

# Neural Network Basics

Quiz, 10 questions

**9/10 points (90%)**

## Congratulations! You passed!

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1.

What does a neuron compute?

- ☐ A neuron computes an activation function followed by a linear function ( $z = Wx + b$ )
- ☐ A neuron computes the mean of all features before applying the output to an activation function
- ☒ A neuron computes a linear function ( $z = Wx + b$ ) followed by an activation function

**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, ...).

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

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2.

Which of these is the "Logistic Loss"?

- ☐  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = \max(0, y^{(i)} - \hat{y}^{(i)})$
- ☐  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = |y^{(i)} - \hat{y}^{(i)}|$
- ☒  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = -(y^{(i)} \log(\hat{y}^{(i)}) + (1 - y^{(i)}) \log(1 - \hat{y}^{(i)}))$

**Correct**

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

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

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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((32*32*3,1))`**Correct**`x = img.reshape((1,32*32,*3))``x = img.reshape((3,32*32))``x = img.reshape((32*32,3))`1 / 1  
point

4.

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

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

What will be the shape of "c"?

`c.shape = (3, 2)`

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

`c.shape = (2, 3)`**Correct**

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

`c.shape = (2, 1)`

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5.

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

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

What will be the shape of "c"?



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

**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).



c.shape = (4,2)



c.shape = (4, 3)



c.shape = (3, 3)

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6.

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

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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 a = np.random.randn(12288, 150) # a.shape = (12288, 150)
2 b = np.random.randn(150, 45) # b.shape = (150, 45)
3 c = np.dot(a,b)
```

What is the shape of c?



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"



c.shape = (12288, 150)



c.shape = (150,150)



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

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8.

Consider the following code snippet:

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

How do you vectorize this?



c = a + b

This should not be selected

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- ☐  $c = a.T + b.T$
- ☐  $c = a + b.T$
- ☐  $c = a.T + b$
- 

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9.

Consider the following code:

```
1 a = np.random.randn(3, 3)
2 b = np.random.randn(3, 1)
3 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)

**Correct**

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)

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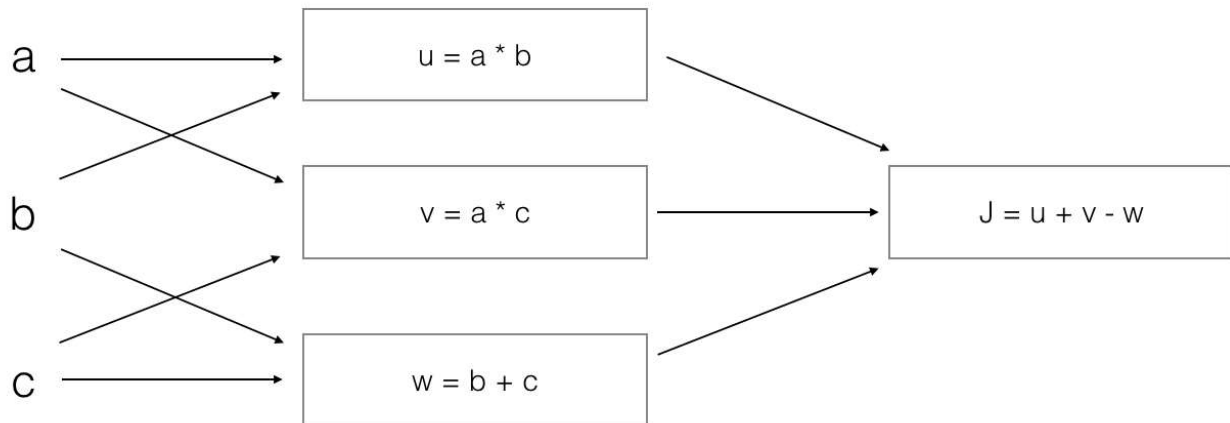
10.

Consider the following computation graph.

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What is the output  $J$ ?

☐  $J = (c - 1) * (b + a)$

☒  $J = (a - 1) * (b + c)$

**Correct**

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

☐  $J = a*b + b*c + a*c$

☐  $J = (b - 1) * (c + a)$

