DNSC 6290
Summer 2025
Assignment 3

Due: 20 June 2025, 11:59:59 PM ET
Email to: jphall@gwu.edu

1	1	1
-1	1	-1
-1	1	1

Kernel ***K***.

2	2	1	-1
2	0	1	2
2	1	2	1
2	1	2	-3

Data matrix ***X***.

1. (1 pt.) What will be the output volume of the feature map created by applying the 3x3 kernel (i.e., filter) ***K*** to the 4x4 data matrix ***X*** using a stride length of 1 and no padding

2. (1 pt.) Apply the 3x3 kernel (i.e., filter) ***K*** to the 4x4 data matrix ***X*** using a stride length of 1 and no padding to create a new feature map. Turn in your work.

3. (1 pt.) What will the output volume be when downsampling ***X*** using average pooling with a 2x2 window, a stride of 1, and no padding?

4. (1 pt.) Apply downsampling to ***X*** using average pooling with a 2x2 window, a stride of 1, and no padding. Turn in your work.

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5. (1 pt.) Circle the Correct Term: (CPU / GPU) are excellent at performing sophisticated tasks with some degree of parallelism, whereas **(CPU / GPU)** excel at performing simple tasks with a high degree of parallelism.

6. (1 pt.) True or False: There are no privacy, security or bias risks to consider when using pre-trained image recognition models.

Use the assignment notebook to complete Questions 7—10. Before running the notebook, copy it to your own drive and follow these instructions carefully:

- Make your activation functions match Lenet-5 in Cell 5.
- In Cell 5, set the correct filter size in layer C5 to create a 1 x 1 x 120 output volume that can be easily flattened into an input vector of length 120 for layer F6.
- In Cell 5, set the number of fully connected (i.e., “dense”) units in layer F6 to match LeNet-5.
- In Cell 5, set the number of output units to the appropriate number for the MNIST data.
- In Cell 7, set the optimizer.

7. (1 pt.) What is the digit in the first image (see Cell 4)?

8. (1 pt.) What is the total number of weights in the model?

9. (1 pt.) What is the training accuracy after 100 epochs? What is the validation accuracy after 100 epochs? What is the test accuracy?

10. (1 pt.) Was validation-based early stopping applied automatically?