) = \text{sign}(w^T x)$ where $w = [w_0, w_1, w_2]$ and $x = [1, x_1, x_2]$. The regions on the plane where $h(x) = +1$ and $h(x) = -1$ are separated by a line. If we express this line by the equation $x_2 = ax_1 + b$, then a and b are **2 points**

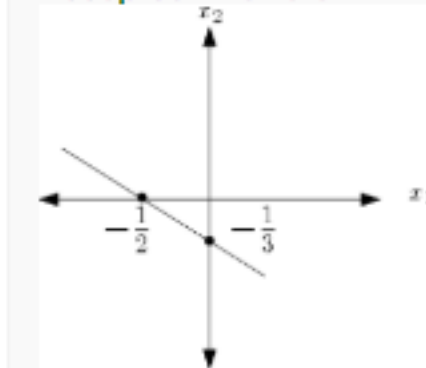
$a = \frac{w_1}{w_2}$ and $b = \frac{w_0}{w_2}$.
 $a = -\frac{w_1}{w_2}$ and $b = -\frac{w_0}{w_2}$.
 $a = -\frac{w_2}{w_1}$ and $b = -\frac{w_0}{w_1}$.
 $a = -\frac{w_1}{w_0}$ and $b = -\frac{w_2}{w_0}$.

No, the answer is incorrect.
Score: 0
Accepted Answers: $a = -\frac{w_1}{w_2}$ and $b = -\frac{w_0}{w_2}$.

8) In continuation with question 7, the line with $w = [-1, -2, -3]$ is **2 points**



No, the answer is incorrect.
Score: 0
Accepted Answers:



9) (True/False) The perceptron learning algorithm always results in the same linear decision boundary irrespective of the initial conditions of the weight parameters. **2 points**

True
 False

No, the answer is incorrect.
Score: 0
Accepted Answers: False

10) Consider two one-dimensional Gaussian distributed classes with mean values $\mu_1 = -10$ and $\mu_2 = 10$ that have a common variance equal to 1. These two classes are essentially linearly separable. The hyperplane capable of classifying the classes is given by $y = w^T x + b$ where y is the log likelihood ratio. The values of w and b are **2 points**

$w = 10, b = 10$
 $w = -10, b = 0$
 $w = -20, b = 10$
 $w = -20, b = 0$

No, the answer is incorrect.
Score: 0
Accepted Answers: $w = -20, b = 0$