School Name	School of Computing
Semester	AY2022/23 Semester 2
Course Name	DAAA
Module Code	ST1504
Module Name	Deep Learning

Assignment 2 (CA2: 40%)

The objective of the assignment is to help you gain a better understanding of applying Generative Adversarial Networks (GAN) and Reinforcement Learning (RL)

Guidelines

1. You are to work on the problem sets in groups of 2-3 persons.

2. In this assignment, you will create a GAN model and evaluate the performance of the network. You must perform necessary steps to improve the model performance.

3. Write a Jupyter notebook including your code and comments and visualizations. In addition, please save a copy of the jupyter notebook as a html file. Create a presentation file for your project. Create a video presentation of your slides with face and voice over and save as mp4. Submit your Jupyter notebook, data, slides and mp4 in a compressed package (zip file)

4. Students are required to submit their assignment using the assignment link under the Assignment folder. Please remember to include all group member full student names and student admission number on the top of your jupyter notebook, in the title slide of your powerpoint, and in the title screen of the mp4.

5. The normal SP's academic policies on Copyright and Plagiarism applies. Please note that you are to cite all sources. You may refer to the citation guide available at: https://www.citationmachine.net/resources/

Submission Details

Deadline: 6 Feb 2023, 08:00H
.Submit through: eSP (Brightspace)

Late Submission

50% of the marks will be deducted for assignments that are received within ONE (1) calendar day after the submission deadline. No marks will be given thereafter.
Exceptions to this policy will be given to students with valid LOA on medical or compassionate grounds. Students in such cases will need to inform the lecturer as soon as reasonably possible. Students are not to assume on their own that their deadline has been extended.

PART A: GAN (50 marks)

This part of the assignment is to be completed individually.

Introduction

Apply a suitable GAN architecture to the problem of image generation.

Dataset

Use the CIFAR10 dataset to create **1000** small colour images.
`tf.keras.datasets.cifar10.load_data()`

Tasks

1. Write the code to solve the GAN task. You would be using TensorFlow 2.0/Keras, but if you'd prefer to work with some other toolkit such as MXNET or PyTorch, that is fine.
2. Write a python code detailing your implementation, your experiments and analysis. Remember to also save the jupyter notebook as a HTML file after running it if you are using jupyter.
3. Create a set of slides with the highlights of your Jupyter notebook. Explain the entire deep learning process you went through, data exploration, data cleaning, feature engineering, and model building and evaluation. Write your conclusions. Create a video presentation of your slides (i.e. with face and voice over) and save it as a mp4 file.

Submission requirements for Part A

1. Submit a zip file containing all the project files (source code, Jupyter notebook, HTML file, and data files) the slides and mp4 video file.
2. Slides should not exceed 15 slides for Part A
3. Submit a docx file containing the list of specific contributions by each team member in the deliverables for part B (e.g. Did background research into Breakout game).
4. Submit online via the Assignment link.

Evaluation criteria:

Background research	20%
Application of GAN	20%
Evaluation of GAN	20%
Presentation/Demo/Video	20%
Quality of report (Jupyter)	20%

PART B: REINFORCEMENT LEARNING (40 marks)

This part of the assignment is to be completed in groups of up to 2. Each team member should submit a copy of the project and include the team member names.

Introduction

Apply a suitable RL architecture to the problem. Land the LunarLander successfully on the landing pad.

Dataset

Please choose following environment from OpenAI Gym.
`https://gym.openai.com/envs/LunarLander-v2/`

Tasks

1. Write the code to solve the RL task. You would be using TensorFlow 2.0/Keras, but if you'd prefer to work with some other toolkit such as MXNET or PyTorch, that is fine.
2. Write a python code detailing your implementation, your experiments and analysis. Remember to also save the jupyter notebook as a HTML file after running it if you are using jupyter.
3. Create a set of slides with the highlights of your Jupyter notebook. Explain the entire deep learning process you went through, data exploration, data cleaning, feature engineering, and model building and evaluation. Write your conclusions. Create a video presentation of your slides (i.e. with face and voice over) and save it as a mp4 file.

Submission requirements for Part B

1. Submit a zip file containing all the project files (Jupyter notebook and HTML file) the slides and mp4 video file.
2. Slides should not exceed 15 slides for Part B
3. Submit a docx file containing the list of specific contributions by each team member in the deliverables for part B (e.g. Did background research into Breakout game).
4. Submit online via the Assignment link.

Evaluation criteria:

Background research	20%
Application of RL algorithms	20%
Evaluation of RL algorithms	20%
Presentation/Demo/Video	20%
Quality of report (Jupyter)	20%

PART C: Technical Paper (10 marks)

This part of the assignment is to be completed individually. This is a challenge task for students who wish to attempt it for higher marks.

Write a technical paper in single column format on any **ONE** of the following topics.

- GAN
- Reinforcement Learning

The paper should have the following component:

1. Abstract
2. Introduction
3. Related Works
4. Dataset/Methodology/Experiment
5. Discussion
6. Conclusions
7. References

Submit the paper in Word or PDF format (page limit of 10 pages)

— End of Assignment —