



**NGEE ANN**  
POLYTECHNIC

**School of InfoComm Technology**

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## **Deep Learning Assignment**

Diploma in DS / IT

Oct 2024 Semester

### **ASSIGNMENT 1**

(40% of DL Module)

**Submission Deadline:**  
**15 Dec 2024 11:59PM**

<b>Tutorial Group</b>	:	
<b>Student Name</b>	:	
<b>Student Number</b>	:	

**Penalty for late submission:**

10% of the marks will be deducted every calendar day after the deadline.

Submissions received more than 7 calendar days after the deadline will not be accepted.

# 1 Assignment Specifications

## 1.1 Objective

Build an image classification model to recognize and classify 10 different types of food.

## 1.2 Dataset

Download the images dataset (5GB) from Kaggle (<https://www.kaggle.com/kmader/food41>). You may need to register an account with Kaggle if you have not already done so.

This dataset contains images of food, organized by the type of food (a total of 101 types). There are 1000 images for each type of food, so in total we have 101,000 images.



For this assignment, we randomly assign 10 different types of food for each student to perform image classification task. **Please refer to the Appendix at the end of this document for the food list file (a .txt file) assigned to you.**

A Jupyter notebook **Image\_Preprocessing.ipynb** is also provided for you to extract the 10 types of food assigned to you. Download the complete set of .txt files (Food\_list.zip) from BrightSpace and enter the .txt file assigned to you in **Image\_Preprocessing.ipynb** to extract the images assigned to you.

**Image\_Preprocessing.ipynb** also helps you to split the images into:

- Training (750 images per food)
- Validation (200 images per food)
- Testing samples (50 images per food)

Feel free to adjust the train, validation and test ratios if required. You only need to run this file once to generate the train, validation and test folders with the corresponding images. **Do remember to run this file first before proceeding to the suggested tasks.**

### 1.3 Suggested Tasks

You should make use of the **Assignment\_1\_[your\_name].ipynb** Jupyter Notebook file to implement your model. It is recommended to tackle this problem by using the suggested structure below.

#### Step 1 – Load Data

- Load the Train, Validation and Test images into Jupyter Notebook
- Resize all the images to 150 x 150 (recommended)
  - If it takes too long for your computer to run, you can downsize the images to 100 x100 or 50 x 50.

#### Step 2 – Develop the Image Classification Models

- You are required to develop at least **TWO** different models:
  - One Model trained from scratch using conv2D & dense layers
  - One Model utilizing pre-trained models
- For each model, you are suggested to follow the universal machine learning workflow to develop the model and improve the model performance, i.e.
  - Start with a baseline model
  - Scale up the model until overfitting occurs
  - Regularize the model accordingly
- Analyze the model performance and tune the model's hyperparameters during training phase
  - **Remember to record model performance curves** for report writing

#### Step 3 – Evaluate the models using the Test Images

- Evaluate the developed models using Test Images
- Compare the model performance during testing phase
- Recommend the best model

#### Step 4 – Use the Best Model to make prediction

- Based on your assigned food types, download at least **THREE** food images from internet
- Feed the images into your Best Model and see whether the model can classify the food images correctly

## 1.4 Report Format & Content Guidelines

Write an **INDIVIDUAL** report with the following sections (see Table below).

Suggested content description and word count are provided for each section. You are free to include other relevant information you deem necessary in the sections.

(Note: For a page with 1-inch margins, 12-point Arial font, and minimal spacing elements, a good rule of thumb is **500 words** for a single-spaced page)

	Suggested Report Sections & Content Guidelines	Word Count
1.	Table of Contents	NA
2.	Overview <ul style="list-style-type: none"> <li>Describe the problem, the objective and the approach.</li> </ul>	Min: 300 words Max: 1000 words
3.	Data Preprocessing and Data Loading <ul style="list-style-type: none"> <li>Describe how you preprocess the data and load data into Jupyter Notebook</li> </ul>	Min: 200 words Max: 500 words
4.	Develop the Image Classification Models (at least <b>TWO</b> ) <ul style="list-style-type: none"> <li>Describe how you build &amp; train the models, tuning model hyperparameters</li> <li>Analyze the model performance during training phase</li> </ul>	Min: 1000 words Max: 2000 words
5.	Evaluate models using Test images <ul style="list-style-type: none"> <li>Compare the models' performance during testing phase</li> <li>Recommend the best model and explain why</li> </ul>	Min: 300 words Max: 1000 words
6.	Use the Best Model to perform classification <ul style="list-style-type: none"> <li>Explain how to apply the model on real life images</li> <li>Explain and analyze the model prediction</li> </ul>	Min: 200 words Max: 500 words
7.	Summary <ul style="list-style-type: none"> <li>Summarize your model performance and provide suggestions for further improvements</li> </ul>	Min: 100 words Max: 500 words
8.	Reflection <ul style="list-style-type: none"> <li>Reflect how using the Learning Assistant (GenAI) provided, has impacted your learning process. Document what you studied with GenAI's assistance, the challenges you faced, and how GenAI helped you overcome them. Consider how these experiences have contributed to your growth and development.</li> </ul>	Min: 300 words Max: no limit

## Presentation and Demonstration

You are required to submit a **video recorded presentation** to showcase and demo your work using your power-point and/or jupyter notebook.

During the recording, your webcam must be turn on, clearly showing your face, for authentication.

The video recorded presentation should **not exceed 10 minutes**.

Video recorded presentations which exceed the allotted time will be penalized.

This video assignment app, powered by Bongo, allows students to capture their presentations multiple times and finally choose their best presentation to be submitted. Each student is to practice the presentation in advance to ensure completion **within 10 minutes**. The recording must include both webcam (clearly showing the student's face for authentication) and slides or codes (whichever is applicable).

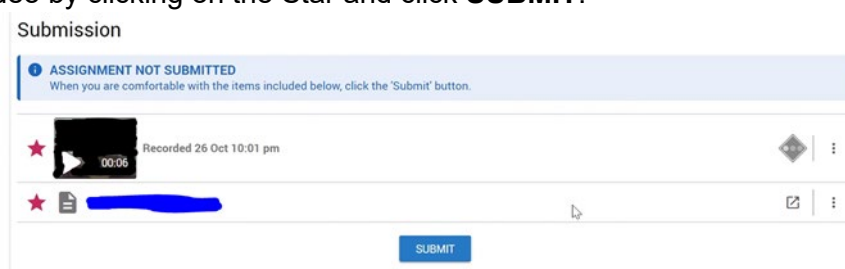
Select the **RECORD VIDEO** option and choose **CAMERA + SCREEN** as shown in the figure below. The figure may differ with the constantly update of the Bongo software, hence students may see a different layout, but general steps should still apply.



After recording the video, click save (as shown below) and it will be ready for students to append it for submission.



Select the video by clicking on the Star and click **SUBMIT**.



## 2 Deliverables

For this assignment, you must separately submit, the following four items into POLITEMall.

1. Recorded Video Presentation using Bongo.
2. PowerPoint Deck: Name the file "Assignment 1 Presentation\_[student\_name].pptx".  
This should be the final presentation slides used for your recorded presentation.
3. Written Report: Name the file "Assignment 1 Report\_[student\_name].docx".
4. Jupyter Notebook: Name the file "Assignment 1 Code\_[student\_name].ipynb".

It is your responsibility to ensure that the correct file is submitted separately to the correct submission links in PoliteMall. Failure to do so will result in the submission not being marked. In the case of multiple submissions, only the most recent submission will be evaluated. Submissions received more than 7 calendar days after the deadline will not be accepted.

## Grading Criteria

	Grading Criteria	Component Weightage
<b>Video Recorded Presentation and Power Point</b>	a) Quality of Content b) Quality of Slides c) Presentation and articulation skills	<b>40%</b>
<b>Final Report and Jupyter Notebook</b>	a) Quality of Workflow b) Quality of Model Tuning c) Quality of Documentation d) Depth of Reflection	<b>60%</b>

### 3 Appendix

#### *Food List*

Each student is assigned a **.txt file** which includes ten different types of food.

S/No.	Student ID	Student Name	Group	Assigned File
1	10257398D	ANG WEI XUAN SENDEROS	T/P01	26.txt
2	10256994E	ARIENNE CHIN	T/P01	27.txt
3	10259990F	ARJUNAN YOHITH	T/P01	28.txt
4	10257346A	BRIAN WONG	T/P01	29.txt
5	10255661G	CADEN CHANG KAI SHEN	T/P01	30.txt
6	10262469G	CELESTE POA SI YING	T/P01	31.txt
7	10259428B	ELVIS CHAN JUN YU	T/P01	32.txt
8	10257966C	ETHAN CHAN	T/P01	33.txt
9	10257070C	HPONE MYINT MYAT PAING	T/P01	34.txt
10	10258267D	JOVAN LEE YI DE	T/P01	35.txt
11	10241851C	JULIA ZHOU YI HONG	T/P01	36.txt
12	10258273A	KEAVEN TONI WOO	T/P01	37.txt
13	10257928J	LAU YU CHENG, ETHAN	T/P01	38.txt
14	10255850G	LIM CHANG ZE	T/P01	39.txt
15	10257450A	LOY XIE JING	T/P01	40.txt
16	10255744J	MAK KAI XIN	T/P01	41.txt
17	10262556H	MUHAMMAD AFIQ BIN ALIAS	T/P01	42.txt
18	10255832J	NG JIA LING JESSICA	T/P01	43.txt
19	10255981F	RAINNEN WONG SHIN-ZER	T/P01	44.txt
20	10258439E	SAHANA NAVEEN	T/P01	45.txt
21	10258535K	SIAH WAN RU, TRICIA	T/P01	46.txt
22	10257951E	TEJ S/O SURESH KUMAR	T/P01	47.txt
23	10257181F	YIM JUN TECK	T/P01	48.txt
24	10257353G	YONG YUN KAI LOUIS	T/P01	49.txt