

# 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

- False  
 True

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 recognize a new person given just a single image of that person.  
 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.  
 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.)

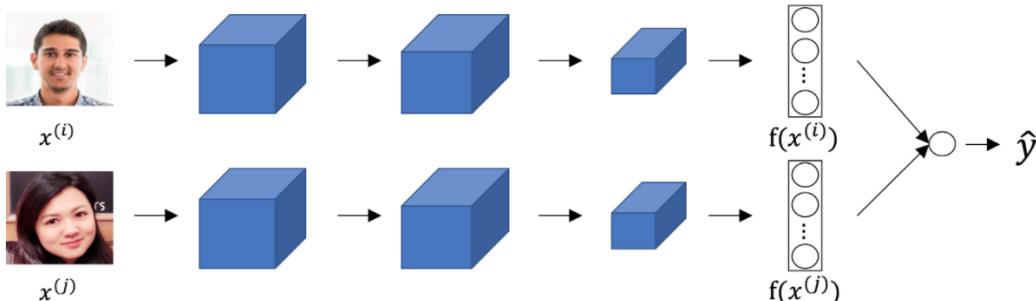
1 point

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

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

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

False

True

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

1 point

- The neural network parameters
- The pixel values of the generated image  $G$
- The pixel values of the content image  $C$
- The regularization 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 has 16 channels), and applies convolutions with 32 filters of dimension  $3 \times 3 \times 3$  (no padding, stride 1). What is the resulting output volume?

1 point

- Undefined: This convolution step is impossible and cannot be performed because the dimensions specified don't match up.
- $30 \times 30 \times 30 \times 32$
- $30 \times 30 \times 30 \times 16$