Assignment 2 - Image classification with Bag of Visual Words and KNN classifier (20 marks)

Available: 1-April-2022.

Due: 11.55PM, 22-April-2022.

Instructions:

1. All code should be in Python (>=3.7.x). You should write appropriate comments through the code.
2. You can use *NumPy*, *SciPy*, *scikit-image, OpenCV* and Python standard libraries.
3. Late submission penalty follows Monash policy.
4. Submission is to be made only on Moodle.
5. Plagiarism cases will be dealt following Monash policy.

Submission: You need to submit a single zip file containing the task python files, report and images. There should be one common *Report.pdf* for all the tasks below. This document must clearly identify both your full name and student ID. The zip file should be named "A2_<YourMonashID>.zip" (e.g. A2_12345678.zip).

Objective:

Build an image classification system using Bag of Words with SIFT local features and KNN classifier. The system will be trained and tested using CIFAR10 dataset. The dataset can be accessed with *Tensorflow*. The dataset consists of 50,000 images for training and 10,000 images for testing.

Marking:

Main functions to create

create_dictionary() – the function computes and saves the visual dictionary. Write your own implementation of clustering. **(5 Marks)**

How did you choose the value of the number of clusters? Mention (<150 words) in the assignment report. **(1 Mark)**

compute_histogram() – the function generates the histogram (the BoW) representation for a given image. **(2 Marks)**

match_histogram() – the function computes the distance between two histograms (two BoW representations). **(2 Marks)**

predict_knn() – This is the KNN classifier. The function returns the predicted label of a given image. Implement KNN using the distance above. (**2 Marks**)

How did you choose the number of nearest neighbors for the classifier (Hint: You can use cross validation.)? Mention (<150 words) in the assignment report. **(2 Marks)**

In the end of the program, display the *overall classification accuracy and* the *class-wise accuracy* of testing data **(2 Marks).**

On the basis of performance of the technique, marks out of a total of **4 Marks** will be awarded. Specifically, the overall classification results from ***main.py*** from all submissions will be compared and grouped into 4 groups. The marks for each group are:

Group 1 (top 25% of leaderboard): 4 marks

Group 2 (25% - 50% of leaderboard): 3 marks

Group 3 (50% - 75% of leaderboard): 2 marks

Group 4 (75% - 100% of leaderboard): 1 mark.

More assignment instructions:

1. No change is going to be made to the code at our end. Make sure that your code works, when the zip file is unzipped.
2. The runtime of the code should be less than 15 minutes.