

CECS 551
Assignment 8
Total: 80 Points

General Instruction

- Submit uncompressed file(s) in the Dropbox folder via BeachBoard (Not email).
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1. Develop face recognition software using pre-trained YOLO V3 and Facenet model. Please note that you don't need to implement and train a model.
 - (a) Search and study open source codes of YOLO V3 and Facenet model.
 - (b) Import the open source codes into your workstation.
 - (c) Download the dataset (`img_celeba.7z`) *at here*. You should download all 7-zip parts to extract it. The dataset includes 202,599 images of 10,177 celebrities.
 - (d) (10 points) `identity_CelebA.txt` includes pairs of the file name and the id. Using `identity_CelebA.txt`, choose the image files of ids included in the `selected_ids.txt`. Create a selected dataset with the selected images. The selected dataset will include 1,200 images. (30 images for each of the 40 celebrities)
 - (e) (25 points) By using pre-trained YOLO V3 and Facenet model, implement a Python program `image2vect.py`.
 - Input: An image (x) which includes a human face.
 - Intermediate steps
 1. Find bounding box of the face in the input image.
 2. Crop the input image for the bounding box. (x')
 - Output: Embedding vector ($f(x') \in \mathbb{R}^d$) in d -dimensional Euclidean space for the cropped image. The embedding vector should be normalized, i.e. $\|f(x')\|_2 = \sum_i^d f_i(x')^2 = 1$.
 - (f) (25 points) Implement a Python program `imageFinder.py`.
 - Input: An image of a celebrity in the selected dataset.
 - Intermediate steps
 1. Using `image2vect.py`, compute Euclidean distances between the embedding vector of the input image and the embedding vectors of other images in the selected dataset. You will have 1,199 Euclidean distances.
 2. Consider a hyper-parameter τ . The other images will be recognized as the same celebrity of the input image if the Euclidean distance is less than τ .
 - Output: A list of image files recognized as the same celebrity of the input image.
 - (g) (10 points) For different τ 's, compute the precision and recall. The range of τ should be wide enough and the interval of τ should be small enough to verify the effect of τ .

- Precision = $\frac{\# \text{ of correctly recognized images}}{\# \text{ of recognized images}}$
 - Recall = $\frac{\# \text{ of correctly recognized images}}{\# \text{ of actual images of the celebrity (29)}}$
- (h) (10 points) Repeat the step (f) and (g) for input images of 10 randomly selected unique celebrities. Draw the overlapped precision and recall curve as shown in Figure 1.
- (i) Submit your source code, requirements.txt and a report file. The report file should include the experimental results, discussions, and the references of the pre-trained models.

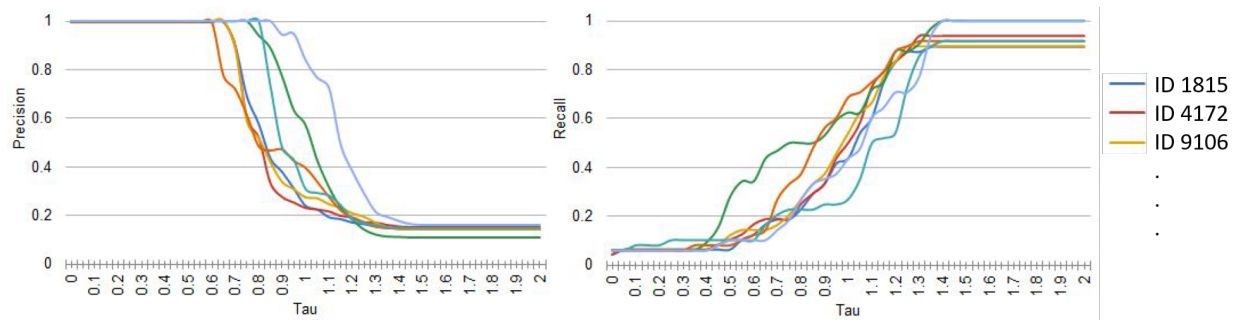


Figure 1: An example of precision and recall curve