AIU. ALAMEIN INTERNATIONAL UNIVERSITY جامعة العلمين الدولية

Date: 26 / 12 /2023
Duration: **30** minutes
Mark: **/25**

AIE231 Quiz 4

Semester: Fall 2023

Faculty : Computer Science and Engineering

Program : All

Course Name : Neural Networks **Course Code: AIE231**

Student's Name: ..... **ID:** .....

Question 1: True or False + Correct Mistakes (9 pts)

☐ 1. If your input image is 64x64x16, there are 65 parameters in a single 1x1 convolution filter, including bias.

☐ 2. If the shape of your input is w x h x d you can reduce w and h by using 1x1 convolutions.

☐ 3. If the shape of your input is w x h x d you can reduce d by using maxpooling.

☐ 4. The hyperparameters of a pooling layer are filter (pool) size and stride and it has no parameters.

☐ 5. Max pooling allows a neuron in a network to have a larger receptive field of the image, compared to a neuron at the same depth in a network without max pooling.

☐ 6. A convolutional neural network is translation invariant.

☐ 7. For transfer learning there are additional hyperparameters: a- How many layers of the original network to keep. b- How many new layers to introduce. c- How many to keep frozen while fine tuning.

☐ 8. In inception you use weights which have been pretrained on a much larger dataset.

☐ 9. The top5-error is the percentage of test samples for which the correct class was not in the top 5 predicted classes.

Corrections:

AIU ALAMEIN INTERNATIONAL UNIVERSITY جامعة العلمين الدولية

Date: 26 / 12 /2023
Duration: **30** minutes
Mark: **/25**

Question 2: (6 pts)

Given an input volume of shape (10, 10, 3), you consider using one of the two following layers:

- Fully-connected layer with 2 neurons, with biases
- Convolutional layer with three 2x2 filters (with biases) with 0 padding and a stride of 2

If you use the fully-connected layer, the input volume is “flattened" into a column vector before being fed into the layer. What is the difference in the number of trainable parameters between these two layers?

You decide to use the convolutional layer. What will be the size of the output of the convolutional layer described above?

What is another type of layer used in CNNs?

Which of the above layer types is expected to be the fastest?

AIU ALAMEIN INTERNATIONAL UNIVERSITY
جامعة العلمين الدولية

Date: 26 / 12 /2023
Duration: **30** minutes
Mark: **/25**

Question 3: (10 pts)

Consider the convolutional neural network defined by the layers in the left column below. Fill in the shape of the output volume and the number of parameters at each layer. You can write the shapes in the numpy format (e.g. (128,128,3)).

Notation:

- CONV5-N denotes a convolutional layer with N filters with height and width equal to 5. Padding is 2, and stride is 1.
- POOL2 denotes a 2x2 max-pooling layer with stride of 2 and 0 padding.
- FC-N denotes a fully-connected layer with N neurons

Layer	Activation Volume Dimensions	Number of parameters
Input	$32 \times 32 \times 1$	0
CONV5-10		
POOL2		
CONV5-10		
POOL2		
FC10		