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Neural Network Basics

Graded Quiz • 50 min

Due Aug 14, 11:59 PM +03

Try again once you are ready

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Try again

1. In logistic regression given the input $\mathbf{x}$, and parameters $w \in \mathbb{R}^{n_x}, b \in \mathbb{R}$, how do we generate the output $\hat{y}$?

1 / 1 point

● $\sigma(W\mathbf{x}+b)$.

○ $\tanh(W\mathbf{x}+b)$

○ $W\mathbf{x}+b$

○ $\sigma(W\mathbf{x})$

Expand

✓ **Correct**

Right, in logistic regression we use a linear function $W\mathbf{x}+b$ followed by the sigmoid function σ, to get an output y, referred to as ŷ, such that $0 < \hat{y} < 1$.

2. Suppose that $\hat{y} = 0.5$ and $y = 0$. What is the value of the "Logistic Loss"? Choose the best option.

0 / 1 point

○ 0.693

○ 0.5

○ $+\infty$

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

⤢ Expand

⊗ **Incorrect**

No. This is only the definition of Logistic Loss.

3. Suppose x is a (8, 1) array. Which of the following is a valid reshape?

0 / 1 point

○ x.reshape(-1, 3)

● x.reshape(2, 4, 4)

○ x.reshape(2, 2, 2)

○ x.reshape(1, 4, 3)

⤢ Expand

⊗ **Incorrect**

No. This requires x to have at least 32 entries.

4. Consider the following random arrays a and b, and c:

0 / 1 point

$$a = np.random.randn(3, 3) \,\#\, a.shape = (3, 3)$$

$$b = np.random.randn(2, 1) \,\#\, b.shape = (2, 1)$$

$$c = a + b$$

What will be the shape of c?

○ The computation cannot happen because it is not possible to broadcast more than one dimension

○ c.shape = (2, 1)

● c.shape = (3,3)

○ c.shape = (2, 3, 3)

Expand

⊗ **Incorrect**

No. It is not possible to broadcast together a and b. In this case there is no way to generate copies of one of the arrays to match the size of the other.

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

0 / 1 point

$$a = np.random.randn(4,3) \,\#\, a.shape = (4,3)$$

$$b = np.random.randn(1,3) \,\#\, b.shape = (1,3)$$

$$c = a * b$$

What will be the shape of c?

○ c.shape = (4, 3)

○ The computation cannot happen because it is not possible to broadcast more than one dimension.

● c.shape = (1, 3)

○ The computation cannot happen because the sizes don't match.

Expand

⊗ **Incorrect**

No. The row b is multiplied element-wise with each row of a to create c.

6. Suppose our input batch consists of 8 grayscale images, each of dimension 8x8. We reshape these images into feature column vectors $\mathbf{x}^j$. Remember that $X = \left[\mathbf{x}^{(1)}\mathbf{x}^{(2)}\cdots\mathbf{x}^{(8)}\right]$. What is the dimension of X?

0 / 1 point

○ (512, 1)

○ (64, 8)

● (8, 64)

○ (8, 8, 8)

Expand

Incorrect

No. After converting the 8x8 gray scale images to a column vector we get a vector of size 64, thus X has dimension $(64, 8)$.

7. Consider the following array:

1 / 1 point

$$a = np.array([[2,1],[1,3]])$$

What is the result of $a * a$?

○ $\begin{pmatrix} 4 & 2 \\ 2 & 6 \end{pmatrix}$

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

○ $\begin{pmatrix} 5 & 5 \\ 5 & 10 \end{pmatrix}$

● $\begin{pmatrix} 4 & 1 \\ 1 & 9 \end{pmatrix}$

Expand

Correct

Yes, recall that * indicates element-wise multiplication.

8. Consider the following code snippet:

1 / 1 point

$$a.shape = (4,3)$$

$$b.shape = (4,1)$$

```
for i in range(3):

 for j in range(4):

 c[i][j] = a[j][i] + b[j]
```

How do you vectorize this?

○ c = a.T + b

○ c = a + b.T

○ c = a + b

● c = a.T + b.T

Expand

✓ **Correct**
Yes. a[j][i] being used for a[i][j] indicates we are using a.T, and the element in the row j is used in the column j thus we are using b.T.

9. Consider the following code:

0 / 1 point

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

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

$c = a * b$

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)

○ 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)

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

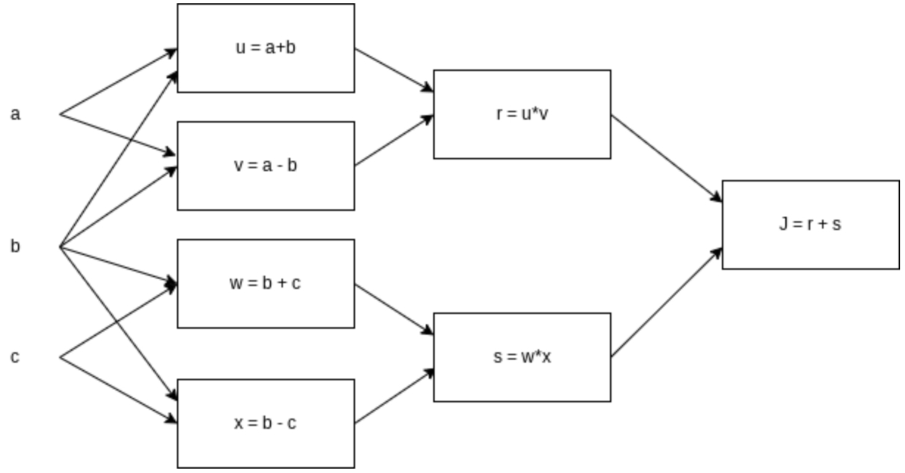
○ This will invoke broadcasting, so b is copied three times to become (3, 3), and $*$ invokes a matrix multiplication operation of two 3x3 matrices so c.shape will be (3, 3)

Expand

⊗ **Incorrect**

10. Consider the following computational graph.

0 / 1 point



What is the output of J?

○ $(a - b) * (a - c)$

● $a^2 + b^2 - c^2$

○ $a^2 - b^2$

○ $a^2 - c^2$

Expand

⊗ **Incorrect**

No.

$J = r + s = u * v + w * x = (a + b) * (a - b) + (b + c) * (b - c) = a^2 - b^2 + b^2 - c^2 = a^2 - c^2$