UNIT 7 ASSIGNMENT

Deep Learning and Computer Vision

## Instructions

The questions below will prepare you for future interviews as they relate to concepts discussed throughout the week. You’ve practiced these concepts in the coding activities, exercises and coding portion of the assignment. Now, let’s formulate your programming into well-thought responses.

Except as indicated, use this document to record all your assignment work and responses to any questions. At a minimum, you will need to turn in a digital copy of this document to your facilitator as part of your assignment completion. You may also have additional supporting documents that you will need to submit. Your facilitator will provide feedback to help you work through your findings.

**Note:** Though your work will only be seen by those grading the course and will not be used or shared outside the course, you should take care to obscure any information you feel might be of a sensitive or confidential nature.

*Begin your assignment by completing the questions below. Directions to submit your work can be found on the assignment page. Information about the grading rubric is available on any of the course assignment pages online. Do not hesitate to contact your facilitator if you have any questions about the assignment.*

Unit 7 Written Portion

# Implementing Neural Networks

Answer the questions below about deep learning and computer vision.

## Questions:

1. What is deep learning? List some real-word applications of deep learning.

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| Deep learning is a subfield of machine learning that uses artificial networks with multiple hidden layers to learn complex nonlinear patterns from data. This is used for image recognition, natural language processing, and more. |

1. Compare and contrast a neural network to a linear model such as logistic regression. What are the advantages of using a neural network instead of a linear model?

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| Both are supervised learning model but Neural networks are more complex than linear models. It is composed of simple linear and nonlinear transformation of the input data through multiple layers. Neural networks require a lot of data for training and can be prone to overfitting if not carefully regularized. |

1. Describe the architecture of a traditional neural network and its core components.

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| A traditional neural network stacks layers. Input layer receives data, one or more hidden layers process it with activation functions, and the output layer delivers the final prediction. The core components include the neurons, activation functions, weights, biases, and the connections between neurons. |

1. Summarize the training process of a traditional neural network.

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| The training process of a traditional neural network involves forward propagation and backpropagation. During forward propagation, input data is passed through the network to compute the output, and the loss function measures the difference between the predicted and actual values. Backpropagation then calculates the gradients of the loss with respect to each weight, and these gradients are used to update the weights using an optimization algorithm like stochastic gradient descent, iteratively reducing the loss and improving the model's performance. |

1. Describe a few advantages and disadvantages of using a neural network.

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| Neural networks excel at recognizing complex patterns in data, making them ideal for tasks like image recognition. Their flexible architecture allows them to adapt to various data types and problems. However, they require a lot of data for training and can overfit if not carefully regularized. Additionally, understanding how they reach their predictions can be challenging. |

1. Why is a specific neural network architecture needed for image data?

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| Images are grids of pixel values, and these spatial relationships are crucial for tasks like object recognition. The same image with different composition could hold significantly different vector information. Convolutional Neural Networks (CNNs) address this by using filters that learn to detect specific features at different locations within the image, ultimately leading to more accurate image analysis. |

1. Compare and contrast a traditional neural network with a convolutional neural network.

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| Traditional neural networks treat all data points equally, making them less suited for images where spatial relationships are key. Convolutional Neural Networks (CNNs) use specialized filters that slide across the image, capturing these crucial spatial features and leading to superior performance in image analysis tasks. |

*To submit this assignment, please refer to the instructions in the course*.