

Qualification	Artificial Intelligence with Python - R/618/3658		
Units	Linear Algebra for Neural networks, Calculus for Neural networks		
Assessor(s)	Lawrence Olusanya		
	25/01/2024	Final deadline	14/03/2024
Assignment Title	Introduction to Neural Network and underlying Mathematic	No.	2
Learning aims covered	Y/650/0762 – 1.1, 1.2, 1.3, 1.4, 1.5, 2.1,2.2, 3.1, 3.2, 4.1 A/650/0763 - 1.1, 1.2		

Scenario	<p>NCC is a medium-sized company creating deep learning applications to meet client's business needs. As part of overall mission, the company is committed to helping college students develop their careers in Artificial Intelligence. As a result, NCC offer work experience opportunities to interested candidates with basic knowledge of Neural networks.</p> <p>You have applied for work experience with the company to build on your learning in college of Artificial Intelligence with Python.</p>
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Task 1: Linear Algebra Essential for Neural Network.	<p>Due 15 February 2024</p> <p>NCC, has selected you for an interview. They have briefed you that the company is currently working on implementing a neural network to predict house prices in a neighbourhood based on historical data. You have been instructed to submit a report on how Linear Algebra are used in the Neural Network Algebra for feedforward to obtaining prediction error.</p> <p>Your report must:</p> <ol style="list-style-type: none"> 1. Outline what a 'vector' is and provide an example of how vectors can represent data in a neural network. 2. Outline the purpose of vector transpose and provide an example of how it can be used in neural networks. 3. Outline how to calculate the magnitude and direction of a vector and provide an example of how this information can be useful in the context of neural networks.
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4. Explain with an example the use of vector addition and multiplication in the context of neural networks.
5. Describe how vectors can be used in programming with Python, including examples of relevant libraries and functions.
6. Give examples of linear combination and span, and explain how they can be used in neural networks.
7. Describe the concept of linear dependency and provide an example of how it can be helpful in neural networks.
8. Outline what a matrix means and provide an example of how matrices can be used in the context of neural networks.
9. Explain how to apply matrix arithmetic to perform matrix addition, scalar multiplication of a matrix, and matrix multiplication, providing examples of how these operations can be helpful in the context of neural networks.
10. Explain how the feedforward process uses linear algebra, providing relevant equations and operations examples.

This provides evidence for the 1.1,1.2,1.3,1.4,1.5,2.1,2.2,3.1,3.2,4.1

Checklist of evidence required

Written report (Word document)

Criteria covered by this task:

To achieve the criteria you must show that you are able to:	Criterion reference
Outline what a 'vector' is.	1.1
Describe the purpose of vector transpose.	1.2
Outline how to calculate magnitude and direction.	1.3
Explain, with examples, the use of vector additions, vector multiplications	1.4
Describe how vectors support programming with Python.	1.5
Give examples of Linear combination, Line span	2.1
Describe the use of linear dependency.	2.2
Outline what is meant by a 'matrix'.	3.1
Explain how to apply matrix arithmetic to perform matrix addition, Scalar multiplication of a matrix, Matrix multiplication.	3.2
Explain how the feedforward process uses linear algebra.	4.1

<p>Task 2</p> <p>Calculus essential for neural networks.</p>	<p>Due 14 March 2024</p> <p>NCC is pleased with your report and has offered you paid work experience. Before you can be assigned to a project team you must create a second report to evidence your understanding of how Calculus can be used to optimise the Cost function, and Backpropagation of model weights to reduce prediction error and update the weights.</p> <ol style="list-style-type: none"> 1. Explain what a Neural Network is, including its essential components and how they work together to make predictions. 2. Outline how calculus supports neural networks, including using derivatives in training. <p>To optimize the performance of a neural network, you need to understand the role of derivatives in the training process.</p> <ol style="list-style-type: none"> 1. Explain what derivatives are, including their mathematical definition and how they can represent rates of change. 2. Outline the need for derivatives in neural networks, including how they are used in the backpropagation algorithm to update the network weights. <p style="text-align: right;">This provides evidence for the 1.1,1.2,2.1,2.2</p>
<p>Checklist of evidence required</p>	<p>Written report (Word document)</p>
<p>Criteria covered by this task:</p>	
<p>To achieve the criteria you must show that you are able to:</p>	<p>Criterion reference</p>
<p>Explain what a 'Neural Network' is.</p>	<p>1.1</p>
<p>Outline how calculus supports neural networks.</p>	<p>1.2</p>
<p>Explain what a Derivative is and its purpose.</p>	<p>2.1</p>
<p>Outline the need for derivatives in neural network.</p>	<p>2.2</p>