

Homework # 5

Class

ECE 568 - Software Engineering of Web Applications

Instructor

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Assignment

Neural Networks and Volume Calculator Webpage

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Question 1: Neural Networks:

The Code for question 1 is located in folder in the HW_Q1.py file. The code was completed using python 3.7.

Results:

Learning rate = 0.5, Target Error = 0.1

```
HW5_Q1.py [C:\Users\Tina-Home\AppData\Local\Programs\Python\Python36-32\python.exe]
Please enter the learning rate: 0.5
Please enter the target error: 0.1

-----
Learning Rate: 0.5
Target Error Rate: 0.1
Batch Size: [array([0.42360868]), array([0.6754233]), array([0.40857266])]
Number of batches run: 113

-----
Initial Weights: [array([[ -1.03650324, -0.69785528,  0.11475595],
 [ 0.55295713,  2.15927052, -1.1155542 ],
 [ 1.22862557,  2.13346014, -0.05530674]]), array([[ -1.22529368],
 [ 1.78918176],
 [ 0.90459369]])]
Initial Errors: [array([0.42360868]), array([0.6754233]), array([0.40857266])]
Initial Error Average: [0.50253488]

-----
Final Weights: [array([[ -1.03650324, -0.69785528,  0.11475595],
 [ 0.55295713,  2.15927052, -1.1155542 ],
 [ 1.22862557,  2.13346014, -0.05530674]]), array([[ -1.22529368],
 [ 1.78918176],
 [ 0.90459369]])]
Final Errors: [array([0.1146781]), array([0.12382176]), array([0.03609577]), array([0.11070176])]
Final Error Average: [0.09632435]

-----
[X1, X2] [Predicted Value]
[0 0] [-0.02408129]
[0 1] [0.88929824]
[1 0] [0.89911332]
[1 1] [0.29359416]
```

Learning rate = 1, Target Error = 0.1

The screenshot shows the Eclipse IDE with the file explorer on the left displaying a project structure for 'ECE568_HW'. The main editor shows a Python script 'HW5_Q1.py' with a comment indicating it's a layer before the output layer. The console output shows the following details:

```
HW5_Q1.py [C:\Users\Tina-Home\AppData\Local\Programs\Python\Python36-32\python.exe]
Please enter the learning rate: 1
Please enter the target error: 0.1

-----
Learning Rate: 1.0
Target Error Rate: 0.1
Batch Size: [array([1.05720078]), array([0.0644165]), array([0.12654])]
Number of batches run: 31

-----
Initial Weights: [array([[ 0.25410774, -0.77897743, -0.2859533 ],
                          [-1.73429573,  0.04018955, -0.08571105],
                          [-1.51842322, -0.7196589 ,  0.59126276]), array([[ -1.33847446,
                          [-0.34406642],
                          [-0.28978289]])]
Initial Errors: [array([1.05720078]), array([0.0644165]), array([0.12654])]
Initial Error Average: [0.41605242]

-----
Final Weights: [array([[ 0.25410774, -0.77897743, -0.2859533 ],
                       [-1.73429573,  0.04018955, -0.08571105],
                       [-1.51842322, -0.7196589 ,  0.59126276]), array([[ -1.33847446,
                       [-0.34406642],
                       [-0.28978289]])]
Final Errors: [array([0.00532346]), array([0.1341776]), array([0.02194504]), array([0.02792351])]
Final Error Average: [0.0473424]

-----
[X1, X2] [Predicted Value]
[0 0] [-0.02792351]
[0 1] [0.8778318]
[1 0] [0.90971292]
[1 1] [0.91828159]
```

Learning rate = 0.5, Target Error = 0.02

The screenshot shows the Eclipse IDE with the file explorer on the left displaying a project structure for 'ECE568_HW'. The main editor shows a Python script 'HW5_Q1.py' with a comment indicating it's a layer before the output layer. The console output shows the following details:

```
HW5_Q1.py [C:\Users\Tina-Home\AppData\Local\Programs\Python\Python36-32\python.exe]
Please enter the learning rate: 0.5
Please enter the target error: 0.02

-----
Learning Rate: 0.5
Target Error Rate: 0.02
Batch Size: [array([0.21232756]), array([0.72394528]), array([0.80804591])]
Number of batches run: 185

-----
Initial Weights: [array([[ -0.69541637, -1.0008713 ,  2.59222056],
                          [ 1.73087597,  0.4052043 , -1.7691262 ],
                          [ 1.87724898, -0.20931504, -1.70545968]), array([[1.67393185],
                          [0.70346882],
                          [1.56223152]])]
Initial Errors: [array([0.21232756]), array([0.72394528]), array([0.80804591])]
Initial Error Average: [0.58143958]

-----
Final Weights: [array([[ -0.69541637, -1.0008713 ,  2.59222056],
                       [ 1.73087597,  0.4052043 , -1.7691262 ],
                       [ 1.87724898, -0.20931504, -1.70545968]), array([[1.67393185],
                       [0.70346882],
                       [1.56223152]])]
Final Errors: [array([0.00024213]), array([0.00013886]), array([0.03779063]), array([0.00202068])]
Final Error Average: [0.01004807]

-----
[X1, X2] [Predicted Value]
[0 0] [0.00202068]
[0 1] [0.9567738]
[1 0] [0.96264107]
[1 1] [0.08932015]
```

Learning rate = 1, Target Error = 0.02

```

HW5_Q1.py [C:\Users\Tina-Home\AppData\Local\Programs\Python\Python36-32\python.exe]
Please enter the learning rate: 1
Please enter the target error: 0.02

-----
Learning Rate: 1.0
Target Error Rate: 0.02
Batch Size: [array([0.32321231]), array([1.002375]), array([0.66316758])]
Number of batches run: 301

-----
Initial Weights: [array([[ 0.20615772, -2.71788565, -1.64690387],
 [ 0.13723339,  2.2161808 ,  2.8127269 ],
 [-0.05426958,  2.25316626,  2.84852679]]), array([[[-0.12657699],
 [-1.74259001],
 [ 1.82894266]])]
Initial Errors: [array([0.32321231]), array([1.002375]), array([0.66316758])]
Initial Error Average: [0.6629183]

-----
Final Weights: [array([[ 0.20615772, -2.71788565, -1.64690387],
 [ 0.13723339,  2.2161808 ,  2.8127269 ],
 [-0.05426958,  2.25316626,  2.84852679]]), array([[[-0.12657699],
 [-1.74259001],
 [ 1.82894266]])]
Final Errors: [array([0.02163705]), array([0.02142]), array([0.02164957]), array([0.02142948])]
Final Error Average: [0.02153403]

-----
[X1, X2] [Predicted Value]
[0 0] [0.00368857]
[0 1] [0.97857852]
[1 0] [0.97891498]
[1 1] [0.15027348]

```

Other Measurements

Learning Rate	Target Error	Initial Error	Final Error	Batches
0.2	0.1	0.37	0.14	144
0.4	0.1	0.37	0.09	149
0.6	0.1	0.37	0.10	289
0.8	0.1	0.46	0.10	198
1.0	0.1	0.47	0.10	486

The optimal learning rate for this test run with a target error of 0.1 seems to be 0.4. This may slightly vary from trail to trail.

Question 2: Volume Calculator

This file is located in the Q2 folder under the VolumeCalculator.html file.

Volume Calculator

file:///C:/Users/Tina-Home/OneDrive%20-%20Rutgers%20University/Rutgers/Courses/ECE568%20(SE2)/ECE568_HW/ECE568_HW5/Code/Q2/VolumeCalculator.html

Apps RU Basics Class Info Tools Software Other Research Topics Project

This webpage allows you to calculate the volume of cones, cylinders, and spheres.

Please enter details about the shape here:

Shape Information

Radius: 44

Height: 12

Unit Type: ☐ SI (meters) ☒ English (feet)

Shape: Cylinder

Reset Get Volume

Results

Parameter	Value	Unit
Shape	Cylinder	
Radius	44	ft
Height	12	ft
Volume	72985.48052819808	ft^3