

FIT5215 Deep Learning

Quiz for:
Convolutional Neural Network

Tutor Team

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Question 1

*Given an 3D input tensor with shape $[32, 32, 3]$ over which we apply a conv2D with **16 filters** each of which has shape $[5,5]$, strides $[3,3]$, and padding **valid**. What is the shape of the output tensor?*

- ☐ A. $[10, 10]$
- ☐ B. $[11, 11]$
- ☐ C. $[11, 11, 16]$
- ☐ D. $[10, 10, 16]$

Question 2

*Given an 3D input tensor with shape [32, 32, 3] over which we apply a conv2D with **16 filters** each of which has shape [5,5], strides [3,3], and padding **same**. What is the shape of the output tensor?*

- ☐ A. [10, 10]
- ☐ B. [11, 11]
- ☐ C. [11, 11, 16]
- ☐ D. [10, 10, 16]

Question 3

*Given an 3D input tensor with shape [64, 64, 10] over which we apply a **max pooling** layer with kernel size [3,3], strides [3,3], and padding **same**. What is the **shape** of the **output tensor**?*

- ☐ A. [21, 21]
- ☐ B. [22, 22]
- ☐ C. [22, 22, 10]
- ☐ D. [22, 22, 3]

Question 4

*Assume that the tensor before the last tensor of a CNN has shape $[32, 32, 32, 10]$ and we apply **5 filters** each of which has the shape **$[5, 5, 10]$** and **strides**= **$[2, 2]$** with padding = '**same**' to obtain the last tensor. What is the **shape** of the output tensor?*

- ☐ A. $[16, 16, 5]$
- ☐ B. $[14, 14, 5]$
- ☐ C. $[32, 14, 14, 5]$
- ☐ D. $[32, 16, 16, 5]$

Question 5

*Assume that the tensor before the last tensor of a CNN has shape $[32, 32, 32, 10]$ and we apply **5 filters** each of which has the shape **$[5, 5, 10]$** and **strides**= **$[2, 2]$** with padding = '**valid**' to obtain the last tensor. We flatten this tensor to a **fully connected (FC)** layer. What is the **number of neurons** on this FC layer?*

- ☐ A. $16 \times 16 \times 5$
- ☐ B. $14 \times 14 \times 5$
- ☐ C. $32 \times 16 \times 16 \times 5$
- ☐ D. $32 \times 14 \times 14 \times 5$

Question 6

What likely happen if using a large filter (e.g., 7x7, 9x9) with a deep model (e.g., 20 layers) if there are few images?

- ☐ A. Overfitting
- ☐ B. Underfitting

Question 7

Which is a good CNN model architecture?

- ☐ A. Input layer → Convolutional layer (Activation) → Pooling layer → FC layer → Output
- ☐ B. Input layer → Pooling layer → Convolutional layer (Activation) → FC layer → Output
- ☐ C. Input layer → FC Layer → Pooling layer → Convolutional layer (Activation) → Output
- ☐ D. Input layer → Convolutional layer (Activation) → FC layer → Pooling layer → Output

Question 8

Given an implementation as below. What is the shape of h1?

```
X = Input(shape=(32, 32, 3))
h1 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='same')(X)
h1 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h1)
h2 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='same')(h1)
h2 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h2)
h3 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='same')(h2)
h4 = Flatten()(h3)
p = Dense(10)(h4)
print("h1", h1.shape)
```

- ☐ A. (16,16,3)
- ☐ B. (16,16,10)
- ☐ C. (None,16,16,3)
- ☐ D. (None, 16,16,10)

Question 9

Given an implementation as below. What is the shape of h1?

```
X = Input(shape=(32, 32, 3))
h1 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(X)
h1 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h1)
h2 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h1)
h2 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h2)
h3 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h2)
h4 = Flatten()(h3)
p = Dense(10)(h4)
print("h1", h1.shape)
```

- ☐ A. (None,16,16,10)
- ☐ B. (None,15,15,10)
- ☐ C. (None,14,14,10)
- ☐ D. (None, 13,13,10)

Question 10

Given an implementation as below. What are the shape of h1/h2/h3?

```
X = Input(shape=(32, 32, 3))
h1 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(X)
h1 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h1)
h2 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h1)
h2 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h2)
h3 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h2)
h4 = Flatten()(h3)
p = Dense(10)(h4)
print("h1", h1.shape)
print("h2", h2.shape)
print("h3", h3.shape)
```

- ☐ A. (None,15,15,10) / (None,6,6,10) / (None,3,3,10)
- ☐ B. (None,15,15,10) / (None,6,6,10) / (None,4,4,10)
- ☐ C. (None,15,15,10) / (None,7,7,10) / (None,3,3,10)
- ☐ D. (None,15,15,10) / (None,7,7,10) / (None,4,4,10)

Question 11

Given an implementation as below. What is the shape of h4?

```
X = Input(shape=(32, 32, 3))
h1 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(X)
h1 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h1)
h2 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h1)
h2 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h2)
h3 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h2)
h4 = Flatten()(h3)
p = Dense(10)(h4)
print("h4", h4.shape)
```

- ☐ A. (None,4,4,10)
- ☐ B. (None,90)
- ☐ C. (None,160)
- ☐ D. (90,)

Question 12

Given an implementation as below. What is the shape of W1 and b1?

```
X = Input(shape=(32, 32, 3))
h1 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(X) # Layer 1
h1 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h1)
h2 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h1)
h2 = AveragePooling2D(pool_size=(2, 2), strides=(2, 2))(h2)
h3 = Conv2D(filters=10, kernel_size=(3, 3), strides=(1, 1), padding='valid')(h2)
h4 = Flatten()(h3)
p = Dense(10)(h4)

model = tf.keras.Model(inputs=X, outputs=p)

W1, b1 = model.layers[1].weights
print(W1.shape)
print(b1.shape)
```

- ☐ A. (3,3,3,10), (10,)
- ☐ B. (3,3,3,10), (3,3,10)
- ☐ C. (15,15,3,10), (10,)
- ☐ D. (15,15,3,10), (3,3,10)