



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

- ☐ Given how few images we have per person, we need to apply transfer learning.
- ☐ 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).
- ☐ This allows us to learn to recognize a new person given just a single image of that person.
- ☐ We need to solve a one-shot learning problem.

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

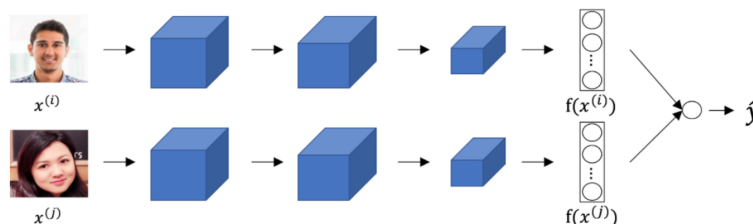
4. Which of the following is a correct definition of the triplet loss? Consider that $\alpha > 0$. (We encourage you to figure out the answer from first principles, rather than just refer to the lecture.)

1 point

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

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 pixel values of the content image C
- ☐ The pixel values of the generated image G
- ☐ The regularization parameters
- ☐ 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 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

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

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