EEEM071 Advanced Topics in Computer Vision and Deep Learning
Coursework Assignment (Spring 2024)
Vehicle Re-identification

NAME: _____

URN: _____

Baseline: The default settings already provided for you in the code base.

Hyperparameters: The parameters that are not learnable, and you can set before starting the training.

Important instructions:
1. Regarding log files:
   a. Please submit your own log files from your codebase.
   b. All log files are automatically watermarked and are unique to each run. Do not change the log file structure.
   c. All log files should be named based on the section number and the question number. (log_{Section_num}_{Question_num}.txt)
      For example, a log file generated for an experiment corresponding to question 2 in section 1, should be named as "log_1_2.txt"
2. Regarding word limit:
   a. Please ensure your answers do NOT exceed the word limit.
   b. Going beyond the word limit will be penalized.
   c. Content within Tables/graphs/log files is <u>not</u> counted in the word limit.
3. Regarding *presentation and clarity* of your answers:
   a. In addition to the scientific content, you will also be assessed on the presentation and clarity of the writing.
   b. This accounts for 10 marks. Following criteria to be taken into consideration:
      i. Figures should be well presented. The axis and the markings should be easily readable.
      ii. The writing should be clear, grammatically correct, and the ideas come across easily to the reader.
      iii. It is important to use tables if you're discussing results across different values of hyperparameters.

NOTE: Please read all questions carefully before attempting to answer. The below three sections account for 90 marks and (as mentioned above) 10 marks are allotted for *presentation and clarity* of the overall report.

Section 1 – Familiarity with the provided code. [40 marks]
Max. 200 words.

1. Run the code using the default settings. **[20 marks]**
    a. Provide evidence in terms of the log file.
    b. Discuss the training and evaluation process followed by implications of the observed performance using an appropriate metric.
       Max. 100 words.
2. Apply another CNN variant (that is not provided in the default settings). **[10 marks]**
    a. Provide evidence in terms of the log file.
    b. Critically discuss and contrast the results with what observed in question 1 above.
       Max. 50 words.
3. Apply one more neural network architecture (say, a transformer variant). **[10 marks]**
    a. Provide evidence in terms of the log file.
    b. Critically discuss and contrast the results with what observed questions 1 and 2 above.
       Max. 50 words.

Section 2 – Dataset preparation and Augmentation experiments. [25 marks]
Max. 250 words.

1. Apply any one data augmentation technique (for example, "crop"). Discuss the results in comparison when no data augmentation is employed, i.e. the default configuration in the provided code. **[10 marks]**
   Max. 100 words.
2. Apply two different augmentations in isolation (for example, only "blurring" or only "horizontal flip" etc.) and discuss the implications of each augmentation and analyze the results in comparison when no data augmentation is employed. Highlight any improvement or drop in overall score. **[10 marks]**
   Max. 100 words.
3. Combine augmentation techniques employed in questions 1 and 2 above (for example, "crop" + "blurring" + "vertical flip"). Highlight any improvement or drop in overall score. **[5 marks]**
   Max. 50 words.

Section 3 – Exploration of Hyperparameters [25 marks]
Max. 250 words.

1. Exploration of Learning Rate (LR). **[10 marks]**
   a. Experiment with 4 values of LR (in addition to the default value).
   b. Discuss the effects observed on overall performance.
      Max. 100 words.
2. Exploration Batch sizes. **[10 marks]**
   a. Fixing the best LR value from the experiments in question 1 above, experiment with 4 different values of the BS (in addition to the default value).
   b. Discuss the effects observed on overall performance.
      Max. 100 words.
3. Exploration of the optimizer. **[5 marks]**
   a. Fixing the best LR value and best Bath Size value from the experiments in question 1 and 2 above, respectively, experiment with changing the optimizer to SGD. (use PyTorch's internal class)
   b. Discuss the effects observed on overall performance.
      Max. 50 words.