



School Name	School of Computing
Semester	AY2021/22 Semester 2
Course Name	DAAA
Module Code	STI504
Module Name	Deep Learning

### Assignment 1 (CA1: 40%)

The objective of the assignment is to help you gain a better understanding of deep learning for image classification using Convolutional Neural Networks (CNN). You may also wish to take on the additional task of applying suitable deep learning techniques to real-world data (bonus task).

#### Guidelines

1. You are to work on the problem set individually.
2. In this assignment, you will create a CNN for image classification 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. Submit your Jupyter notebook, data and the slides 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 your student name and student admission number on the top of your jupyter notebook and in the title slide of your powerpoint.
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: [http://eliser.lib.sp.edu.sg/elsr\\_website/Html/citation.pdf](http://eliser.lib.sp.edu.sg/elsr_website/Html/citation.pdf)

#### Submission Details

Deadline: 26 Nov 2021, 23:59H  
Submit through: Blackboard

#### 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: CONVOLUTIONAL NEURAL NETWORK (50 marks)

#### Background

Implement an image classifier using a deep learning network.

#### Dataset

You are to use the Fashion MNIST dataset.

```
tf.keras.datasets.fashion_mnist.load_data()
```

#### Tasks

1. Write the code to solve the prediction 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 Jupyter notebook detailing your implementation, your experiments and analysis. Remember to also save the jupyter notebook as a HTML file after running it.
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.

#### Submission requirements for Part A

1. Submit a zip file containing all the project files (Jupyter notebook and HTML file) and the slides (PPTX or pdf).
2. Submit online via the Assignment link.

#### Evaluation criteria:

Background Research & Data Exploration	20%
Feature Engineering or Data Augmentation	20%
Modelling and Evaluation	20%
Model Improvement	20%
Demo/Presentation and Quality of report (Jupyter)	20%

### PART B: CONVOLUTIONAL NEURAL NETWORK 2 (40 marks)

#### Background

Implement an image classifier using a deep learning network. These images are in colour instead of black and white.

#### Dataset

You are to use the CIFAR10 dataset.

```
tf.keras.datasets.cifar10.load_data()
```

#### Tasks

1. Write the code to solve the prediction 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 Jupyter notebook detailing your implementation, your experiments and analysis. Remember to also save the jupyter notebook as a HTML file after running it.
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.

#### Submission requirements for Part B

1. Submit a zip file containing all the project files (Jupyter notebook and HTML file) and the slides (PPTX or pdf).
2. Submit online via the Assignment link.

#### Evaluation criteria:

Background Research & Data Exploration	20%
Feature Engineering or Data Augmentation	20%
Modelling and Evaluation	20%
Model Improvement	20%
Demo/Presentation and 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.

- CNN
- RNN or LSTM

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* —