Department of Statistics & Data Science Institute
Columbia University

GR5293 Applied Machine Learning for Image Analysis
Homework #1

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Fall 2022

Homework#1: practice an image segmentation algorithm using K-means

- **Requirement**:

  1. Use a relative path for reading the color face image which can be downloaded from the Coursework .

  2. Use k-means to segment faces from an image, e.g., set k=3 or try other k, note: the second testing image, i.e., faces.jpg is optional which is a little bit challenging, but you will get an extra credit.

  3. Find the face cluster and convert the original image to a binary image(face and background). Please refer to the lecture slides in week 3.

  4. Find the location of face from the binary image.

  5. Output of the script should be an image with a bounding box (see an example on the next slide)

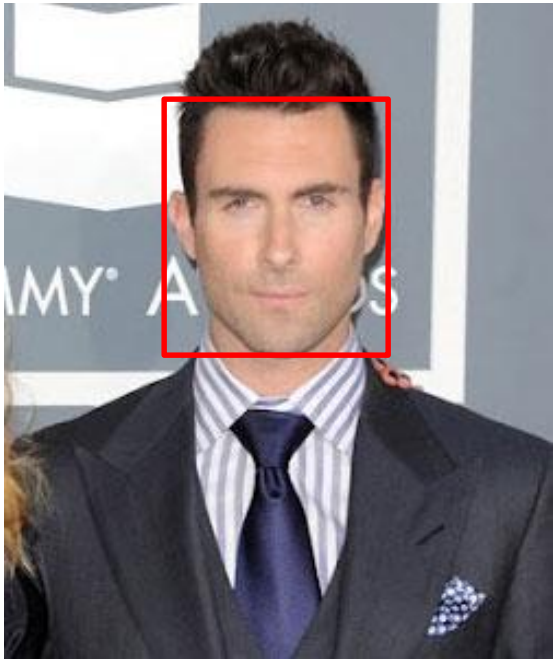
- **Submission**:

  1. Matlab or Python script named UNI_Name_kmeans.m/.py (see the pseudoCode.m in the coursework), which must be runnable (we won't debug for you).

  2. A readme file (UNI_Name_kmeans.README)

  - Explain the logic behind the Flow (or script), e.g. what is the loop for? What is that piece of code for? (you can do this in the Matlab or Python script directly)
  - Specify and Explain **ALL** key variables/parameters used in the code. (you can do this in the Matlab or Python script directly)
  - Briefly discuss the limitation(s) of the current script. How can you improve it?

Submit to the coursework, due on Wednesday Oct. 5 (11:59PM)



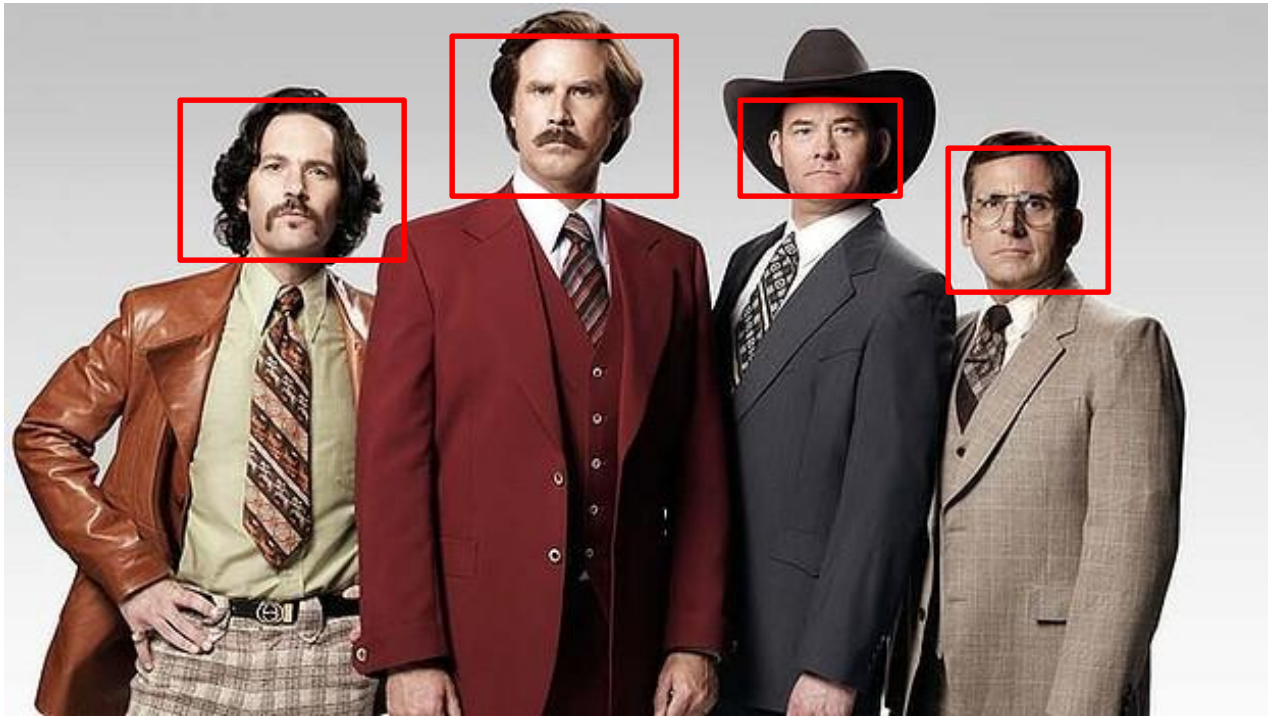
https://artofstyle.club/wp-content/uploads/2014/03/adam-levine-oblong-face-wide-spread-collar-full-windsor-knot.jpg

K-means Implementation

- There are many existing K-means Implementations in both Python and MATLAB which you could use. You could also write your own K-means function.
- Python: https://scikit-learn.org/stable/modules/generated/sklearn.cluster.KMeans.html

- MATLAB: https://www.mathworks.com/help/stats/kmeans.html

Optional (extra credit)



http://facedetection.jaysalvat.com/