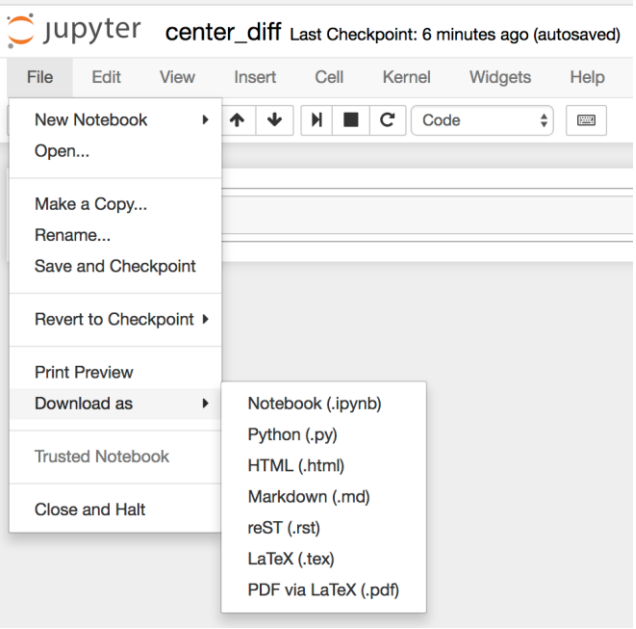
Homework 4
Concept, Derivation and Programming, Due 9:00, Tuesday, November 22, 2022

Late submission within 24 hours: score*0.9;
Late submission before post of solution: score*0.8 (the solution will usually be posted within a week); no late submission after the post of solution)

HW Submission Procedure (請仔細閱讀)

1. For concept and derivation, please write them in a professional format and submit a pdf file. Name your pdf file `YourID_HW3.pdf`, for example, `n96081494_HW4.pdf`

2. You should submit your Jupyter notebook and Python script (`*.py`, in Jupyter, click File, Download as, Python (`*.py`)).

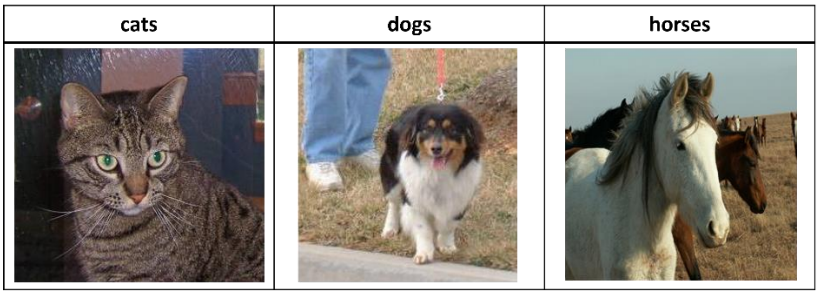


3. Name a folder using your student id and HW number (e.g., n96081494_HW4), put the pdf and all the Jupyter notebooks and python scripts into the folder and zip the folder (e.g., n96081494_HW4.zip).

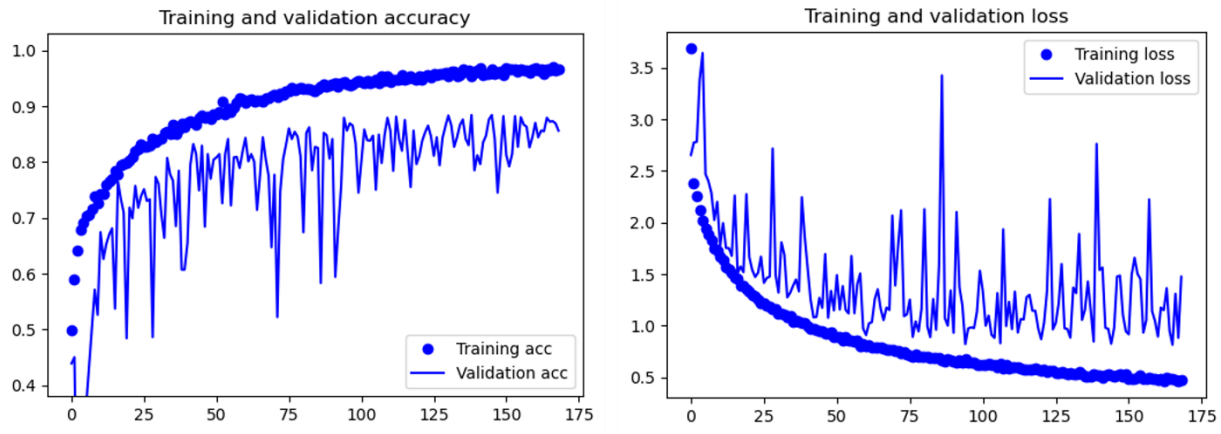
4. Submit your HW directly through the course website.

Total 100%

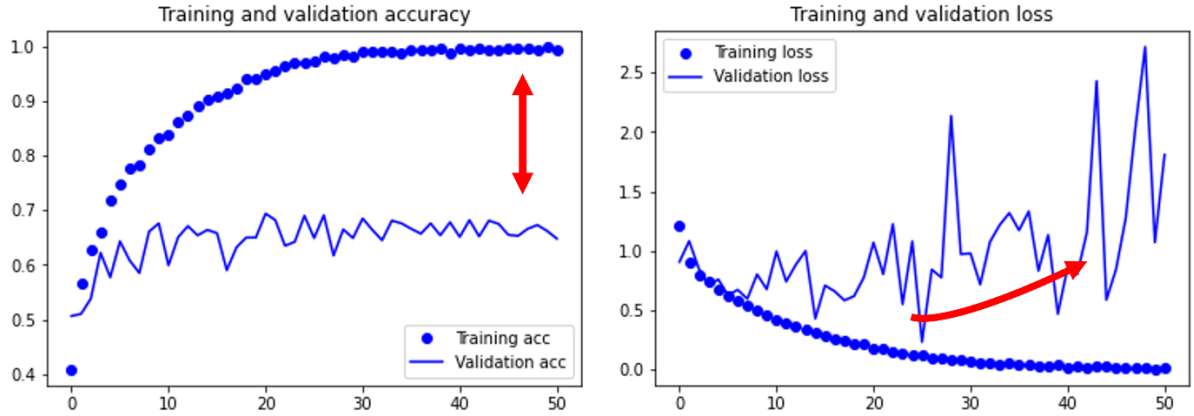
1. (**50%**) **Please download the zip file cats_dogs_horses_small.zip from Moodle.** Name your Jupyter notebook `CNN_animal` and Python script `CNN_animal.py`. Please create a classification model to classify cats, dogs, and horses where both `Conv2D` and `MaxPooling2D` of the model must be more than one layer. The dataset cats_dogs_horses_small.zip can be downloaded from Moodle.



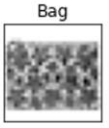
For data preprocessing, please refer to the code in 4.2.3 Data preprocessing of the handout. After training the model with cats_dogs_horses_small, please plot the training history.



A relatively large gap between the training and the validation accuracy indicated that the model is likely overfitting the training dataset. If the training results are overfitting, please use what you have learned to reduce overfitting as much as possible.

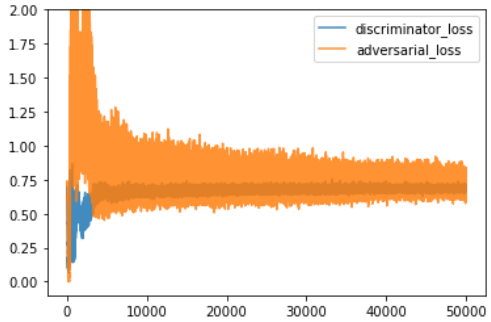


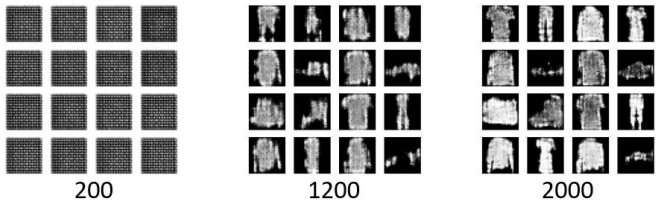
2. (50%) **Please download the zip file HW4_template.zip from Moodle.** Name your Jupyter notebook `CGAN` and Python script `CGAN.py`. Please create a CGAN model to generate grayscale pictures of clothing. Please use `from tensorflow.keras.datasets import fashion_mnist` to read the training dataset. The data contains 10 classes of labels, the classes is shown in the figure below:

Label	0	1	2	3	4
	T-shirt/top	Trouser	Pullover	Dress	Coat
					
Label	5	6	7	8	9
	Sandal	Shirt	Sneaker	Bag	Ankle boot
					

You need to complete function `build_and_train_models()` to enable CGAN to run. Note that the input of CGAN has noise and **one-hot label**.

Please plot training history and report the results of fake images generated by CGAN. The label of the fake image is the condition [0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5]. The results of fake images must contain 9 different epochs to show the process of model learning.

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