6. Changing Labels

Project due Oct 21, 2020 05:29 IST *Completed*

We now wish to classify the digits by their (mod 3) value, such that the new label $y^{(i)}$ of sample i is the old $y^{(i)} \pmod 3$. An example is provided in the next section. (Reminder: Return the `temp_parameter` to be 1 if you changed it for the last section)

You will be working in the file `part1/main.py` and `part1/softmax.py` in this problem

Using the Current Model - update target

3.0/3.0 points (graded)

Given that we already classified every $x^{(i)}$ as a digit, we could use the model we already trained and just calculate our estimations (mod 3).

Implement `update_y` function, which changes the old digit labels for the training and test set for the new (mod 3) labels.

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

```
def update_y(train_y, test_y):
    """
    Changes the old digit labels for the training and test set for the new (mod 3)
    labels.

    Args:
        train_y - (n, ) NumPy array containing the labels (a number between 0-9)
                  for each datapoint in the training set
        test_y - (n, ) NumPy array containing the labels (a number between 0-9)
                 for each datapoint in the test set

    Returns:
        train_y_mod3 - (n, ) NumPy array containing the new labels (a number between 0-2)
                       for each datapoint in the training set
        test_y_mod3 - (n, ) NumPy array containing the new labels (a number between 0-2)
                      for each datapoint in the test set
```

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 25 attempts

Using the Current Model - compute test error

3.0/3.0 points (graded)

Implement `compute_test_error_mod3` function, which takes the test points `X`, their correct labels `Y` (digits (mod 3) from 0-2), `theta`, and the `temp_parameter`, and returns the error.

Example:

Estimated Y	Estimated Y (mod 3)	Correct Y	Correct Y (mod 3)

x_1	9	0	8	2
x_2	6	0	6	0
x_3	5	2	8	2

The error of the regression with the original labels would be 0.66667.

In comparison, the error of the regression with the labels after the “mod 3" operation would be 0.33333.

Available Functions: You have access to the NumPy python library as `np` and to the `get_classification` function from the released project.

```
def compute_test_error_mod3(X, Y, theta, temp_parameter):
    """
    Returns the error of these new labels when the classifier predicts the digit. (mod 3)

    Args:
        X - (n, d - 1) NumPy array (n datapoints each with d - 1 features)
        Y - (n, ) NumPy array containing the labels (a number from 0-2) for each
            data point
        theta - (k, d) NumPy array, where row j represents the parameters of our
                model for label j
        temp_parameter - the temperature parameter of softmax function (scalar)

    Returns:
        test_error - the error rate of the classifier (scalar)
    """
    #YOUR CODE HERE
```

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 25 attempts

Using the Current Model - test error

1.0/1.0 point (graded)

Find the error rate of the new labels (call these two functions at the end of `run_softmax_on_MNIST`). See the functions' documentation for detailed explanations of the inputs and outputs.

Error rate for labels mod 3: 0.07679999999999998 ✔ **Answer:** 0.0768

Submit You have used 3 of 20 attempts

Answers are displayed within the problem

Retrain with New Labels

3.0/3.0 points (graded)

Now suppose that instead we want to retrain our classifier with the new labels. In other words, rather than training the model to predict the original digits and then taking those predictions modulo 3, we explicitly train the model to predict the digits modulo 3 from the original image.

How do you expect the performance to change using the new labels?

- ◯ Increase
- ◉ Decrease
- ◯ Stay the same

✔

Implement `run_softmax_on_MNIST_mod3` in **main.py** to perform this new training; report the new error rate.

Error rate when trained on labels mod 3: 0.18720000000000003 ✔ **Answer:** 0.1881

Solution:

We are trying to find common features of all numbers that have the same mod 3 value, however a lot of them look widely different, so it is harder to separate the data set into 3 groups since, for example, 2 does not share many features with 5 or 8. Therefore one would expect the performance to decrease, and this is what happens.

Submit You have used 1 of 2 attempts

ℹ Answers are displayed within the problem

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💬	[staff] Why not leave temp at 0.5 to speed up things? ... wasting another hour ... please vote +1 Please reply with: +1	2
?	Why are we doing mod(3)? What is the purpose of this? I'm scratching my head why we'd want to do this? Is it just to see what happens?	7
💬	Tip that I found helpful for debugging Hi guys, this exercise is encouraging us to be careful with our code by having us execute tests with long run times. For this problem, ...	2
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?	Retrain with New Labels - what exactly is meant by "the performance" Is it performance of the computation (time it takes to complete training of the model) or performance in terms of the error rate?	6
?	compute_test_error_mod3 I'm having trouble to get the answer of the "compute_test_error_mod3" right. It looks simple, but i`m apparently missing something...	4
?	What the freak is mod 3?	3

I do not understand what is mod 3 or how to calculate it for the labels. I have also searched for it on the web and found nothing. Co...

? [Staff] Using the Current Model - compute test error 4

This function should be pretty straightforward but it is taking me quite a while, 9 attempts already and unfortunately it does not hav...

Hint: compute_test_error_mod3 4

The labels you get from **get_classification** must be "mod-ed 3" before comparing them with the labels you receive in parameter ...

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