**Homework V Report**

Name: Dazhi Li

RUID:197007456

Course: Sp.20 Software Engineering Web Application

Professor: Yinglung Liang

**Question 1**

Source code:

# -\*- coding: utf-8 -\*-  
  
import numpy as np  
#import matplotlib.pyplot as plt  
  
  
def sigmoid(x):  
 return 1/(1+np.exp(-x))  
  
def s\_prime(z):  
 return np.multiply(z, 1.0-z)  
  
def init\_weights(layers, epsilon):  
 weights = []  
 for i in range(len(layers)-1):  
 w = np.random.rand(layers[i+1], layers[i]+1)  
 w = w \* 2\*epsilon - epsilon  
 weights.append(np.mat(w))  
 return weights  
  
def fit(X, Y, w):  
 # now each para has a grad equals to 0  
 w\_grad = ([np.mat(np.zeros(np.shape(w[i])))  
 for i in range(len(w))]) # len(w) equals the layer number  
 m, n = X.shape  
 h\_total = np.zeros((m, 1)) # 所有样本的预测值, m\*1, probability  
 for i in range(m):  
 x = X[i]  
 y = Y[0,i]  
 # forward propagate  
 a = x  
 a\_s = []  
 for j in range(len(w)):  
 a = np.mat(np.append(1, a)).T  
 a\_s.append(a) # 这里保存了前L-1层的a值  
 z = w[j] \* a  
 a = sigmoid(z)  
 h\_total[i, 0] = a  
 # back propagate  
 delta = a - y.T  
 w\_grad[-1] += delta \* a\_s[-1].T # L-1层的梯度  
 # 倒过来，从倒数第二层开始到第二层结束，不包括第一层和最后一层  
 for j in reversed(range(1, len(w))):  
 delta = np.multiply(w[j].T\*delta, s\_prime(a\_s[j])) # 这里传递的参数是a，而不是z  
 w\_grad[j-1] += (delta[1:] \* a\_s[j-1].T)  
 w\_grad = [w\_grad[i]/m for i in range(len(w))]  
 J = (1.0 / m) \* np.sum(-Y \* np.log(h\_total) - (np.array([[1]]) - Y) \* np.log(1 - h\_total))  
 return {'w\_grad': w\_grad, 'J': J, 'h': h\_total}  
 #w\_grad return gradient, j return cost, h\_total return predict\_result  
  
def error\_cal(y\_true,y\_pre):  
 return (np.power(y\_true-y\_pre.reshape(1,4),2)).sum()/4  
  
def main():  
 X = np.mat([[0,0],  
 [0,1],  
 [1,0],  
 [1,1]])  
 Y = np.mat([0,1,1,0])  
 layers = [2,2,1]  
 #error rate  
 e=0.001  
 #learning rate  
 lr = 0.5  
 w = init\_weights(layers, 1)  
 print("The initial weights are \n"+str(w))  
 result = {'J': [], 'h': []}  
 error\_rate=1  
 errors=[]  
 while(error\_rate>e):  
 fit\_result = fit(X, Y, w)  
 w\_grad = fit\_result.get('w\_grad')  
 J = fit\_result.get('J')  
 h\_current = fit\_result.get('h')  
 error\_rate=error\_cal(Y,h\_current)  
 errors.append(error\_rate)  
 result['J'].append(J)  
 result['h'].append(h\_current)  
 for j in range(len(w)):  
 w[j] -= lr \* w\_grad[j]  
 print("The final weights are \n"+str(w))  
  
 print("\nThe first batch error is: "+str(errors[0]))  
 print("The final batch error is: "+str(errors[-1]))  
 print("\nThe number of batches are: "+str(len(result['J']))+"\n")  
 # plt.plot(result.get('J'))  
 # plt.show()  
 print(result.get('h')[0])  
 print(result.get('h')[-1])  
  
if \_\_name\_\_=="\_\_main\_\_":  
 main()

Running result:

Changing learning rate

手机屏幕的截图

描述已自动生成

Fig 1-1 Learning rate=0.5, target error=0.1

手机屏幕的截图

描述已自动生成

Fig 1-2 Learning rate=0.1, target error=0.1

手机屏幕的截图

描述已自动生成

Fig 1-3 Learning rate=0.01, target error=0.1

Changing target error

手机屏幕的截图

描述已自动生成

Fig 2-1 Learning rate=0.5, target error=0.02

手机屏幕的截图

描述已自动生成

Fig 2-2 Learning rate=0.5, target error=0.001

**Question 2**

Source code:

**Html**

<!DOCTYPE html>  
<html lang="en">  
<head>  
 <meta charset="UTF-8">  
 <title>Homework5</title>  
 <script src="calculate.js"></script>  
</head>  
<body style="background-color:lightgray">  
<h1 style="text-align:center">This is a website which will calculate the volume of objects</h1>  
<hr/>  
<h3>select the units first</h3>  
<input name="unit" type="radio" value="0" onclick="getvalue(this.value)">English  
<input name="unit" type="radio" value="1" onclick="getvalue(this.value)">SI unit  
<p style="font-family:arial;color:red;font-size:20px;">A paragraph.</p>  
<form>  
 PLase select a shape:  
<select id="shape">  
 <option value="0" selected="selected">-none-</option>  
 <option value ="1">Cylinder</option>  
 <option value ="2">Cone</option>  
 <option value="3">Sphere</option>  
</select>  
</form>  
<br/>  
<form action="">  
 Enter the radius:<br>  
<input id="radius" type="text" name="radius">  
<br>  
 For the Cylinder and Cone, please enter the height:<br>  
<input id="height" type="text" name="height">  
</form>  
<br/>  
<button type="button" onclick="calculate()">Click To Calculate!</button>  
<br/>  
<hr/>  
<h2>Result</h2>  
<p id="phase\_1" style="font-family:arial;color:balck;font-size:16px;">You choose to use units</p>  
<p id="phase\_2" style="font-family:arial;color:balck;font-size:16px;">You choose to find the volume of </p>  
<br/>  
<table border="1">  
 <tr>  
 <th>Object Volume</th>  
 </tr>  
 <tr>  
 <td>Shape</td>  
 <td>Radius</td>  
 <td>Height</td>  
 <td>Volume</td>  
 </tr>  
 <tr>  
 <td>&nbsp;</td>  
 <td id="2-2">(ft)</td>  
 <td id="2-3">(ft)</td>  
 <td id="2-4">(ft^3)</td>  
 </tr>  
 <tr>  
 <td id="3-1">object</td>  
 <td id="3-2">num1</td>  
 <td id="3-3">num2</td>  
 <td id="3-4">num3</td>  
 </tr>  
</table>  
</body>  
</html>

**JavaScript**

var unit  
function calculate()  
{  
 console.log(unit);  
 var shape=document.getElementById("shape");  
 console.log(shape.value);  
 var r=document.getElementById("radius");  
 console.log(r.value);  
 var h=document.getElementById("height");  
 console.log(h.value);  
 var v;  
 var pi=3.1415926;  
 if (unit==0)  
 {  
 document.getElementById("phase\_1").innerHTML = "You choose to use English units";  
 document.getElementById("2-2").innerHTML = "(ft)";  
 document.getElementById("2-3").innerHTML = "(ft)";  
 document.getElementById("2-4").innerHTML = "(ft^3)";  
 }  
 else if (unit==1)  
 {  
 document.getElementById("phase\_1").innerHTML = "You choose to use SI units";  
 document.getElementById("2-2").innerHTML = "(m)";  
 document.getElementById("2-3").innerHTML = "(m)";  
 document.getElementById("2-4").innerHTML = "(m^3)";  
 }  
 else  
 {  
 alert("Please choose unit first");  
 location.reload();  
 }  
 switch(Number(shape.value))  
 {  
 case 1:  
 v=pi\*Math.pow(r.value,2)\*h.value;  
 document.getElementById("phase\_2").innerHTML = "You choose to find the volume of Cylinder";  
 document.getElementById("3-1").innerHTML = "Cylinder";  
 document.getElementById("3-2").innerHTML = r.value;  
 document.getElementById("3-3").innerHTML = h.value;  
 document.getElementById("3-4").innerHTML = v;  
 break;  
 case 2:  
 v=pi\*Math.pow(r.value,2)\*h.value/3;  
 document.getElementById("phase\_2").innerHTML = "You choose to find the volume of Cone";  
 document.getElementById("3-1").innerHTML = "Cone";  
 document.getElementById("3-2").innerHTML = r.value;  
 document.getElementById("3-3").innerHTML = h.value;  
 document.getElementById("3-4").innerHTML = v;  
 break;  
 case 3:  
 v=4/3\*pi\*Math.pow(r.value,2);  
 document.getElementById("phase\_2").innerHTML = "You choose to find the volume of Sphere";  
 document.getElementById("3-1").innerHTML = "Sphere";  
 document.getElementById("3-2").innerHTML = r.value;  
 document.getElementById("3-3").innerHTML = " ";  
 document.getElementById("3-4").innerHTML = v;  
 break;  
 default:  
 alert("Please choose shape ");  
 //location.reload();  
 }  
}  
function getvalue(value)  
{  
 unit=value  
}

Web page result:

手机屏幕截图

描述已自动生成

Fig 3-1 Initial page

手机屏幕截图

描述已自动生成

Fig 3-2 Calculated page