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TITLE- HOMEWORK 5

**COURSE NAME- 16:332:568 SOFTWARE
ENGINEERING OF WEB APPLICATIONS**

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ANSWER 1

Program results with different learning rates with target error=0.1

```
enter the learning rate0.5
enter the target error0.1
Initial weights after input layer:
[[-0.21783034  0.42700952]
 [ 0.99309257 -0.68491093]]
Initial weights after hidden layer:
[[ 0.54189552]
 [-0.57620389]]
First-batch error is:
1.003079381566953
Final weights after input layer:
[[7.99134794 0.93864625]
 [7.98842956 0.93864223]]
Final weights after hidden layer:
[[ 29.9844588 ]
 [-37.60751321]]
Final error is:
0.09999856630012541
The total number of batches run through in the training is:
35698
```

```
enter the learning rate1
enter the target error0.1
Initial weights after input layer:
[[ 0.61883903  0.21856479]
 [ 0.27302183 -0.01149609]]
Initial weights after hidden layer:
[[-0.21964156]
 [-0.07857479]]
First-batch error is:
1.0040651212384692
Final weights after input layer:
[[7.99029632 0.93864578]
 [7.98922733 0.9386443 ]]
Final weights after hidden layer:
[[ 29.98472843]
 [-37.60784425]]
Final error is:
0.0999978080880737
The total number of batches run through in the training is:
18082
```

```

enter the learning rate0.25
enter the target error0.1
Initial weights after input layer:
[[ 0.46765339 -0.13238672]
 [ 0.47173606 0.361153 ]]
Initial weights after hidden layer:
[[-0.07420504]
 [ 0.92999283]]
First-batch error is:
1.0241916790772516
Final weights after input layer:
[[0.93864195 7.98818539]
 [0.93864524 7.99057525]]
Final weights after hidden layer:
[[-37.60723937]
 [ 29.98423907]]
Final error is:
0.09999999083227301
The total number of batches run through in the training is:
83252

```

```

enter the learning rate0.75
enter the target error0.1
Initial weights after input layer:
[[ 0.43625079 0.55996698]
 [ 0.93791482 -0.61557156]]
Initial weights after hidden layer:
[[ 0.909147 ]
 [-0.05514898]]
First-batch error is:
1.0353608527484195
Final weights after input layer:
[[7.99274308 0.93864745]
 [7.98801335 0.93864093]]
Final weights after hidden layer:
[[ 29.98444624]
 [-37.607501 ]]
Final error is:
0.09999920922508498
The total number of batches run through in the training is:
23350

```

We find that learning rate=1 gives us the best results as it has the smallest number of batches run through in the training.

Program results with different learning rates with target error=0.02

```
enter the learning rate0.25
enter the target error0.02
Initial weights after input layer:
[[-0.84150752  0.94995735]
 [ 0.70625622  0.30128973]]
Initial weights after hidden layer:
[[-0.62055795]
 [ 0.72031853]]
First-batch error is:
1.004595537432087
Final weights after input layer:
[[0.97113942 8.94532327]
 [0.97114127 8.94879326]]
Final weights after hidden layer:
[[-59.4103724 ]
 [ 47.68181181]]
Final error is:
0.01999999449449063
The total number of batches run through in the training is:
1513587
```

```
enter the learning rate0.5
enter the target error0.02
Initial weights after input layer:
[[ 0.64172023 -0.13499458]
 [ 0.58406865 -0.23115338]]
Initial weights after hidden layer:
[[-0.01219978]
 [ 0.35723912]]
First-batch error is:
1.003054351409248
Final weights after input layer:
[[8.94643414 0.97114039]
 [8.94634904 0.97114035]]
Final weights after hidden layer:
[[ 47.68184067]
 [-59.41040546]]
Final error is:
0.019999992269481456
The total number of batches run through in the training is:
757684
```

```

enter the learning rate0.75
enter the target error0.02
Initial weights after input layer:
[[0.08458399 0.4920924 ]
 [0.62242477 0.47415273]]
Initial weights after hidden layer:
[[-0.64694742]
 [ 0.27674803]]
First-batch error is:
1.0052463924057802
Final weights after input layer:
[[0.97114012 8.94593704]
 [0.97114064 8.94690356]]
Final weights after hidden layer:
[[-59.41041626]
 [ 47.68184934]]
Final error is:
0.019999981150549316
The total number of batches run through in the training is:
504544

```

```

enter the learning rate1
enter the target error0.02
Initial weights after input layer:
[[9.29456289e-01 4.95108023e-01]
 [8.21259702e-01 6.30234877e-04]]
Initial weights after hidden layer:
[[-0.14875886]
 [-0.95120988]]
First-batch error is:
1.0477700489756963
Final weights after input layer:
[[8.94682781 0.97114057]
 [8.94611726 0.97114019]]
Final weights after hidden layer:
[[ 47.6818495 ]
 [-59.41041666]]
Final error is:
0.019999984097340474
The total number of batches run through in the training is:
378314

```

We find that learning rate=1 gives us the best results as it has the smallest number of batches run through in the training.

For Answer 2, I have attached the files `html_test.html` and `html_testing.js`