Course › Unit 1 Linear Classifiers and Generalizations (2 weeks) › Project 1: Automatic Review Analyzer › 3. Perceptron Algorithm

3. Perceptron Algorithm

Now you will implement the Perceptron algorithm

Perceptron Single Step Update

0/1 point (graded)

Now you will implement the single step update for the perceptron algorithm (implemented with $0-1$ loss). You will be given the feature vector as an array of numbers, the current θ and θ_0 parameters, and the correct label of the feature vector. The function should return a tuple in which the first element is the correctly updated value of θ and the second element is the correctly updated value of θ_0.

Available Functions: You have access to the NumPy python library as `np`.

Tip:: Because of numerical instabilities, it is preferable to identify 0 with a small range $[-\varepsilon, \varepsilon]$. That is, when x is a float, "$x = 0$" should be checked with $|x| < \varepsilon$.

```
def perceptron_single_step_update(
        feature_vector,
        label,
        current_theta,
        current_theta_0):
    """
    Properly updates the classification parameter, theta and theta_0, on a
    single step of the perceptron algorithm.

    Args:
        feature_vector - A numpy array describing a single data point.
        label - The correct classification of the feature vector.
        current_theta - The current theta being used by the perceptron
            algorithm before this update.
        current_theta_0 - The current theta_0 being used by the perceptron
```

Press ESC then TAB or click outside of the code editor to exit

Processing

Your answer has been submitted. As soon as your submission is graded, this message will be replaced with the grader's feedback.

Submit You have used 2 of 20 attempts

Full Perceptron Algorithm

0/1 point (graded)

In this step you will implement the full perceptron algorithm. You will be given the same feature matrix and labels array as you were given in **The Complete Hinge Loss**. You will also be given T, the maximum number of times that you should iterate through the feature matrix before terminating the algorithm. Initialize θ and θ_0 to zero. This function should return a tuple in which the first element is the final value of θ and the second element is the value of θ_0.

Tip: Call the function `perceptron_single_step_update` directly without coding it again.

Hint: Make sure you initialize `theta` to a 1D array of shape `(n,)`, and **not** a 2D array of shape `(1, n)`.

Note: Please call `get_order(feature_matrix.shape[0])`, and use the ordering to iterate the feature matrix in each iteration. The ordering is specified due to grading purpose. In practice, people typically just randomly shuffle indices to do stochastic optimization.

Available Functions: You have access to the NumPy python library as `np` and `perceptron_single_step_update` which you have already implemented.

```
def perceptron(feature_matrix, labels, T):
    """
    Runs the full perceptron algorithm on a given set of data. Runs T
    iterations through the data set, there is no need to worry about
    stopping early.

    NOTE: Please use the previously implemented functions when applicable.
    Do not copy paste code from previous parts.

    NOTE: Iterate the data matrix by the orders returned by get_order(feature_matrix.shape[0])

    Args:
        feature_matrix -  A numpy matrix describing the given data. Each row
            represents a single data point.
        labels - A numpy array where the kth element of the array is the
            correct classification of the kth row of the feature matrix
```

Press ESC then TAB or click outside of the code editor to exit

Processing

Your answer has been submitted. As soon as your submission is graded, this message will be replaced with the grader's feedback.

Submit You have used 1 of 20 attempts

Average Perceptron Algorithm

1/1 point (graded)

The average perceptron will add a modification to the original perceptron algorithm: since the basic algorithm continues updating as the algorithm runs, nudging parameters in possibly conflicting directions, it is better to take an average of those parameters as the final answer. Every update of the algorithm is the same as before. The returned parameters θ, however, are an average of the θs across the nT steps:

$$\theta_{final} = \frac{1}{nT}(\theta^{(1)} + \theta^{(2)} + \ldots + \theta^{(nT)})$$

You will now implement the average perceptron algorithm. This function should be constructed similarly to the Full Perceptron Algorithm above, except that it should return the average values of θ and θ_0

Tip: Tracking a moving average through loops is difficult, but tracking a sum through loops is simple.

Note: Please call `get_order(feature_matrix.shape[0])` , and use the ordering to iterate the feature matrix in each iteration. The ordering is specified due to grading purpose. In practice, people typically just randomly shuffle indices to do stochastic optimization.

Available Functions: You have access to the NumPy python library as `np` and `perceptron_single_step_update` which you have already implemented.

```
def average_perceptron(feature_matrix, labels, T):
    """
    Runs the average perceptron algorithm on a given set of data. Runs T
    iterations through the data set, there is no need to worry about
    stopping early.

    NOTE: Please use the previously implemented functions when applicable.
    Do not copy paste code from previous parts.

    NOTE: Iterate the data matrix by the orders returned by get_order(feature_matrix.shape[0])


    Args:
        feature_matrix -  A numpy matrix describing the given data. Each row
            represents a single data point.
        labels - A numpy array where the kth element of the array is the
```

Press ESC then TAB or click outside of the code editor to exit

Correct

Test results

See full output

```
CORRECT
```

See full output

Submit You have used 1 of 20 attempts

✔ Correct (1/1 point)

Discussion

Hide Discussion

Topic: Unit 1 Linear Classifiers and Generalizations (2 weeks):Project 1: Automatic Review Analyzer / 3. Perceptron Algorithm

Add a Post

Show all posts ▼ by recent activity ▼

? Average Perceptron Algorithm 2
I have some doubts about the last implementation. Are we supposed to call "perceptron_single_step_update" function? I would also clarify what it means when we by n*T....

? Why do we require hinge loss >1 1
Grader only accepted my solution for single step update when I required the loss to be>1 (not 0), why is this? Thanks

? Could someone please help... What am I doing wrong? 2
def perceptron_single_step_update(feature_vector, label, current_theta, current_theta_0): if label*(np.dot(feature_vector,np.transpose(current_theta)) + current_theta_0)<...

☑ get_order(feature_matrix.shape[0]) 4
Can someone let me know where the get_order() function is implemented? The one implemented in the project1.py is not the one called here, right?

💬 [P1][1] Implemented with 0–1 loss 3

? Value of epsilon in Perceptron Single Step Update 5
When I ignored the hint, I've got score 0.8/1. The test that was incorrect suggested that I updated thetas when thetas shouldn't be updated. I started playing with different...

? Perceptron single step update: Your output == Correct output, yet marked as incorrect (for all 5 tests). 4

💬 Full Perceptron algorithm help with previously implemented single step perceptron 5
Hello, Im having some trouble with writing the full perceptron algorithm by implementing the single step perceptron function (which worked). The single step perceptron f...

? Average Perceptron Algorithm : Puzzled following error analysis 2

? Issue in test.py in Full perceptron algo 2

☑ Perceptron Single Step Update - What epsilon is reasonable?
What epsilon should I use? Why? I've done the exercise ignoring the tip, and the grader accepted it, but I get the issue. 4

? Using the functions defined earlier
I am getting an error if I use a function that is already defined. Eg. if I use hinge_loss_single in perceptron, I get a NameError message stating hinge_loss_single is not defin... 2

? Q1 Grader is wrong
The testing of the same vectors in the console yields the correct result while the Grader outputs it as error. Also, Q2 and Q3 questions use the function I defined at Q1and ... 14

💬 average nT clarification
Just to understand what type of average is expected Let's say I go through the first row from the matrix, the first n dimensional vector and it requires an update. I should s... 10

Learn About Verified Certificates