1. Which of the following do you typically see in ConvNet?

- ○ ConvNet makes exclusive use of CONV layers.
- ◉ Use of FC layers after flattening the volume to generate output classes.
- ○ Use of multiple POOL layers followed by a CONV layer.
- ○ Multiple FC layers followed by a CONV layer.

Correct
Yes, FC layers are typically used in the last few layers after flattening the volume to generate the output in classification.

2. In LeNet - 5 we can see that as we get into deeper networks the number of channels increases while the height and width of the volume decreases. True/False?

- ◉ True
- ○ False

Correct
Correct, since in its implementation only valid convolutions were used, without padding, the height and width of the volume were reduced at each convolution. These were also reduced by the POOL layers, whereas the number of channels was increased from 6 to 16.

3. The motivation of Residual Networks is that very deep networks are so good at fitting complex functions that when training them we almost always overfit the training data. True/False?

- ◉ False
- ○ True

Correct
Correct, very deep neural networks are hard to train and a deeper network does not always imply lower training error. Residual Networks allow us to train very deep neural networks.

4. The computation of a ResNet block is expressed in the equation:

$$a^{[l+2]} = g\left(\boxed{W^{[l+2]}}\, g\left(W^{[l+1]}\, a^{[l]} + \boxed{b^{[l+1]}}\right) + b^{[l+2]} + \boxed{a^{[l]}}\right)$$

C A B

Which part corresponds to the skip connection?

- ○ The term in the red box, marked as C.
- ○ The equation of ResNet.
- ◉ The term in the orange box, marked as B.
- ○ The term in the blue box, marked as A.

Correct
Yes, this term is the result of the skip connection or shortcut.

5. Which ones of the following statements on Residual Networks are true? (Check all that apply.)

- ☐ A ResNet with L layers would have on the order of L^2 skip connections in total.
- ☐ The skip-connections compute a complex non-linear function of the input to pass to a deeper layer in the network.
- ☑ Using a skip-connection helps the gradient to backpropagate and thus helps you to train deeper networks

Correct
This is true.

- ☑ The skip-connection makes it easy for the network to learn an identity mapping between the input and the output within the ResNet block.

Correct
This is true.

6. 1×1 convolutions are the same as multiplying by a single number. True/False?

- ○ True
- ◉ False

Correct
Yes, a 1×1 layer doesn't act as a single number because it makes a sum over the depth of the volume.

7. Which of the following are true about bottleneck layers? (Check all that apply)

- ☑ Bottleneck layers help to compress the 1x1, 3x3, 5x5 convolutional layers in the inception network.

This should not be selected
No, the bottleneck layer doesn't combine any of these different layers.

- ☐ The bottleneck layer has a more powerful regularization effect than Dropout layers.
- ☑ The use of bottlenecks doesn't seem to hurt the performance of the network.

Correct
Yes, although it reduces the computational cost significantly.

- ☑ By adding these layers we can reduce the computational cost in the inception modules.

Correct
Yes, by using the 1×1 convolutional layers we can reduce the depth of the volume and help reduce the computational cost of applying other convolutional layers with different filter sizes.

8. Which of the following are common reasons for using open-source implementations of ConvNets (both the model and/or weights)? Check all that apply.

- ☐ The same techniques for winning computer vision competitions, such as using multiple crops at test time, are widely used in practical deployments (or production system deployments) of ConvNets.
- ☑ Parameters trained for one computer vision task are often useful as pre-training for other computer vision tasks.

Correct
True

- ☐ A model trained for one computer vision task can usually be used to perform data augmentation for a different computer vision task.
- ☑ It is a convenient way to get working with an implementation of a complex ConvNet architecture.

Correct
True

9. Which of the following are true about Depth wise-separable convolutions? (Choose all that apply)

- ☐ They are just a combination of a normal convolution and a bottleneck layer.
- ☑ They have a lower computational cost than normal convolutions.

Correct
Yes, as seen in the lectures the use of the depthwise and pointwise convolution reduces the computational cost significantly.

- ☐ The result has always the same number of channels n_c as the input.
- ☑ They combine depthwise convolutions with pointwise convolutions.

Correct
Correct, this combination is what we call depth wise separable convolutions.