

# School of InfoComm Technology

**Deep Learning Assignment**

Diploma in CSF / FI / IT

April 2022 Semester

**ASSIGNMENT 1**

(30% of DL Module)

16th May 2022 – 10th June 2022

**Submission Deadline:**

**Presentation: 10th June 2022 (Sunday), 11:59PM**

**Report and Code: 10th June 2022 (Sunday), 11:59PM**

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| **Tutorial Group** | **:** | **T01 / T02 / T03 / T04** |
| **Student Name** | **:** | Dominic Lee |
| **Student Number** | **:** | S10222894 |

**Penalty for late submission:**

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

**NO** submission will be accepted after 19th June 2022 (Sunday), 11:59PM.

# Assignment Specifications

## Objective

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

## 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.**

## 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

## 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)*

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| --- | --- | --- |
|  | **Suggested Report Sections & Content Guidelines** | **Word Count** |
| 1. | Table of Contents | NA |
| 2. | Overview   * Describe the problem, the objective and the approach. | Min: 300 words  Max: 1000 words |
| 3. | Data Preprocessing and Data Loading   * Describe how you preprocess the data and load data into Jupyter Notebook | Min: 200 words  Max: 500 words |
| 4. | Develop the Image Classification Models (at least **TWO**)   * Describe how you build & train the models, tuning model hyperparameters * Analyze the model performance during training phase | Min: 1000 words  Max: 2000 words |
| 5. | Evaluate models using Test images   * Compare the models’ performance during testing phase * Recommend the best model and explain why | Min: 300 words  Max: 1000 words |
| 6. | Use the Best Model to perform classification   * Explain how to apply the model on real life images * Explain and analyze the model prediction | Min: 200 words  Max: 500 words |
| 7. | Summary   * Summarize your model performance and provide suggestions for further improvements | Min: 100 words  Max: 500 words |

# Presentation and Demonstration

You are required to submit a **video recorded presentation** to showcase and demo your work. The video recorded presentation **should be not exceed 10 minutes**. Video recorded presentations which exceed the allotted time will be **penalized**.

You must record your video presentation using **Microsoft Teams**, and do remember to grant your tutor access to view your video.

# Deliverables

For this assignment, you must submit all the following items into BrightSpace by **Friday 10th June 2022, 2359 hours**:

1. A deck of **“Assignment 1 Presentation\_[your\_name].pptx”** presentation slide

This is the deck of final presentation slides which you used to conduct your recorded presentation

1. A softcopy **“Assignment 1 Report\_[your\_name].docx”** report
2. The **completed “Assignment 1\_[your\_name].ipynb”** Jupyter Notebook File
3. The **link to your recorded presentation**

* Submit the link of your recorded presentation in the **Comments** section of your Assignment 1 Submission
* Extend your Teams recording expiration date to **No expiration**
  + - Open your video recording in a browser and select the **i** icon at the upper right of the screen to launch the details pane and choose **No expiration** by clicking the calendar icon
    - Details are outlined in the following URL:

<https://support.microsoft.com/en-us/office/record-a-meeting-in-teams-34dfbe7f-b07d-4a27-b4c6-de62f1348c24#bkmk_view_change_expiration_date>

* **Edit the sharing of the recorded video** to be viewable by the tutor as outlined in this URL:

<https://docs.microsoft.com/en-us/stream/portal-edit-video>

* **Note**: if tutors cannot access the recorded video, and students need to be reminded by tutors to reset permission, students will be penalized for non-conformance.

# Grading Criteria

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| --- | --- | --- |
|  | **Grading Criteria** | **Component**  **Weightage** |
| **Video Recorded Presentation** | 1. Quality of work 2. Flow of presentation based on content guidelines (see section 1.4) 3. Quality of presentation slides 4. Presentation and articulation skills | **50%** |
| **Final Report** | 1. Quality of work 2. Completeness of report based on suggested report sections and content guidelines (see section 1.4) 3. Clarity of report, Quality of analysis and discussions 4. Use of proper visual aids and Use of proper grammar | **50%** |

# 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 | 10219364J | DANIEL CHIA ERN ZHI | T/P01 | 1.txt |
| 2 | 10221825F | HO ZHENG YI, NATHYN | T/P01 | 2.txt |
| 3 | 10204128J | LEE CHENG JHANG | T/P01 | 3.txt |
| 4 | 10189566E | LEE THIN TSIN, JOHN | T/P01 | 4.txt |
| 5 | 10222894G | LEE YU YEE, DOMINIC | T/P01 | 5.txt |
| 6 | 10223468J | LEROI JUNE YEN HAO | T/P01 | 6.txt |
| 7 | 10226797J | LIM KAI CHONG | T/P01 | 7.txt |
| 8 | 10223032B | LUCAS SIM | T/P01 | 8.txt |
| 9 | 10219397E | MANANSALA EUGENIO BAUTISTA | T/P01 | 9.txt |
| 10 | 10222031D | NADIA LO MEI SHI | T/P01 | 10.txt |
| 11 | 10221773B | NEO JIA CHEN | T/P01 | 11.txt |
| 12 | 10223609B | RACHELLE GOH WEN NI | T/P01 | 12.txt |
| 13 | 10204092E | SUEN JEREN | T/P01 | 13.txt |
| 14 | 10222944C | TAN JIA JUN, JEFF | T/P01 | 14.txt |
| 15 | 10222317E | TAN SI XUAN ALYSSA | T/P01 | 15.txt |
| 16 | 10223135K | TAN YUN-E | T/P01 | 16.txt |
| 17 | 10227533B | TAY GAO JUN | T/P01 | 17.txt |
| 18 | 10222046B | TEO PEI SEN BENSON | T/P01 | 18.txt |
| 19 | 10227963E | VINCENT TAN GUAN SHEN | T/P01 | 19.txt |
| 20 | 10222200H | WONG JING EN | T/P01 | 20.txt |
| 21 | 10222489E | AU YONG CHENG JUN | T/P01 | 21.txt |
| 22 | 10222533G | AW JIN LE, RAY | T/P01 | 22.txt |
| 23 | 10222096G | CASSIDY QUEK JING HUI | T/P02 | 23.txt |
| 24 | 10227778A | CELSIUS CHIA ZHAN YAO | T/P02 | 24.txt |
| 25 | 10222140J | CHUA HAO ZHONG | T/P02 | 25.txt |
| 26 | 10222081J | FUN GAO WEI, FARRELL | T/P02 | 26.txt |
| 27 | 10222177A | GOH TIAN LE, MATTHEW | T/P02 | 27.txt |
| 28 | 10222998D | HAN XIHE | T/P02 | 28.txt |
| 29 | 10222566C | HASANAH BINTE SAMRI | T/P02 | 29.txt |
| 30 | 10221841F | JAVIEN TAN JIE EN | T/P02 | 30.txt |
| 31 | 10218985A | KEENE NG | T/P02 | 31.txt |
| 32 | 10222275D | KOH HAN JIE, ISAAC | T/P02 | 32.txt |
| 33 | 10222972D | LAI YONG CHUEN | T/P02 | 33.txt |
| 34 | 10222162C | LEE WEE KANG | T/P02 | 34.txt |
| 35 | 10221824G | LIM LONG TECK | T/P02 | 35.txt |
| 36 | 10222186E | LOW JUN JIE, RYAN | T/P02 | 36.txt |
| 37 | 10227463K | MARZAN RICHARD PAUL PAMINTUAN | T/P02 | 37.txt |
| 38 | 10223145C | NG E KAI | T/P02 | 38.txt |
| 39 | 10223647F | OOI JUN HENG, RYAN | T/P03 | 39.txt |
| 40 | 10219526G | QIN GUAN | T/P03 | 40.txt |
| 41 | 10221943E | QUEK LENG SONG | T/P03 | 41.txt |
| 42 | 10227835C | SOH YI WEI | T/P03 | 42.txt |
| 43 | 10221930E | TAN YEE MING | T/P03 | 43.txt |
| 44 | 10222170H | TEO YAN JUN, SAMUEL | T/P03 | 44.txt |
| 45 | 10219524J | YONG ZI REN | T/P03 | 45.txt |
| 46 | 10208272G | AHMAD SYAFIQ BIN HAMZAH | T/P03 | 46.txt |
| 47 | 10204891D | ANG ZI YANG | T/P03 | 47.txt |
| 48 | 10203364H | CORTEZ NATHAN EMERSON MACALANDA | T/P03 | 48.txt |
| 49 | 10205324D | DALTON CHNG CHENG HAO | T/P03 | 49.txt |
| 50 | 10206197J | DAMIEN TAN QING XUN | T/P03 | 50.txt |
| 51 | 10203067B | DEX NGIAM CHAO YI | T/P03 | 51.txt |
| 52 | 10208607E | FATIMAH BASIRAH BINTE MUHAMMAD MANAN SHAH | T/P03 | 52.txt |
| 53 | 10194271B | FUN KAI JUN | T/P03 | 53.txt |
| 54 | 10208163B | JOHNY TOH | T/P03 | 54.txt |
| 55 | 10204720C | LU JUNJI | T/P03 | 55.txt |
| 56 | 10204413D | MARCUS AW KAR MING | T/P03 | 56.txt |
| 57 | 10198345F | MUHAMMAD NUR AZLAN B ROSLAN | T/P03 | 57.txt |
| 58 | 10205779H | OWG JUN XIAN | T/P03 | 58.txt |
| 59 | 10202752B | SEAN TAN YI XUN | T/P03 | 59.txt |
| 60 | 10205100K | SEO SHIN YOUN | T/P03 | 60.txt |
| 61 | 10194140C | SIVARAJ S/O ARICHANDRAN | T/P03 | 61.txt |
| 62 | 10185325F | SNG JUN SHENG | T/P03 | 62.txt |
| 63 | 10204577J | TAN ZHONG ZE, ERNEST | T/P03 | 63.txt |
| 64 | 10205696F | YU MENGYAO | T/P03 | 64.txt |
| 65 | 10205992C | ZEN KOH SHENG SIAN | T/P03 | 65.txt |
| 66 | 10205458K | ARIQ LIM KIAT SIANG | T/P04 | 66.txt |
| 67 | 10204406H | BRANDON WONG JUN HAO | T/P04 | 67.txt |
| 68 | 10205582F | CESAR CHEN PERALTA JR II | T/P04 | 68.txt |
| 69 | 10205229H | CHUA KAI LING | T/P04 | 69.txt |
| 70 | 10205569C | IVAN CHANG ZHONG PING | T/P04 | 70.txt |
| 71 | 10206270A | JAVIER TAY WEI YI | T/P04 | 71.txt |
| 72 | 10203213C | KOH KIANG WEI GREGORY | T/P04 | 72.txt |
| 73 | 10205682G | KOK WAI LOK | T/P04 | 73.txt |
| 74 | 10208320E | LEE JUNPENG HERMAN | T/P04 | 74.txt |
| 75 | 10204757E | MUHAMMAD FARIS ZHARFAN B A G | T/P04 | 75.txt |
| 76 | 10205123C | NG YU TYAN | T/P04 | 76.txt |
| 77 | 10207999D | NUR HARITH MIRZA BIN NORRAHAMAD | T/P04 | 77.txt |
| 78 | 10204864B | ONG JUN WEI | T/P04 | 78.txt |
| 79 | 10208470A | SHANICE YEONG KAI WEN | T/P04 | 79.txt |
| 80 | 10194069J | TAN HOU HUA DONALD | T/P04 | 80.txt |
| 81 | 10203489K | XAVER TAN GHIM YONG | T/P04 | 81.txt |
| 82 | 10208045C | XU ZHIHONG | T/P04 | 82.txt |
| 83 | 10205175F | ZAFEERAH | T/P04 | 83.txt |