CSE 340 –MACHINE LEARNING 1

LAB ASSIGNMENT 2

21/02/2024

Unique id :E0321037 Sarah Madhavan K

QUESTION :

Consider a simple neural network with 2 input nodes - x1 and x2 connected to an output node via weights w1 and w2. Thus,

y = w1*x1 + w2*x2

compute the loss function, and the gradient of the loss function with respect to each of the weights w1 and w2.

Use the table below to test your result

x1	x2	y
1	0	1
2	1	9
0	1	1
-2	1	7

CODE :

```
#BATCH GRADIENT DESCENT
from statistics import mean
def gradW1(x1,x2,y,w1,w2):
    w1_new= -2*(y-(w1*x1+w2*x2))*x1
    return w1_new
def gradW2(x1,x2,y,w1,w2):
    w2_new= -2*(y-(w1*x1+w2*x2))*x2
    return w2_new

x1=[0,2,1,-2]
x2=[1,1,0,1]
y=[1,9,1,7]
```

```
w1=1
w2=3
mean_w1=[]#stores updated  w1 and w2 after every epoch
.
mean_w2=[]

for epoch in range(25):
    arr_err1=[] #stores doe "E" by doe w1 for every
data point
    arr_err2=[] #stores doe "E" by doe w2 for every
data point
    print("EPOCH",epoch)
    print("W1",w1,"w2",w2)
    print()
    print()
    for a,b,c in zip(x1,x2,y):
        arr_err1.append(gradW1(a,b,c,w1,w2))
        arr_err2.append(gradW2(a,b,c,w1,w2))

    w1=w1-0.01*(mean(arr_err1))
    mean_w1.append(w1)
    w2=w2-0.01*(mean(arr_err2))
    mean_w2.append(w2)
```

OUTPUT :

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS COMMENTS

```
PS D:\SS\SARAH MADHAVAN K\SRET - AI DA\CODING SKILLS>  d:; cd 'd:\SS\SARAH MADHAVAN K\
SRET - AI DA\CODING SKILLS'; & 'c:\Users\shri\AppData\Local\Programs\Python\Python39\p
ython.exe' 'c:\Users\shri\.vscode\extensions\ms-python.debugpy-2024.0.0-win32-x64\bund
led\libs\debugpy\adapter/../..\debugpy\launcher' '53952' '--' 'd:\SS\SARAH MADHAVAN K\
SRET - AI DA\CSE 340 -MACHINE LEARNING 1\gradient_algorithm.py'
EPOCH 0
W1= 1    w2= 3

EPOCH 1
W1= 0.98         w2= 3.04

EPOCH 2
W1= 0.9609       w2= 3.0794

EPOCH 3
W1= 0.9426595    w2= 3.1182090000000002

EPOCH 4
W1= 0.9252398225         w2= 3.156435865

EPOCH 5
W1= 0.9086040304875      w2= 3.1940893270250004

EPOCH 6
W1= 0.8927168491155626   w2= 3.2311779871196253

EPOCH 7
W1= 0.8775445909053623   w2= 3.267710317312831

EPOCH 8
W1= 0.863055084314621    w2= 3.3036946625531383
```

```
EPOCH 9
W1= 0.849217605520463    w2= 3.3391392426148414

EPOCH 10
W1= 0.8360028132720422   w2= 3.3740521539756188

EPOCH 11
W1= 0.8233826866748003   w2= 3.4084413716659845

EPOCH 12
W1= 0.8113304657744342   w2= 3.442314751090995

EPOCH 13
W1= 0.7998205948145847   w2= 3.47568002982463

EPOCH 14
W1= 0.7888286680479284   w2= 3.5085448293772603

EPOCH 15
W1= 0.7783313779857716   w2= 3.5409166569366013

EPOCH 16
W1= 0.7683064659764118   w2= 3.5728029070825524

EPOCH 17
W1= 0.7587326750074733   w2= 3.604210863476314

EPOCH 18
W1= 0.749589704632137    w2= 3.6351477005241692
```

```
 EPOCH 19
 W1= 0.7408581679236909   w2= 3.6656204850163068

 EPOCH 20
 W1= 0.7325195503671248   w2= 3.6956361777410622

 EPOCH 21
 W1= 0.7245561706006042   w2= 3.725201635074946

 EPOCH 22
 W1= 0.716951142923577    w2= 3.754323610548822

 EPOCH 23
 W1= 0.709688341492016    w2= 3.78300875639059

 EPOCH 24
 W1= 0.7027523661248752   w2= 3.811263625044731

 PS D:\SS\SARAH MADHAVAN K\SRET - AI DA\CODING SKILLS>
```