



## Special applications: Face recognition & Neural style transfer

TOTAL POINTS 10

1. Face verification requires comparing a new picture against one person's face, whereas face recognition requires comparing a new picture against K person's faces.

1 point

- ☒ True  
☐ False

2. Why do we learn a function  $d(img1, img2)$  for face verification? (Select all that apply.)

1 point

- ☐ This allows us to learn to predict a person's identity using a softmax output unit, where the number of classes equals the number of persons in the database plus 1 (for the final "not in database" class).  
☒ We need to solve a one-shot learning problem.  
☒ This allows us to learn to recognize a new person given just a single image of that person.  
☐ Given how few images we have per person, we need to apply transfer learning.

3. In order to train the parameters of a face recognition system, it would be reasonable to use a training set comprising 100,000 pictures of 100,000 different persons.

1 point

- ☐ True  
☒ False

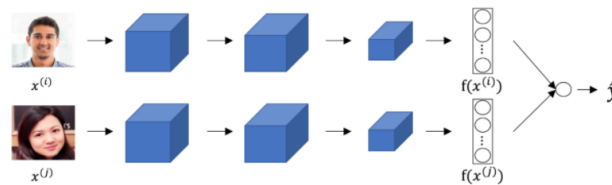
4. Which of the following is a correct definition of the triplet loss? Consider that  $\alpha > 0$ . (We encourage you to figure out the answer from first principles, rather than just refer to the lecture.)

1 point

- ☐  $\max(\|f(A) - f(P)\|^2 - \|f(A) - f(N)\|^2 - \alpha, 0)$   
☐  $\max(\|f(A) - f(N)\|^2 - \|f(A) - f(P)\|^2 + \alpha, 0)$   
☒  $\max(\|f(A) - f(P)\|^2 - \|f(A) - f(N)\|^2 + \alpha, 0)$   
☐  $\max(\|f(A) - f(N)\|^2 - \|f(A) - f(P)\|^2 - \alpha, 0)$

5. Consider the following Siamese network architecture:

1 point



The upper and lower neural networks have different input images, but have exactly the same parameters.

- ☒ True  
☐ False

6. You train a ConvNet on a dataset with 100 different classes. You wonder if you can find a hidden unit which responds strongly to pictures of cats. (i.e., a neuron so that, of all the input/training images that strongly activate that neuron, the majority are cat pictures.) You are more likely to find this unit in layer 4 of the network than in layer 1.

1 point

- ☒ True  
☐ False

7. Neural style transfer is trained as a supervised learning task in which the goal is to input two images ( $x$ ), and train a network to output a new, synthesized image ( $y$ ).

1 point

- ☐ True  
☒ False

8. In the deeper layers of a ConvNet, each channel corresponds to a different feature detector. The style matrix  $G^{[l]}$  measures the degree to which the activations of different feature detectors in layer  $l$  vary (or correlate) together with each other.

1 point

- ☒ True  
☐ False

9. In neural style transfer, what is updated in each iteration of the optimization algorithm?

1 point

- ☐ The regularization parameters  
☐ The pixel values of the content image  $C$   
☒ The pixel values of the generated image  $G$   
☐ The neural network parameters

10. You are working with 3D data. You are building a network layer whose input volume has size  $32 \times 32 \times 32 \times 16$  (this volume

1 point

has 16 channels), and applies convolutions with 32 filters of dimension 3x3x3 (no padding, stride 1). What is the resulting output volume?

- ☒ 30x30x30x32
- ☐ Undefined: This convolution step is impossible and cannot be performed because the dimensions specified don't match up.
- ☐ 30x30x30x16

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