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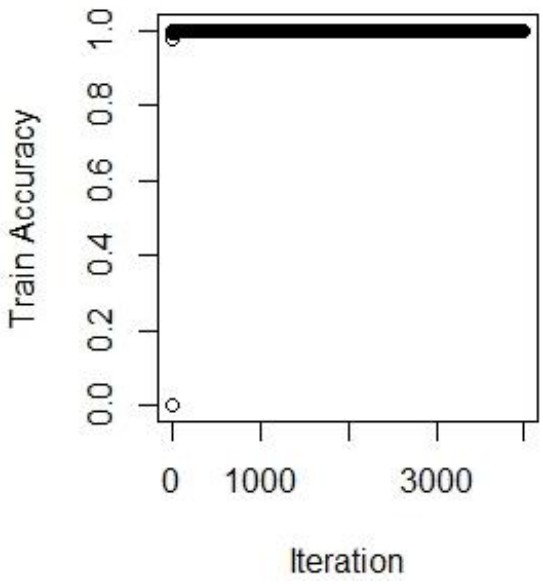
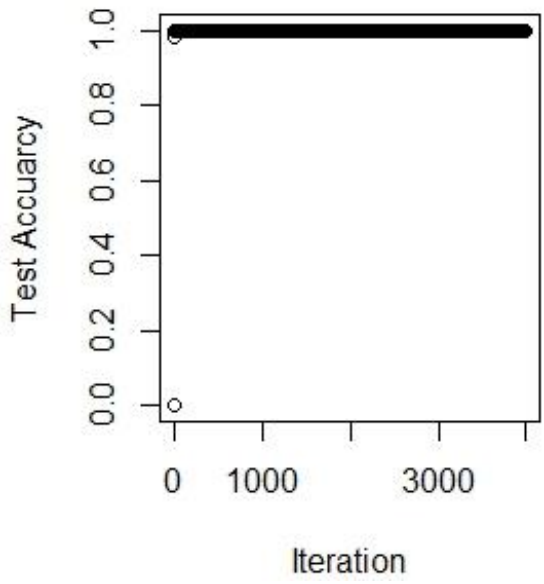
Homework 6 submission-

R Output:

SVM Output:

```
> final_result = train(training_digits, training_labels, testing_digits, testing_labels)
[1] 100   1   1
[1] 200   1   1
[1] 300   1   1
[1] 400   1   1
[1] 500   1   1
[1] 600   1   1
[1] 700   1   1
[1] 800   1   1
[1] 900   1   1
[1] 1000    1    1
[1] 1100    1    1
[1] 1200    1    1
[1] 1300    1    1
[1] 1400    1    1
[1] 1500    1    1
[1] 1600    1    1
[1] 1700    1    1
[1] 1800    1    1
[1] 1900    1    1
[1] 2000    1    1
[1] 2100    1    1
[1] 2200    1    1
[1] 2300    1    1
[1] 2400    1    1
[1] 2500    1    1
[1] 2600    1    1
[1] 2700    1    1
[1] 2800    1    1
[1] 2900    1    1
[1] 3000    1    1
[1] 3100    1    1
[1] 3200    1    1
[1] 3300    1    1
[1] 3400    1    1
[1] 3500    1    1
[1] 3600    1    1
[1] 3700    1    1
[1] 3800    1    1
[1] 3900    1    1
[1] 4000    1    1
```

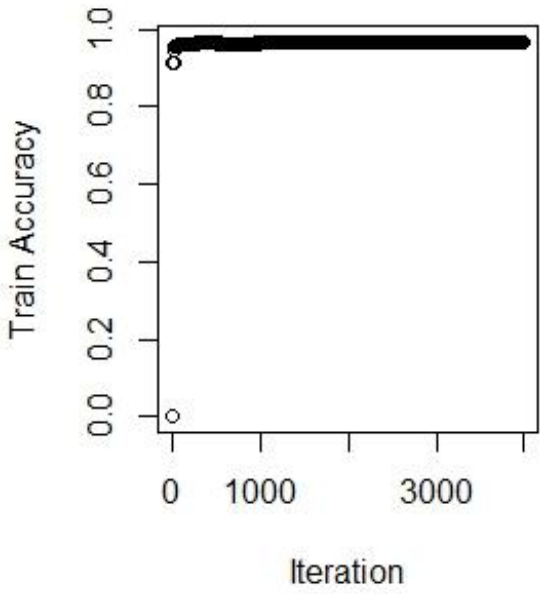


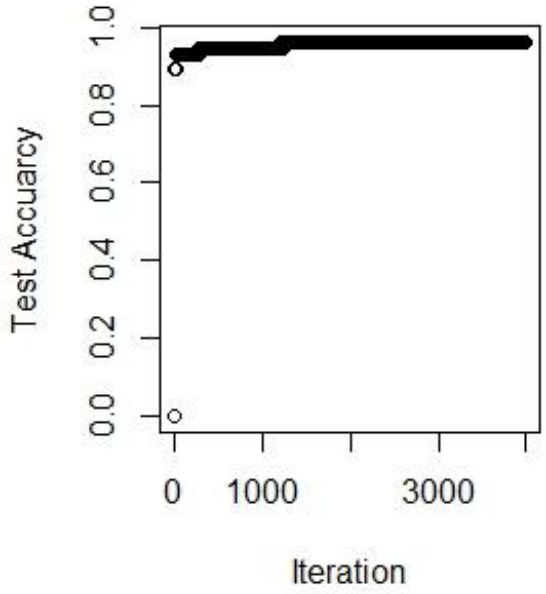


Adaboost Output:

```
> final_result = train(training_digits, training_labels, testing_digits, testing_labels)
[1] 100.0000000   0.9607843   0.9272727
[1] 200.0000000   0.9607843   0.9272727
[1] 300.0000000   0.9686275   0.9454545
[1] 400.0000000   0.9686275   0.9454545
[1] 500.0000000   0.9686275   0.9454545
[1] 600.0000000   0.9607843   0.9454545
[1] 700.0000000   0.9607843   0.9454545
[1] 800.0000000   0.9607843   0.9454545
[1] 900.0000000   0.9607843   0.9454545
[1] 1000.0000000    0.9686275    0.9454545
[1] 1100.0000000    0.9686275    0.9454545
[1] 1200.0000000    0.9686275    0.9454545
[1] 1300.0000000    0.9686275    0.9636364
[1] 1400.0000000    0.9686275    0.9636364
[1] 1500.0000000    0.9686275    0.9636364
[1] 1600.0000000    0.9686275    0.9636364
[1] 1700.0000000    0.9686275    0.9636364
[1] 1800.0000000    0.9686275    0.9636364
[1] 1900.0000000    0.9686275    0.9636364
[1] 2000.0000000    0.9686275    0.9636364
```

```
[1] 2100.0000000    0.9686275    0.9636364
[1] 2200.0000000    0.9686275    0.9636364
[1] 2300.0000000    0.9686275    0.9636364
[1] 2400.0000000    0.9686275    0.9636364
[1] 2500.0000000    0.9686275    0.9636364
[1] 2600.0000000    0.9686275    0.9636364
[1] 2700.0000000    0.9686275    0.9636364
[1] 2800.0000000    0.9686275    0.9636364
[1] 2900.0000000    0.9686275    0.9636364
[1] 3000.0000000    0.9686275    0.9636364
[1] 3100.0000000    0.9686275    0.9636364
[1] 3200.0000000    0.9686275    0.9636364
[1] 3300.0000000    0.9686275    0.9636364
[1] 3400.0000000    0.9686275    0.9636364
[1] 3500.0000000    0.9686275    0.9636364
[1] 3600.0000000    0.9686275    0.9636364
[1] 3700.0000000    0.9686275    0.9636364
[1] 3800.0000000    0.9686275    0.9636364
[1] 3900.0000000    0.9686275    0.9636364
[1] 4000.0000000    0.9686275    0.9636364
```

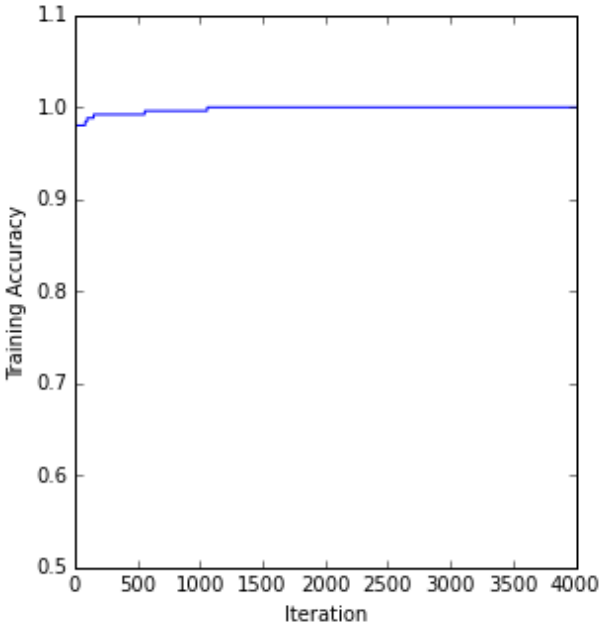


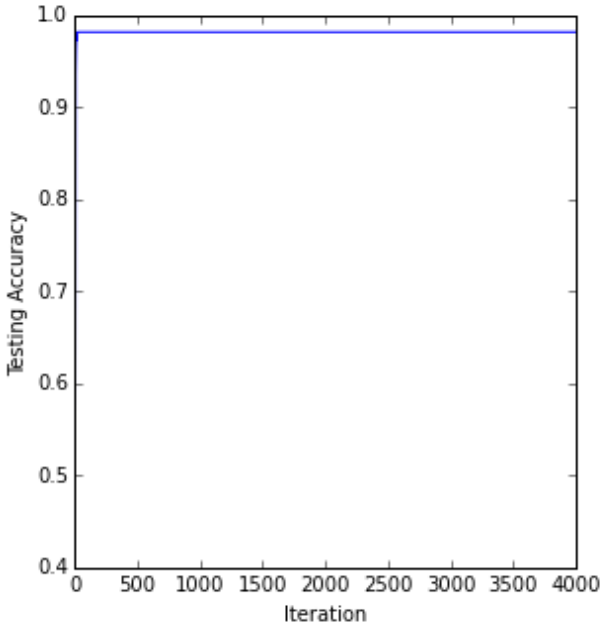


Python Output:

Logistic Regression Output:

```
In [13]: runfile('H:/UCLA Fall 2015/202 - Statistics Programming/HW6/logistic_gradient.py',
wdir='H:/UCLA Fall 2015/202 - Statistics Programming/HW6')
# training 255
# testing 110
After iteration 100, Train Accuracy = 0.988235,Test Accuracy = 0.981818
After iteration 200, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 300, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 400, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 500, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 600, Train Accuracy = 0.996078,Test Accuracy = 0.981818
After iteration 700, Train Accuracy = 0.996078,Test Accuracy = 0.981818
After iteration 800, Train Accuracy = 0.996078,Test Accuracy = 0.981818
After iteration 900, Train Accuracy = 0.996078,Test Accuracy = 0.981818
After iteration 1000, Train Accuracy = 0.996078,Test Accuracy = 0.981818
After iteration 1100, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1200, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1300, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1400, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1500, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1600, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1700, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2100, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2200, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2300, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2400, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2500, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2600, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2700, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3100, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3200, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3300, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3400, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3500, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3600, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3700, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 4000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
```

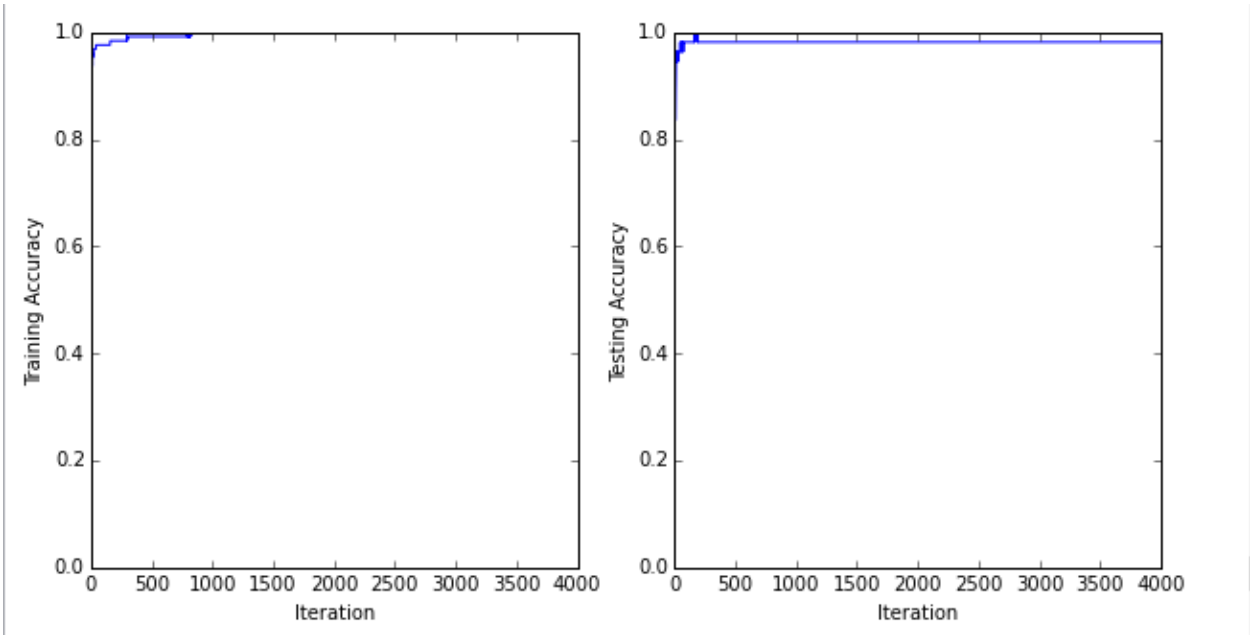




SVM Output:

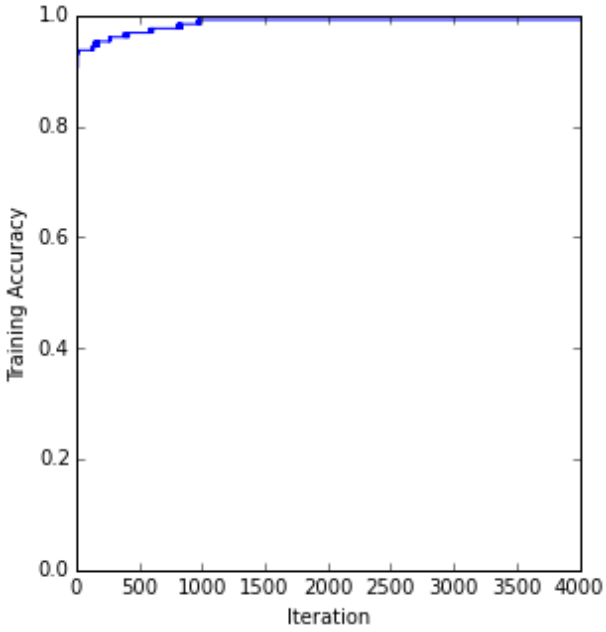
```
In [14]: runfile('H:/UCLA Fall 2015/202 - Statistics Programming/HW6/svm_gradient.py',
wdir='H:/UCLA Fall 2015/202 - Statistics Programming/HW6')
# training 255
# testing 110
After iteration 100, Train Accuracy = 0.976471,Test Accuracy = 0.981818
After iteration 200, Train Accuracy = 0.984314,Test Accuracy = 0.981818
After iteration 300, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 400, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 500, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 600, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 700, Train Accuracy = 0.992157,Test Accuracy = 0.981818
After iteration 800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1100, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1200, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1300, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1400, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1500, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1600, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1700, Train Accuracy = 1.000000,Test Accuracy = 0.981818
```

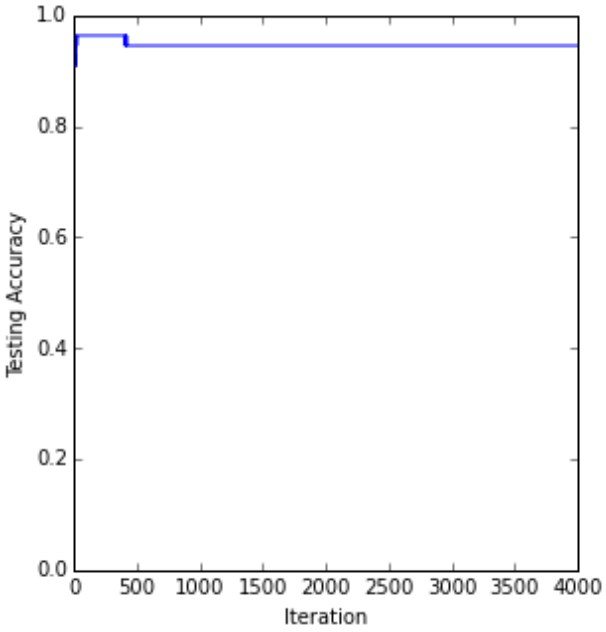
```
After iteration 1800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 1900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2100, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2200, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2300, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2400, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2500, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2600, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2700, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 2900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3100, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3200, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3300, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3400, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3500, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3600, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3700, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3800, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 3900, Train Accuracy = 1.000000,Test Accuracy = 0.981818
After iteration 4000, Train Accuracy = 1.000000,Test Accuracy = 0.981818
```



Adaboost Output:

```
In [21]: runfile('H:/UCLA Fall 2015/202 - Statistics Programming/HW6/adaboost_gradient.py
wdir='H:/UCLA Fall 2015/202 - Statistics Programming/HW6')
# training 255
# testing 110
After iteration 100, Train Accuracy = 0.937255,Test Accuracy = 0.963636
After iteration 200, Train Accuracy = 0.952941,Test Accuracy = 0.963636
After iteration 300, Train Accuracy = 0.960784,Test Accuracy = 0.963636
After iteration 400, Train Accuracy = 0.960784,Test Accuracy = 0.963636
After iteration 500, Train Accuracy = 0.968627,Test Accuracy = 0.945455
After iteration 600, Train Accuracy = 0.976471,Test Accuracy = 0.945455
After iteration 700, Train Accuracy = 0.976471,Test Accuracy = 0.945455
After iteration 800, Train Accuracy = 0.976471,Test Accuracy = 0.945455
After iteration 900, Train Accuracy = 0.984314,Test Accuracy = 0.945455
After iteration 1000, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1100, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1200, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1300, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1400, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1500, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1600, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1700, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1800, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 1900, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2000, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2100, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2200, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2300, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2400, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2500, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2600, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2700, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2800, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 2900, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3000, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3100, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3200, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3300, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3400, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3500, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3600, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3700, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3800, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 3900, Train Accuracy = 0.992157,Test Accuracy = 0.945455
After iteration 4000, Train Accuracy = 0.992157,Test Accuracy = 0.945455
```


Training Accuracy
Iteration
0.0
0.2
0.4
0.6
0.8
1.0
0
500
1000
1500
2000
2500
3000
3500
4000


Testing Accuracy
Iteration
0.0
0.2
0.4
0.6
0.8
1.0
0
500
1000
1500
2000
2500
3000
3500
4000