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3. Perceptron Algorithm

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Project due Mar 1, 2023 08:59 -03 Completed

Now you will implement the Perceptron algorithm

Perceptron Single Step Update

0.8/1 point (graded)

Now you will implement the single step update for the perceptron algorithm (implement `perceptron_single_step_update`). You will be given the feature vector as an array of numbers, the current θ and θ_0 parameters, and the label of the feature vector. The function should return a tuple in which the first element is the current 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. If x is a float, " $x = 0$ " should be checked with $|x| < \epsilon$.

```
1 def perceptron_single_step_update(  
2     feature_vector,  
3     label,  
4     current_theta,  
5     current_theta_0):  
6     """  
7     Updates the classification parameters `theta` and `theta_0` via a  
8     step of the perceptron algorithm. Returns new parameters rather than  
9     modifying in-place.  
10  
11     Args:  
12         feature_vector - A numpy array describing a single data point.  
13         label - The correct classification of the feature vector.  
14         current_theta - The current theta being used by the perceptron  
15         algorithm before this update.
```

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

Incorrect

Test results

INCORRECT

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.

```
1 def perceptron(feature_matrix, labels, T):
2     """
3     Runs the full perceptron algorithm on a given set of data. Runs T
4     iterations through the data set: we do not stop early.
5
6     NOTE: Please use the previously implemented functions when applicable.
7     Do not copy paste code from previous parts.
8
9     Args:
10         `feature_matrix` - numpy matrix describing the given data.
11                           Each row
12                           represents a single data point.
13         `labels` - numpy array where the kth element of the array is the
14                   correct classification of the kth row of the feature matrix.
15         `T` - integer indicating how many times the perceptron algorithm
16               should iterate through the feature matrix.
```

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Correct

Test results

CORRECT

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You have used 8 of 25 attempts

Average Perceptron Algorithm

1.0/1 point (graded)

The average perceptron will add a modification to the original perceptron algorithm: instead of stopping when the algorithm runs, nudging parameters in possibly conflicting directions, it continues updating as the algorithm runs, nudging parameters in possibly conflicting directions. At the end, it takes an average of those parameters as the final answer. Every update of the algorithm nudges the parameters in a certain direction. The returned parameters, however, are an average of the parameters across the steps:

You will now implement the average perceptron algorithm. This function should be consistent with the Full Perceptron Algorithm above, except that it should return the average values of the parameters across the steps.

```
11         represents a single data point.
12         labels - A numpy array where the kth element of the array is
13                 correct classification of the kth row of the feature
14         T - An integer indicating how many times the perceptron algorithm
15             should iterate through the feature matrix.
```

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CORRECT

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Tested Unit 1: Linear Classifiers and Generalizations (2 weeks): Project 1: Automatic Review Analyzer



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