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Machine Learning with Python-From Linear Models to Deep Learning

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3. Support Vector Machine

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Project due Mar 15, 2023 08:59 -03   Completed

Bob thinks it is clearly not a regression problem, but a classification problem. He thinks
into a binary classification and use the support vector machine we learned in Lecture 4
order to do so, he suggests that we can build an one vs. rest model for every digit. For
digits into two classes: 0 and not 0.

Bob wrote a function `run_svm_one_vs_rest_on_MNIST` where he changed the labels
keeps the label 0 for digit 0. He also found that `sklearn` package contains an SVM mo
directly. He gave you the link to this model and hopes you can tell him how to use that.

You will be working in the file `part1/svm.py` in this problem

Important: For this problem, you will need to use the scikit-learn library. If you don't ha
`install sklearn`

One vs. Rest SVM

5.0/5.0 points (graded)
Use the `sklearn` package and build the SVM model on your local machine. Use `rand`
and default values for other parameters.

Available Functions: You have access to the sklearn's implementation of the linear SVM
need to import anything.

```
 1 def one_vs_rest_svm(train_x, train_y, test_x):
 2     """
 3     Trains a linear SVM for binary classifciation
 4
 5     Args:
 6         train_x - (n, d) NumPy array (n datapoints each with d features)
 7         train_y - (n, ) NumPy array containing the labels (0 or 1) for each
 8         test_x - (m, d) NumPy array (m datapoints each with d features)
 9     Returns:
10         pred_test_y - (m,) NumPy array containing the labels (0 or 1) for e
11     """
12     model = LinearSVC(C=0.1, random_state=0)
13     model.fit(train_x, train_y)
14     pred_test_y = model.predict(test_x)
15
```

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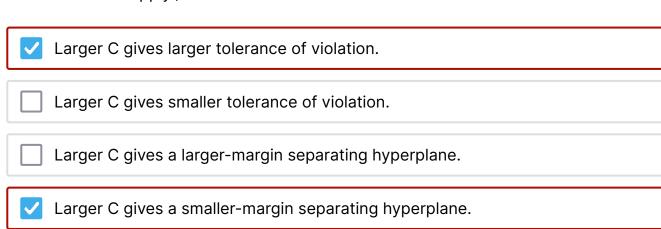
Correct

Test results

Submit   You have used 1 of 20 attempts

Implement C-SVM

0.0/5.0 points (graded)
Play with the C parameter of SVM, what statement is true about the C parameter?

(Choose all that apply.)

- ☑ Larger C gives larger tolerance of violation.

- ☐ Larger C gives smaller tolerance of violation.

- ☐ Larger C gives a larger-margin separating hyperplane.

- ☑ Larger C gives a smaller-margin separating hyperplane.

✗

Submit   You have used 2 of 2 attempts

Multiclass SVM

5.0/5.0 points (graded)
In fact, `sklearn` already implements a multiclass SVM with a one-vs-rest strategy. Us
multiclass SVM model

Available Functions: You have access to the sklearn's implementation of the linear SVM
need to import anything.

```
1 def multi_class_svm(train_x, train_y, test_x):
2     """
3     Trains a linear SVM for multiclass classifciation using a one-vs-rest s
4
5     Args:
6         train_x - (n, d) NumPy array (n datapoints each with d features)
7         train_y - (n, ) NumPy array containing the labels (int) for each tr
8         test_x - (m, d) NumPy array (m datapoints each with d features)
9     Returns:
10        pred_test_y - (m,) NumPy array containing the labels (int) for each
11    """
```

Submit   You have used 1 of 25 attempts

Multiclass SVM error

5.0/5.0 points (graded)
Report the overall test error by running `run_multiclass_svm_on_MNIST`.

0.0818   ✔

Submit   You have used 1 of 20 attempts

Discussion

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