UNIVERSITY *of* LIMERICK

O L L S C O I L   L U I M N I G H

FACULTY *of* SCIENCE *and* ENGINEERING
Department of Computer Science
and Information Systems

Mid-Term Assessment Paper

Academic Year:	2021-2022	Semester:	Spring
Module Title:	Deep Reinforcement Learning	Module Code:	CS6482
Duration of Exam:	1 Hour	Percent of Total Marks:	10
Lecturer(s):	J.J. Collins	Paper marked out of :	10

11:00-12:00 Thur. 24th February 2022 (Week 5)

Instructions to Candidates:

- Answer ALL ten questions.
- All questions carry equal marks.
- NO RED PEN

Name: _____

ID Number: _____

Course: _____

Q1. Describe the Symbolic AI and Machine Learning paradigms, and illustrate the answer with examples.

Symbolic AI is

Machine Learning is

Q2: What is the formula for the update applied to a weight in a hidden layer when performing Back Propagation (BP) in a Multi-Layer Perceptron (MLP)?

Q3: The following code fragments are from Nielsen's implementation of an MLP for MNIST.

```
L1      #### network.py
L2      class Network(object):

L3       def __init__(self, sizes):
L4          self.num_layers = len(sizes)
L5          self.sizes = sizes
L6          self.biases = [np.random.randn(y, 1) for y in sizes[1:]]
L7          self.weights = [np.random.randn(y, x) for x, y in zip(sizes[:-1], sizes[1:])]

L8      #### test.py
L9      import network
L10     net = network.Network([784, 30, 10])
```

What are the dimesnions of the three lists

1. sizes,

2. sizes[1:]

3. zip(sizes[:-1],sizes[1:])

Q4: What is a vanishing gradient? What causes vanishing gradient? And what technique(s) can be used to reduce the impact of vanishing gradients? Include diagram(s) if discussing activation functions.

Q5: Explain why the number of parameters in GoogleLeNet using Inception modules is significantly less than AlexNet - 6 million v of 60 million. The answer should focus exclusively on the Inception module. Illustrate the answer with a diagram and/or calculations.

Q6: Describe the key concept(s) in ResNet. Include a discussion on the purpose of a kernel of size 1x1 with stride 2. Illustrate the discussion with a diagram.

Q7: Given an input image of dimensions 75 x 100 with 3 channels for RGB. And a convolutional layer with 5x5 kernels stride 1, outputting 200 feature maps of size 75x100. How many parameters in the convolutional layer? Please show your calculations.

Q8: Briefly describe four techniques that can be used to reduce overfitting

1

2

3

4

Q9: Describe the two key concerns addressed in Reinforcement Learning paradigms?

1

2

Q10: What happens in Figure 1 when the number of steps approaches infinity?
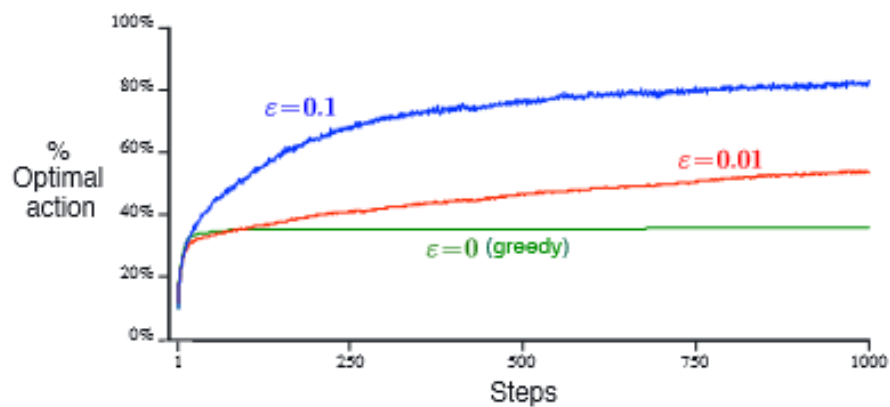

Figure 1: Sutton and Barto. Introduction to Reinforcement Learning, 2nd Edition. The MIT Press. 2018