MITx 6.86x
Machine Learning with Python-From Linear Models to Deep Learning

Course   Progress   Dates   Discussion   Resources

Course / Unit 1. Linear Classifiers and Generalizations (2 weeks) / Homework 1

‹ Previous

2. Perceptron Performance

Bookmark this page

Homework due Feb 22, 2023 08:59 -03 Past due

In class we initialized the perceptron algorithm with $\theta = 0$. In this problem we will also initialization choices.

---

2. (a)

2 points possible (graded)

The following table shows a data set and the number of times each point is misclassifie perceptron algorithm (**with offset θ_0**). θ and θ_0 are initialized to zero.

i	$x^{(i)}$	$y^{(i)}$	times misclassified
1	[-4, 2]	+1	1
2	[-2, 1]	+1	0
3	[-1, -1]	-1	2
4	[2, 2]	-1	1
5	[1, -2]	-1	0

Write down the state of θ and θ_0 after this run has completed (note, the algorithm may converged). Enter θ as a list $[\theta_1, \theta_2]$ and θ_0 as a single number in the following boxes.

Please enter θ:

[ ]

Please enter θ_0 :

[ ]

Submit   You have used 0 of 3 attempts

---

2. (b)

The theorem from question 1. (e) provides an upper bound on the number of steps of th
and implies that it indeed converges. In this question, we will show that the result still h
initialized to

In other words: Given a set of training examples that are linearly separable through the
initialization of   does not impact the perceptron algorithm's ability to eventually conve

To derive the bounds for convergence, we assume the following inequalities holds:

- There exists   such that   for all   and some

- All the examples are bounded

If   is initialized to   , we can show by induction that:

For instance,

If we initialize   to a general (not necessarily 0)   , then:

Determine the formulation of   in terms of   and   :

Important: Please enter   as theta^{star} and   as theta^{0}, and use norm(...) for th

```
┌─────────────────────────────────────────────────┐
│                                                 │
│                                                 │
└─────────────────────────────────────────────────┘
```

If   is initialized to   , we can show by induction that:

From the above inequality, we can derive the inequality   by applyin

inequality: if   .

If   is initialized to   , we then use the fact that   to get the upper bc

In the case where we initialize   to a general   , use the inequality for   abo

to derive a bound on the number of iterations   .

Hint: Use the larger root of a quadratic equation to obtain the upper bound.

Note: Give your answer in terms of   (enter the latter as ₉ₐₘₘₐ).

? STANDARD NOTATION

Submit   You have used 0 of 3 attempts

2. (d)

2/2 points (graded)

Since the convergence of the perceptron algorithm doesn't depend on the initialization
on the training set must be the same. Are the resulting   's the same regardless of the i

○ Yes

◉ No

✔

Does this necessarily imply that the performance on a test set is the same?

○ Yes

☑ [Part 2 (c)](#)

💬 [can you give us a hint on 2c?](#)
seems like we have to solve multiple inequalities but dont know how to solve that in python.

❓ [How is the update rule additively associative?](#)
This relates to the additional insight in 2(a). On the previous page we found that the iteration order affects th

❓ [any further explanation for 2c?](#)
I still do not really get the explanation after seeing it. any further explanation?

❓ [I believe my answer to 2(c) estimate k was correct](#)
I believe my answer to 2(c) estimate k was correct. It was just in an alternative algebraic form, yet the system

💬 [Note to TA on question 2(a)](#)
Hi, In this question the number of times each point is misclassified is stated as 2 for i = 3. I ran some tests an

💬 [Finally understanding 2(a)](#)
Well, i've got the correct answer after reading this a hundred times. What the problem try to tell us is: "During

💬 [Question 2(a): where could I have gone wrong with this?](#)
Hi all, I am failing to understand where I have gone wrong with this question. My approach : Initially set theta

💬 [IMPROVEMENTS](#)
I really don't like how the course is being carried out so far. It would be nice to have slides to download, in cla

💬 [please read these highlights first](#)

  👤 [Community TA](#)

❓ [Why do we have a graded problem that builds from an optional problem?](#)
It is strange to me that we have a graded problem here that builds from the concepts of an optional problem

❓ [[staff] incorrectly marked on 2.a](#)
Hello staff, could you check my submission history on question 2(a)? I think I got the correct answer in eithe

💬 [Please fix this.](#)
In question 2b, when only one of input values is wrong the grader determines both as wrong. Please fix this.

edX

edX

[About](#)
[Affiliates](#)

Connect

Blog

Contact Us

Help Center

Security

Media Kit