ASSIGNMENT 1
CS4186 VISION AND IMAGE

INSTANCE SEARCH

You are given a collection of 5,000 images and 20 testing query instances (you can download from this link: onedrive link). Each image contains one instance (object). Your task is to implement two methods for instance search. Specifically, given a query instance with the instance bounding box location in the query instance image (stored in the *query_txt* directory with the same name of query instance image), a method needs to find the images that contain the same query instance from the image collection （5000 images） and then ranks them according to similarity or confidence. The 20 testing query images are used for evaluating the performance of your implementation.

MARKING SCHEME

A. **Report** (30%)
   Write a report (no more than 5 pages) that briefly describes the two methods and list the top10 search results for every 20 query instances.

B. **Method** (50%):
   a. Implement any two methods (e.g., color histogram, LBP, SIFT, CNN) for instance search. You can employ the methods you learn in the class, or you could choose other methods in the literature. It is also encouraged to design the method by yourself. (40%)
   b. Try to combine two methods (e.g., color histogram, LBP, SIFT, CNN), which may provide better performance than using only one method. (10%)

   At least **one method** should be implemented by yourself, instead of calling the ready-made function package.

C. **Benchmarking** (20%)
   For each of your methods, show the retrieval result for each of the 20 testing query instances (as detailed in the submission section). The mark will be allocated based on the retrieval performance of the method with better performance.

DEADLINE

The submission should be done before 15-Apr-2023 11:59PM, Hong Kong Time.

Penalty on late submission: 20% of marks will be deducted per day. No submission will be allowed after five days from the deadline. *Do NOT copy code from the internet and do not borrow other people's code. Remember that PLAGIARISM is a serious offense for which you may fail the class or even be expelled from the university.*

NOTE

1. In the provided zip file, the folders are organized as: **gallery_4186** – 5,000 images for search; **query_4186** – 20 query instances; **query_txt_4186** - the instance bounding box location in the query instance image.
2. The instance of an image is given as bounding box. The bounding box is represented as (top left corner in x, top left corner in y, width, height) in the text file. For example, the file *01.txt* specifies the bounding box of the query instance for image *01.jpg*.
3. You can use any distance or similarity function for measuring the similarity between two images or instances. Examples include:

   Euclidean distance between a query $Q = [q_1, q_2 \cdots q_n]$ and an image $F = [f_1, f_2 \cdots f_n]$:

   $$Distance(Q, F) = \sqrt{\sum_{i=1}^{n}(q_i - f_i)^2}$$

   Cosine similarity between a query $Q = [q_1, q_2 \cdots q_n]$ and an image $F = [f_1, f_2 \cdots f_n]$:

   $$Similarity(Q, F) = \frac{\sum_{i=1}^{n} q_i f_i}{\sqrt{\sum_{i=1}^{n} q_i^2} \sqrt{\sum_{i=1}^{n} f_i^2}}$$

SUBMISSION

PLEASE ZIP THE FOLLOWINGS AND SUBMIT TO CANVAS:

✓ *Computer program*: Python/Matlab/C++ recommended. If you want to use another program language, please send an email to our Teaching Assistant.
✓ *Report:* The top10 results of every 20 query images should be listed in the report, i.e. the top10 results for every row in the format of the Rank list file (shown below).
✓ *Rank list*: A text file (rankList.txt) showing the images in descending order of similarity:

```
Q1: 7 12 214 350 …
Q2: 301 501 1990 2 …
Q3: 288 345 389 1290 …
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Q4: 248 293 1098 2000 …
Q5: 380 287 392 478 222 …

Remark: 20 rows only (for 20 testing query instances); Each row should list the names of the 5,000 images (named in number) in descending order of their similarities to a query.

CONTACT PERSON

Please email our Teaching Assistant: TIAN Xing (Email: xingtian4-c@my.cityu.edu.hk) for any technical questions.