Key concepts on Deep Neural Networks

TOTAL POINTS 10

1. **What is the "cache" used for in our implementation of forward propagation and backward propagation?**

   - We use it to pass variables computed during backward propagation to the corresponding forward propagation step. It contains useful values for forward propagation to compute activations.
   - It is used to keep track of the hyperparameters that we are searching over, to speed up computation.
   - We use it to pass variables computed during forward propagation to the corresponding backward propagation step. It contains useful values for backward propagation to compute derivatives.
   - It is used to cache the intermediate values of the cost function during training.

2. **Among the following, which ones are "hyperparameters"? (Check all that apply.)**

   - learning rate α
   - weight matrices $W^{[l]}$
   - bias vectors $b^{[l]}$
   - activation values $a^{[l]}$
   - number of layers L in the neural network
   - size of the hidden layers $n^{[l]}$
   - number of iterations

3. **Which of the following statements is true?**

   - The deeper layers of a neural network are typically computing more complex features of the input than the earlier layers.
   - The earlier layers of a neural network are typically computing more complex features of the input than the deeper layers.

4. **Vectorization allows you to compute forward propagation in an L-layer neural network without an explicit for-loop (or any other explicit iterative loop) over the layers l=1, 2, ...,L. True/False?**

- ○ True
- ○ False

5. **Assume we store the values for $n^{[l]}$ in an array called layers, as follows: layer_dims = [n_x, 4,3,2,1]. So layer 1 has four hidden units, layer 2 has 3 hidden units and so on. Which of the following for-loops will allow you to initialize the parameters for the model?**

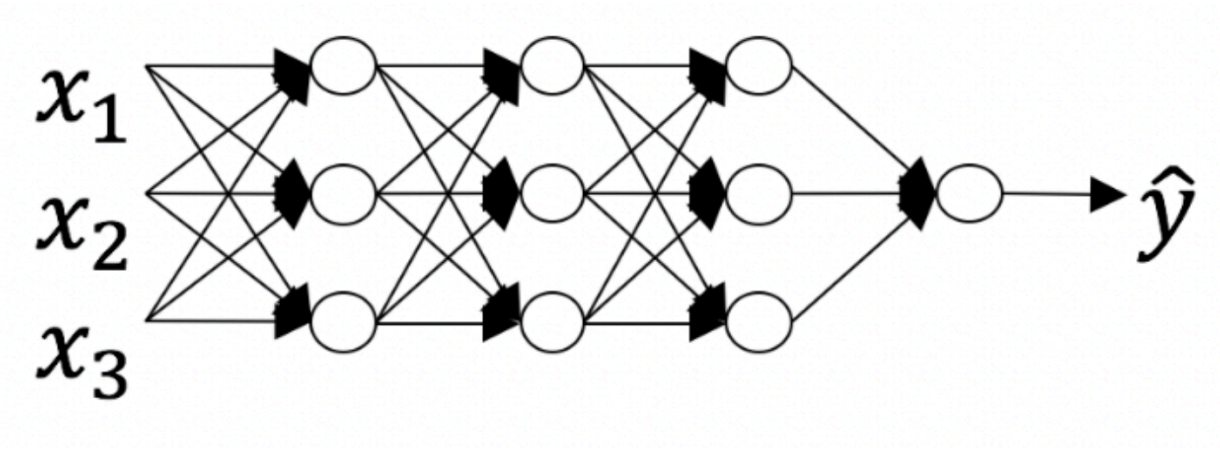
- ○
```
for(i in range(1, len(layer_dims)/2)):
  parameter['W' + str(i)] = np.random.randn(layers[i], layers[i-1])) * 0.01
  parameter['b' + str(i)] = np.random.randn(layers[i], 1) * 0.01
```

- ○
```
for(i in range(1, len(layer_dims)/2)):
  parameter['W' + str(i)] = np.random.randn(layers[i], layers[i-1])) * 0.01
  parameter['b' + str(i)] = np.random.randn(layers[i-1], 1) * 0.01
```

- ○
```
for(i in range(1, len(layer_dims))):
  parameter['W' + str(i)] = np.random.randn(layers[i-1], layers[i])) * 0.01
  parameter['b' + str(i)] = np.random.randn(layers[i], 1) * 0.01
```

- ○
```
for(i in range(1, len(layer_dims))):
  parameter['W' + str(i)] = np.random.randn(layers[i], layers[i-1])) * 0.01
  parameter['b' + str(i)] = np.random.randn(layers[i], 1) * 0.01
```

6. **Consider the following neural network.**



How many layers does this network have?

- The number of layers L is 4. The number of hidden layers is 3.
- The number of layers L is 3. The number of hidden layers is 3.
- The number of layers L is 4. The number of hidden layers is 4.
- The number of layers L is 5. The number of hidden layers is 4.

7. **During forward propagation, in the forward function for a layer l you need to know what is the activation function in a layer (Sigmoid, tanh, ReLU, etc.). During backpropagation, the corresponding backward function also needs to know what is the activation function for layer l, since the gradient depends on it. True/False?**

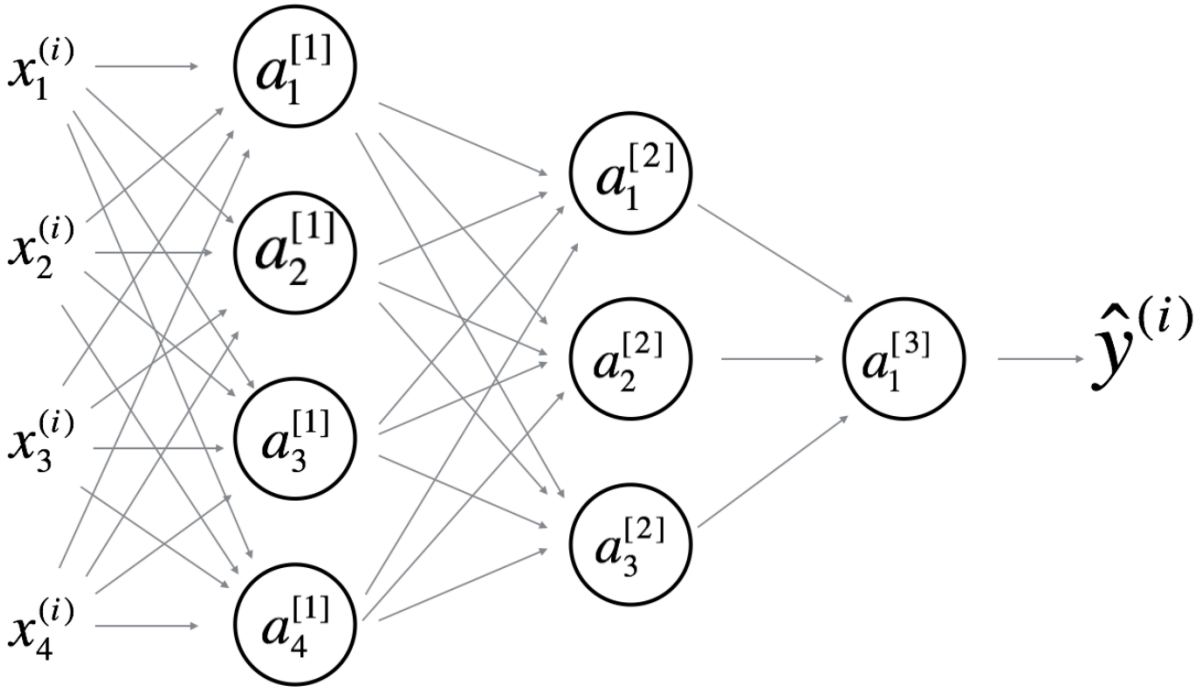
- True
- False

8. **There are certain functions with the following properties:**

(i) To compute the function using a shallow network circuit, you will need a large network (where we measure size by the number of logic gates in the network), but (ii) To compute it using a deep network circuit, you need only an exponentially smaller network. True/False?

- True
- False

9. **Consider the following 2 hidden layer neural network:**



Which of the following statements are True? (Check all that apply).

- [ ] $W^{[1]}$ will have shape (4, 4)
- [ ] $b^{[1]}$ will have shape (4, 1)
- [ ] $W^{[1]}$ will have shape (3, 4)
- [ ] $b^{[1]}$ will have shape (3, 1)
- [ ] $W^{[2]}$ will have shape (3, 4)
- [ ] $b^{[2]}$ will have shape (1, 1)
- [ ] $W^{[2]}$ will have shape (3, 1)
- [ ] $b^{[2]}$ will have shape (3, 1)
- [ ] $W^{[3]}$ will have shape (3, 1)
- [ ] $b^{[3]}$ will have shape (1, 1)
- [ ] $W^{[3]}$ will have shape (1, 3)
- [ ] $b^{[3]}$ will have shape (3, 1)

10. **Whereas the previous question used a specific network, in the general case what is the dimension of W^{[l]}, the weight matrix associated with layer l?**

- $W^{[l]}$ has shape $(n^{[l+1]}, n^{[l]})$
- $W^{[l]}$ has shape $(n^{[l]}, n^{[l+1]})$
- $W^{[l]}$ has shape $(n^{[l-1]}, n^{[l]})$
- $W^{[l]}$ has shape $(n^{[l]}, n^{[l-1]})$