Neural Network Basics [Solution by Karthikeyan.S]

LATEST SUBMISSION GRADE

100%

1.Question 1

What does a neuron compute?

A neuron computes a function g that scales the input x linearly (Wx + b)

A neuron computes a linear function (z = Wx + b) followed by an activation function

A neuron computes the mean of all features before applying the output to an activation function

A neuron computes an activation function followed by a linear function (z = Wx + b)

Correct

Correct, we generally say that the output of a neuron is a = g(Wx + b) where g is the activation function (sigmoid, tanh, ReLU, ...).

1 / 1 point

2.Question 2

Which of these is the "Logistic Loss"?

\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = \mid y^{(i)} - \hat{y}^{(i)} \mid^{2}$L_{(i)}(\hat{y}^{(i)}, y^{(i)}) = |y^{(i)} - \hat{y}^{(i)}|^{2}$

\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = -(y^{(i)}\log(\hat{y}^{(i)}) + (1- y^{(i)})\log(1-\hat{y}^{(i)}))$L_{(i)}(\hat{y}^{(i)}, y^{(i)}) = -(y^{(i)}\log(\hat{y}^{(i)}) + (1-y^{(i)})\log(1-\hat{y}^{(i)}))$

\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = max(0, y^{(i)} - \hat{y}^{(i)})$L_{(i)}(\hat{y}^{(i)}, y^{(i)}) = max(0, y^{(i)} - \hat{y}^{(i)})$

\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = \mid y^{(i)} - \hat{y}^{(i)} \mid$L_{(i)}(\hat{y}^{(i)}, y^{(i)}) = |y^{(i)} - \hat{y}^{(i)}|$

Correct

Correct, this is the logistic loss you've seen in lecture!

1 / 1 point

3.Question 3

Suppose img is a (32,32,3) array, representing a 32x32 image with 3 color channels red, green and blue. How do you reshape this into a column vector?

x = img.reshape((1,32*32,*3))

x = img.reshape((32*32,3))

x = img.reshape((3,32*32))

x = img.reshape((32*32*3,1))

Correct

1 / 1 point

4.Question 4

Consider the two following random arrays "a" and "b":

```
1
2
3
a = np.random.randn(2, 3) # a.shape = (2, 3)
b = np.random.randn(2, 1) # b.shape = (2, 1)
c = a + b
```

What will be the shape of "c"?

c.shape = (3, 2)

c.shape = (2, 3)

c.shape = (2, 1)

The computation cannot happen because the sizes don't match. It's going to be "Error"!

Correct

Yes! This is broadcasting. b (column vector) is copied 3 times so that it can be summed to each column of a.

1 / 1 point

5.Question 5

Consider the two following random arrays "a" and "b":

```
1
2
3
a = np.random.randn(4, 3) # a.shape = (4, 3)
b = np.random.randn(3, 2) # b.shape = (3, 2)
c = a*b
```

What will be the shape of "c"?

c.shape = (4, 3)

The computation cannot happen because the sizes don't match. It's going to be "Error"!

c.shape = (4,2)

c.shape = (3, 3)

Correct

Indeed! In numpy the "*" operator indicates element-wise multiplication. It is different from "np.dot()". If you would try "c = np.dot(a,b)" you would get c.shape = (4, 2).

1 / 1 point

6.Question 6

Suppose you have n_x input features per example. Recall that X = [x^{(1)} x^{(2)} ... x^{(m)}]$X=[x^{(1)}x^{(2)}...x^{(m)}]$. What is the dimension of X?

- (n_x,m)
- (m,1)
- (m,n_x)
- (1,m)

Correct

1 / 1 point

7.Question 7

Recall that "np.dot(a,b)" performs a matrix multiplication on a and b, whereas "a*b" performs an element-wise multiplication.

Consider the two following random arrays "a" and "b":

```
1
2
3
a = np.random.randn(12288, 150) # a.shape = (12288, 150)

b = np.random.randn(150, 45) # b.shape = (150, 45)

c = np.dot(a,b)
```

What is the shape of c?

c.shape = (150,150)

c.shape = (12288, 150)

The computation cannot happen because the sizes don't match. It's going to be "Error"!

c.shape = (12288, 45)

Correct

Correct, remember that a np.dot(a, b) has shape (number of rows of a, number of columns of b). The sizes match because :

"number of columns of a = 150 = number of rows of b"

1 / 1 point

8.Question 8
Consider the following code snippet:

```
# a.shape = (3,4)
# b.shape = (4,1)
for i in range(3):
  for j in range(4):
    c[i][j] = a[i][j] + b[j]
```

How do you vectorize this?

c = a.T + b

c = a.T + b.T

c = a + b

c = a + b.T

Correct

1 / 1 point

9.Question 9
Consider the following code:

```
a = np.random.randn(3, 3)

b = np.random.randn(3, 1)

c = a*b
```

What will be c? (If you're not sure, feel free to run this in python to find out).

This will invoke broadcasting, so b is copied three times to become (3,3), and *∗ is an element-wise product so c.shape will be (3, 3)

This will invoke broadcasting, so b is copied three times to become (3, 3), and *∗ invokes a matrix multiplication operation of two 3x3 matrices so c.shape will be (3, 3)

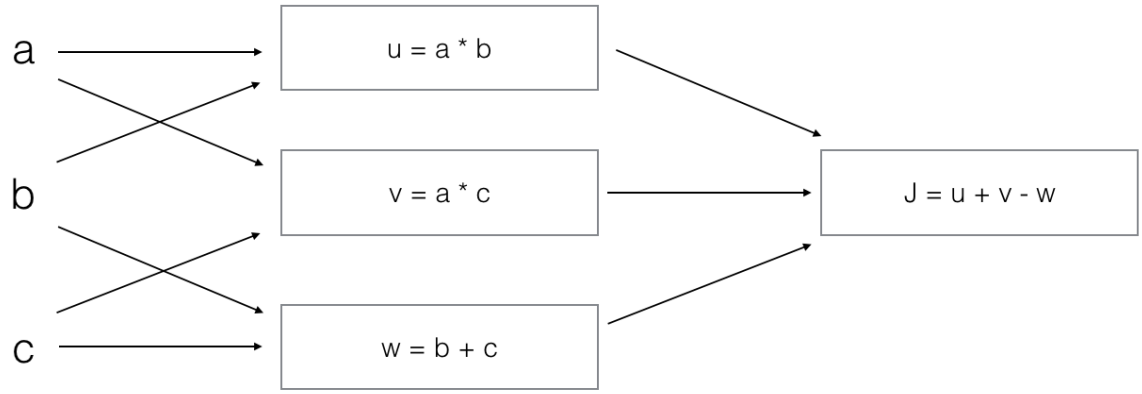
This will multiply a 3x3 matrix a with a 3x1 vector, thus resulting in a 3x1 vector. That is, c.shape = (3,1).

It will lead to an error since you cannot use “*” to operate on these two matrices. You need to instead use np.dot(a,b)

Correct

1 / 1 point

10.Question 10
Consider the following computation graph.



What is the output J?

J = (c - 1)*(b + a)

J = (a - 1) * (b + c)

J = a*b + b*c + a*c

J = (b - 1) * (c + a)

Correct

Yes. J = u + v - w = a*b + a*c - (b + c) = a * (b + c) - (b + c) = (a - 1) * (b + c).