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## Neural Network Basics

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1. What does a neuron compute?

0 / 1 point

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



**Incorrect**

No. It is the other way round. A neuron computes a linearity ( $Wx + b$ ) and then an activation  $g$  (sigmoid, tanh, ReLU, ...).

2. Which of these is the "Logistic Loss"?

1 / 1 point

- ☐  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = |y^{(i)} - \hat{y}^{(i)}|$
- ☐  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = |y^{(i)} - \hat{y}^{(i)}|^2$
- ☒  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = -(y^{(i)} \log(\hat{y}^{(i)}) + (1 - y^{(i)}) \log(1 - \hat{y}^{(i)}))$
- ☐  $\mathcal{L}^{(i)}(\hat{y}^{(i)}, y^{(i)}) = \max(0, y^{(i)} - \hat{y}^{(i)})$



**Correct**

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

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?

1 / 1 point

- ☐ `x = img.reshape((1,32*32,*3))`
- ☒ `x = img.reshape((32*32*3,1))`
- ☐ `x = img.reshape((32*32,3))`
- ☐ `x = img.reshape((3,32*32))`



**Correct**

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

1 / 1 point

```
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"?

- ☐ The computation cannot happen because the sizes don't match. It's going to be "Error"!
- ☐ `c.shape = (2, 1)`
- ☒ `c.shape = (2, 3)`
- ☐ `c.shape = (3, 2)`



**Correct**

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

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

1 / 1 point

```
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"?

- ☐ c.shape = (4, 3)
- ☒ The computation cannot happen because the sizes don't match. It's going to be "Error"!
- ☐ c.shape = (3, 3)
- ☐ c.shape = (4,2)

✓ 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).

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 / 1 point

- ☐  $(m, n_x)$
- ☐  $(1, m)$
- ☐  $(m, 1)$
- ☒  $(n_x, m)$

✓ Correct

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

1 / 1 point

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, 150)
- ☒ c.shape = (12288, 45)
- ☐ The computation cannot happen because the sizes don't match. It's going to be "Error"!
- ☐ c.shape = (150,150)

✓ 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"

8. Consider the following code snippet:

1 / 1 point

```
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.T + b.T
- ☐ c = a + b
- ☐ c = a.T + b
- ☒ c = a + b.T

✓ Correct

9. Consider the following code:

1 / 1 point

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

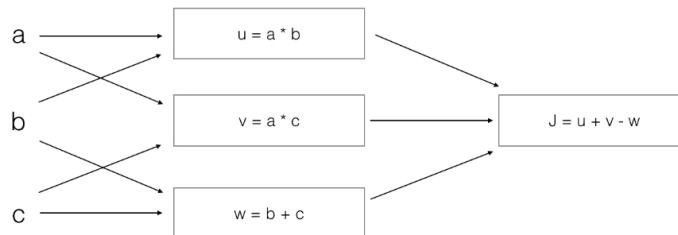
What will be c? (If you're not sure, feel free to run this in python to find out).

- ☒ 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)
- ☐ 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

10. Consider the following computation graph.

1 / 1 point



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