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 type of machine learning that uses neural networks. Deep learning works with many layers to learn from the data it is expected to be trained on. The idea of deep learning models after the neurons in the brain. This model is good at tacking issues like natural language processing as well as image and speech recognition. Some real-world applications of deep learning is self-driving cars, language translation, and even medical diagnosis. |

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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| Neural networks work with multiples layers which each have many neurons. This structure allows the models to learn from the data to find complex patters and relationship in potentially non-linear data. Logistic regression, however, is a linear model which means that it searches for a linear trend in the data it trains on to determine relationships directly. In comparison, however, neural networks is computationally heavy and often require more data and well-chosen hyperparameters to perform well. |

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

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| A traditional neural network has an input layer, one or more “hidden” layers, and an output layer. As mentioned before, each of these layers are composed of neurons, which perform a weighted sum of inputs followed by what we know as an activation function. The input layer receives input data and after this, the layers each process this data through non-linear transformations. Then the output layer produces the final prediction. The connections between neurons are represented by weights, which are learned during the training to increase the accuracy of the model. |

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

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| When training a traditional neural network, the input data is sent through the network to calculate the predictions to compare them to the actual target values using a loss function. After this, the model uses backpropagation to update the weights of the network to reduce the loss as much as possible. This cycle is repeated a certain number of times – or over multiple “epochs” – and by adjusting the weights using algorithms like stochastic gradient descent. |

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

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| The advantage of using a neural network is that it is very good at learning complex patterns and relationships in the data. Neural networks can also handle a diverse range of input data such as images or tests and can output classification and regression results. Some disadvantages of using neural networks are that using parameters such as the learning rate and epochs must be well-chosen for the model to perform well. Also, neural networks can also be prone to overfitting if the data is not good for the model to learn from. |

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

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| Image data is structured with pixels arranged in a grid. In this grid, each pixel represents a feature. Convolutional Neural Networks (CNNs) are designed specifically for image data by utilizing convolutional layers that pool layers to reduce dimensionality while retaining important features. This architecture allows CNNs to effectively learn hierarchical representations of images, making them suitable for tasks like object detection and image classification. |

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

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| Traditional Neural Networks are good for general learning tasks on structured data but struggle analysis. In contrast, Convolutional Neural Networks (CNNs) are specifically designed for data like image analysis. However, CNNs require more computational resources and data for training due to their complex architecture. CNNs perform exceptionally well in tasks that require understanding spatial relationships and extracting detailed features, which sets them apart from traditional neural networks. |



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