PROJECT #3 – Rohith Reddy Kolla | rkolla

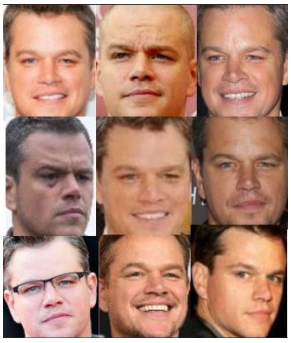
1 Face Detection in the Wild

- In order to detect faces from the given images, a Haar Cascade Classifier is used that has been trained to detect frontal faces.
- The classifier is loaded using cv2's CascadeClassifier function and the haarcascade_frontalface_default.xml
- Firstly, the image is read using cv2's imread function.
- This is then converted to grayscale to be used with the cascade classifier which detects the locations of each face in the image.
- This is done for each image in the given folder and the name of the image along with their resulting bounding boxes are dumped in a json file.
- `0.8113207547169811` is the resulting F1 score from using the face detection on the validation set.
- While the score is decent, there might be a few factors that prevent it from being better.
- Although the classifier has already been trained for frontal face detection, it is not perfect.
- The images in the validation set contain some faces which are blurred and, in the background, along with faces which aren't at a fully frontal angle.
- The accuracy can be potentially improved by additional training but the results are fairly satisfactory.

2 Face Clustering

- The algorithm used to do the clustering is the k-means algorithm.
- dlib's facial recognition library is used to generate a 128-dimension encoding.
- This is done after using Part-A for detecting the locations of the faces in the image.
- A line of code is used to identify the number of clusters present based on the name of the folder.

- Randomly, facial encodings based on the number of clusters are selected to serve as the initial centroids for the k-means algorithm. A seed is used to recreate the results.
- The Euclidean distance between these centroids and all the other encodings is calculated and the centroid that is closest is assigned to each one.
- Based on the encodings assigned to a centroid, a new centroid is calculated by averaging all the values.
- This is repeated until the centroids assigned to each encoding remain unchanged.
- These final centroids are used to identify the clusters.
- The resulting clusters are:



Cluster 0

Cluster 1

Cluster 2

Cluster 4

Cluster 5

The clustering is working with full accuracy for the given images.