COS30082 Assignment
Bird Species Classification

Individual Assignment

This is for students who are aiming for a credit grade.

1. Objectives

This assignment involves working on a multi-class classification task. You are encouraged to apply any method you've learned or know to address this challenge.

2. Dataset

The dataset for this project is Caltech-UCSD Birds 200 (CUB-200), which contains images of 200 bird species primarily from North America. There are 4,829 images available for training. You can download both the images and the annotation files from the Assignment page on Canvas.

Caltech-UCSD Birds 200

https://www.vision.caltech.edu/datasets/cub_200_2011/

You can find the training images in the **Train.zip** file and the annotation file in **train.txt**. The format of the **train.txt** file is as follows:

image's name{space}class label

Here is an example:

```
Black_footed_Albatross_0019_416160254.jpg 0
Black_footed_Albatross_0005_2755588934.jpg 0
Laysan_Albatross_0014_174432783.jpg 1
Sooty_Albatross_0005_340127050.jpg 2
.
```

You can also find the testing images in the **Test.zip** file and the annotation file in **test.txt**. Its format is the same as the one of the training.

3. Evaluation Metric

You are required to report your results using two evaluation metrics: Top-1 accuracy and Average accuracy per class. You may also include additional evaluation metrics, provided they are properly justified.

The *Top-1 accuracy* is used to evaluate the overall classification performance of the models.

$$\text{Top-1 accuracy} = \frac{1}{N}\sum_{k=1}^{N} 1\{argmax(y) == groudtruth\}$$

where N is the total number of testing images, y is the output probabilities of 200 classes.
arg max(y) is the class label corresponding to the highest predicted probability by the model.

The Average accuracy per class is used to assess the model's performance across each individual class.

$$\text{Ave} = \frac{1}{C}\sum_{i=1}^{C} T_i$$

where T_i is the accuracy calculated for all test images of the class C_i, and C is the total number of classes.

4. Submission

4.1 Report

Your report (in PDF format) should include two sections: 'Methodology' and 'Results and Discussion.'

It is likely that you will encounter overfitting issues, so your model design should address how to minimise this risk. In the report, describe the architecture of your models, the loss function, hyperparameters, and any other related details. Additionally, discuss the performance discrepancies between the models and provide a justification for which one yielded the best results. Please ensure that the report does not exceed 4 pages.

4.2 Python Source Code

Ensure your code is well-documented.