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## Machine Learning with Python-From Linear Models to Deep Learning

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## **6. Perceptron Updates**

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

In this problem, we will try to understand the convergence of perceptron algorithm and ordering of the training samples for the following simple example.

Consider a set of n=d labeled d-dimensional feature vectors,  $\{(x^{(t)},y^{(t)})\,,t=1,$  follows:

$$x_i^{(t)} = \cos{(\pi t)}$$
 if  $i = t$ 

$$x_i^{(t)} = 0$$
 otherwise,

Recall the no-offset perceptron algorithm, and assume that  $heta \cdot x = 0$  is treated as a mature label. Assume that in all of the following problems, we initialize heta = 0 and when we refall algorithm we only consider the no-offset variant of it.

## Working out Perceptron Algorithm

3 points possible (graded)

Consider the d=2 case. Let  $y^{(1)}=1, y^{(2)}=1$ . Assume that the feature vector  $x^{(1)}$  perceptron algorithm before  $x^{(2)}$ .

For this particular assignment of labels, work out the perceptron algorithm until converg

Let  $\hat{ heta}$  be the resulting heta value after convergence. Note that for d=2,  $\hat{ heta}$  would be a tw Let's denote the first and second components of  $\hat{ heta}$  by  $\hat{ heta}_1$  and  $\hat{ heta}_2$  respectively.

Please enter the total number of updates made to heta by perceptron algorithm:

Please enter the numerical value of	$\hat{m{ heta}}_1$
Please enter the numerical value of	$\hat{m{ heta}}_2$

	tne or	dering of the feature vectors pres	sented to it and their labeling
C		ptron algorithm will make at most dering of the feature vectors pres	
S	ubmit	You have used 0 of 3 attempts	
Ske	etching	g convergence	
Con	sider the plane thr		hat all the feature vectors are positions and whose vector representations a
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s <u>Superscripts for reature vectors:</u>

? Solution after deadline

- Will solutions for questions be available (provided) after deadline is past? Even after submitting answers, I do
- Working out Perceptron Algorithm Should clarify that x\_i^(d) is [x\_1, x\_2, ..., x\_d]^(d) vector. When I saw "i" I thought that was the "i" of the percentage of the percent

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