A Sample Assignment in the Style of Assignment 1A and Assignment 1B

CAB420, Machine Learning

This document sets out a single sample question to illustrate the expected solution format for CAB420 Assignment 1A and Assignment 1B.

Further Details:

1. While a sample solution is provided for this question, the data and code are not available.

2. As per Assignment 1A and 1B, the sample solution provides **a concise written response** addressing the question. As per Assignment 1A and 1B, figures are not counted within the page lengths listed against individual response items.

3. As per Assignment 1A and 1B, submission of code is optional, and the provided sample solution does not contain code attached as an appendix.

Problem 1. Image Classification. Semantic person search is the task of matching a person to a semantic query. For example, given the query '1.8m tall man wearing jeans a red shirt', a semantic person search method should return images that feature people matching that description. As such, a semantic search process needs to consider multiple traits. A simple approach to enable this form of search is use classification to determine the traits present in an input image.

You have been provided with a dataset (see `Q1/Q1.tar.gz`) that contains the following annotation for a number of semantic attributes (gender, pose, torso clothing type, torso clothing colour, torso clothing texture, leg clothing type, leg clothing colour, leg clothing texture, luggage). This question will focus exclusively on the *Torso Clothing Colour* attribute which can take one of the following values: Black (0), Blue (1), Brown (2), Green (3), Grey (4), Orange (5), Pink (6), Purple (7), Red (8), White (9), Yellow (10).

Your Task: Using this data you are to implement a deep learning approach to classify the torso colour of a subject from an image. Your network should be trained from scratch, though you are welcome to use ideas and code from teaching examples where appropriate. Consideration should be given to appropriate data pre-processing.
Note that we do not expect the developed networks to perform at a high accuracy for all classes. While your approach should take appropriate steps to improve performance across all classes, your response should also analyse failure cases and discuss likely reasons for the level of performance observed.
You have been provided code to load the images and labels ready for use with keras and tensorflow, and to resize and convert images to grey scale is you wish to do so. The provided code will aplit the data into train and test splits, and you are to use these splits as is.

Your final response should include sections that address the following:

- Any pre-processing that is performed on the data (cropping, resizing), and any data augmentation that is used. Note that you may wish to crop and/or resize data to reduce the computational demands of your approach. This is completely acceptable, though the pre-processing should be explained, and care should be taken to ensure that the images are not resized to such an extent that traits become indistinguishable. **(1/2 page)**.

- A description and justification for your approach. This should include justification for the network design and training. **(1/2 page)**.

- An evaluation of performance for the classification of torso colour. The evaluation should include an investigation of situations where the proposed solution performs poorly, exploring possible reasons for this. **(1 page)**