SOLUTIONS

Quiz - EE16ML - Week 8 - Module 36 - Introduction to PyTorch and TensorFlow

Time Limit: 20 mins

Tensorflow Questions

1. **What's the difference between a constant and a variable?**
    a. **There aren't any differences since constants and variables can be used interchangeably in any circumstance**
    b. **Constants cannot be modified whereas variables can be modified through various graph operations**
    c. **Constants can only be modified with the .assign method**
    d. **None of the above**
2. **Select the correct statement:**
    a. **A scalar is a rank 1 tensor with no "axes"**
    b. **A matrix is a rank 2 tensor with 2 "axes"**
    c. **Elements in an axis can have different data types**
    d. **Everything above is correct**
3. **Fill in the Blank: A _____ is a data structure that represents/defines computations, or dependencies between various mathematical operations.**
    a. **Session**
    b. **Graph**
    c. **Convolution Tree**
    d. **Spiral Heap**
4. **Which of the following does NOT exist in Tensorflow v2.3.0?**
    a. **tf.nn.softmax()**
    b. **tf.nn.selu()**
    c. **tf.math.sigmoid()**
    d. **tf.nn.conv2d()**
    e. **tf.nn.elu()**
5. **What are the three types of tensors? Rectangular, ragged, and sparse**
6. **What is a Dense?**
    a. **Mass of the weights divided by the volume of the weights**
    b. **A single neuron**
    c. **A layer of connected neurons**
    d. **A layer of disconnected neurons**
7. **What does it mean when a multiclass classification algorithm built using Tensorflow has 10 output neurons?**
    a. **It trains 10 times as fast or 10 times as slow depending on the weights**
    b. **It classifies 10 times as fast or 10 times as slow depending on the weights**
    c. **It classifies into 10 different categories/labels**
    d. **It doesn't mean anything since the algorithm will still serve its purpose even if we set the number of output neurons to 12**

PyTorch Question

1. **Your friend Amanda is debating whether to use PyTorch or TensorFlow. Which of the following statements are NOT TRUE?**

   A. PyTorch was created by Google and TensorFlow was created by Facebook

   B. In TensorFlow you define a graph statically before you run it, whereas in PyTorch graphs are more imperative and dynamic.

   C. TensorFlow has a whole deployment framework that makes creating large scale applications more convenient than in PyTorch.

   D. All answers above are true.

2. **Looking at the code below, what is the order of finishing from earliest to latest.**

1	2	3

`%%time`
`x = torch.rand(10000, 10000, device=device)`
`y = torch.rand(10000, 10000, device=device)`
`x.to(device) # send data`
`y.to(device) # send data`
`a = x + y`
`b = x - y`
`c = x * y`
	`%%time`
	`# TENSOR`
	`x = torch.rand(10000, 10000)`
	`y = torch.rand(10000, 10000)`
	`a = x + y`
	`b = x - y`
	`c = x * y`
		`%%time`
		`#NUMPY`
		`x = np.random.rand(10000, 10000)`
		`y = np.random.rand(10000, 10000)`
		`a = x + y`
		`b = x - y`
		`c = x * y`

   A. 1, 3, 2

   B. 2, 3, 1

   C. 1, 2, 3

   D. None of the Above

3. **What factors attribute to different finishing times for the exact same mathematical operations?**

SOLUTION: Tensors are some kind of data structures that optimize arithmetic operations than for example in arrays. The fastest of them all above is using both the GPU and tensors and therefore is many times faster than the slower two.

For the next two questions, you will picking numbers from this list. It is possible that you will have to pick the same number twice or not pick a certain number at all.

List of functions:

a. `def __init__(self, labels, images, transform=None)`

b. `def __init__(self)`

c. `def __getitem__(self, idx)`

d. `def __len__(self)`

e. `def num_flat_features(self, x)`

f. `def forward(self, x)`

4. Which of the functions above could potentially be implemented under a `Dataset` class?
SOLUTION: A,B,C,D

5. Which of the functions above could potentially be implemented under a `CNN` class?
SOLUTION: B,E,F

6. Kevin implemented your bone fracture classifier in the hospital. What are some possible ethical shortcomings that your model might have?

SOLUTION: Any reasonable answer deserves full credit as long student response contains a logical solution along with a sufficiently elaborated explanation and it shows that students put in thought answering the question.
Examples:

- Racial differences in healthcare data
- Generally, males have denser bones and therefore can have different predictions than females
- Deep Learning Frameworks are often still unexplained and baseless. If Kevin relies too much on this model, this might exclude groups of patients systematically from receiving treatment put people in danger.
- For this model, we need to be extremely cautious when implementing it because healthcare problems, even when they have extremely high accuracy, are extremely high stakes due to the matters of life and death. Every model is bad until we reach 100% accuracy.