6. Perceptron Updates

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:

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

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

Recall the no-offset perceptron algorithm, and assume that $\theta \cdot x = 0$ is treated as a m label. Assume that in all of the following problems, we initialize $\theta = 0$ and when we refe 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 $\hat{\theta}$ be the resulting θ value after convergence. Note that for $d = 2$, $\hat{\theta}$ would be a tw Let's denote the first and second components of $\hat{\theta}$ by $\hat{\theta}_1$ and $\hat{\theta}_2$ respectively.

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

Please enter the numerical value of $\hat{\theta}_1$:

Please enter the numerical value of $\hat{\theta}_2$:

- Perceptron algorithm will make at least updates to with the exact number of the ordering of the feature vectors presented to it and their labeling
- Perceptron algorithm will make at most updates to with the exact number of the ordering of the feature vectors presented to it and their labeling

Submit You have used 0 of 3 attempts

Sketching convergence

1 point possible (graded)

Consider the case with . Also assume that all the feature vectors are positively la the plane through the three points in a 3-d space whose vector representations are giv vectors .

Let denote the value of after perceptron algorithm converges for this example. Let connecting the origin and . Which of the following options is true regarding the vector

- is parallel to the plane
- is per n
- is perpendicular to the plane and pointing towards it

Previous Next

Superscripts for feature vectors?

? 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 perce

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