Visual Recognition

Assignment 6

Face Verification and Generation (GANs)

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May 11, 2019

1 QUESTION 1

Face Verification

Goal is to verify that given two face images do they belong to the same person or not.

The model we implement here is a little more general where instead of taking as input two images we do something extra. We first define a training set that contains the ground truth value for all the given classes, then we classify the test set images.

Approach

We use Googleś **FaceNet** deep learning model to accomplish this. We use a pretrained FaceNet model trained on CELEB-A dataset that has approximately >200K celebrity images.

Method Working

- What FaceNet does is to provide for every face image a 128 dimensional vector. Then for finding whether two images are of the same or a different person we simply find the **"Euclidean Distance"** between the two 128-dimensional vectors of the two face images.
- If the two images are of the same person then the euclidean distance between the two is a very small number and if the two images are of different person then the euclidean distance between them is large.
- We specify a **threshold** (selected based on trial and error) to define the boundary between same and different.

Model Building

- We use out of the box **HaarCascade** filter to extract the face images.
- We keep things simple. We use three images per class (i.e. per unique person in our database) as training data and the rest of the images act as test data.
- We donf́ actually train the FaceNet model here, we first calculate the 128 dimensional vector for our training images which act as ground truth values.
- Now for classifying a test image as one of the ground truth classes, we first find the 128 dimensional representation of the image and then perform **"Nearest Neighbour Classification"** to assign a label.

Attached code file provides the complete approach.

Results

We were able to achieve a test accuracy of 91.6%.
We can get even better results if we apply some better pre-processing to extract the face images.

2 QUESTION 2

Face Verification

Goal is to use the IIITB dataset to create new face images that doesn't exist in the IIITB dataset or in any other dataset in the world!

Approach

- We use an implementation of DC-GAN (Deep Convolutional - Generative Adversarial Networks) to achieve this.
- We were not able to find a pre-trained GANś model for generating face images specifically for Keras.
- So we trained our own model from scratch, utilizing whatever computing power we had to itś maximum.

Results

Below images shows the results we obtained. These results don't look perfect but on comparing with the results of other people with limited computing power they are considerably better.

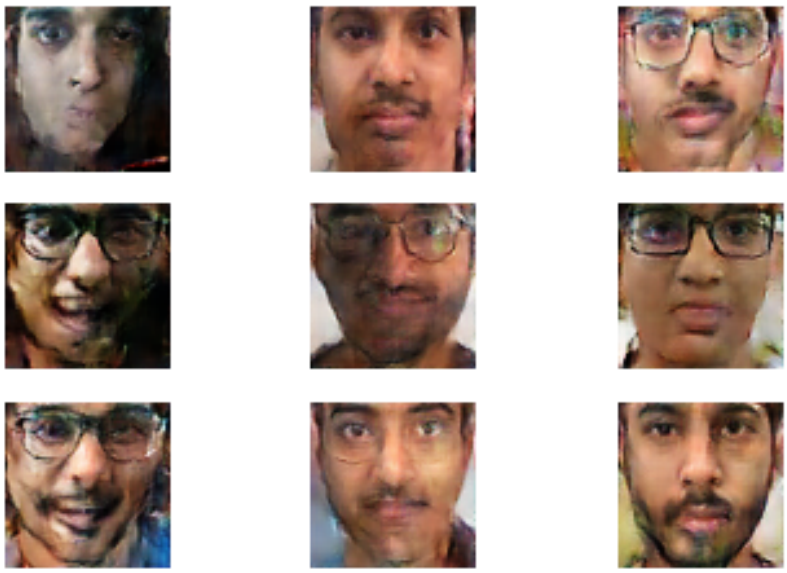

Figure 2.1: GAN generated images - 1

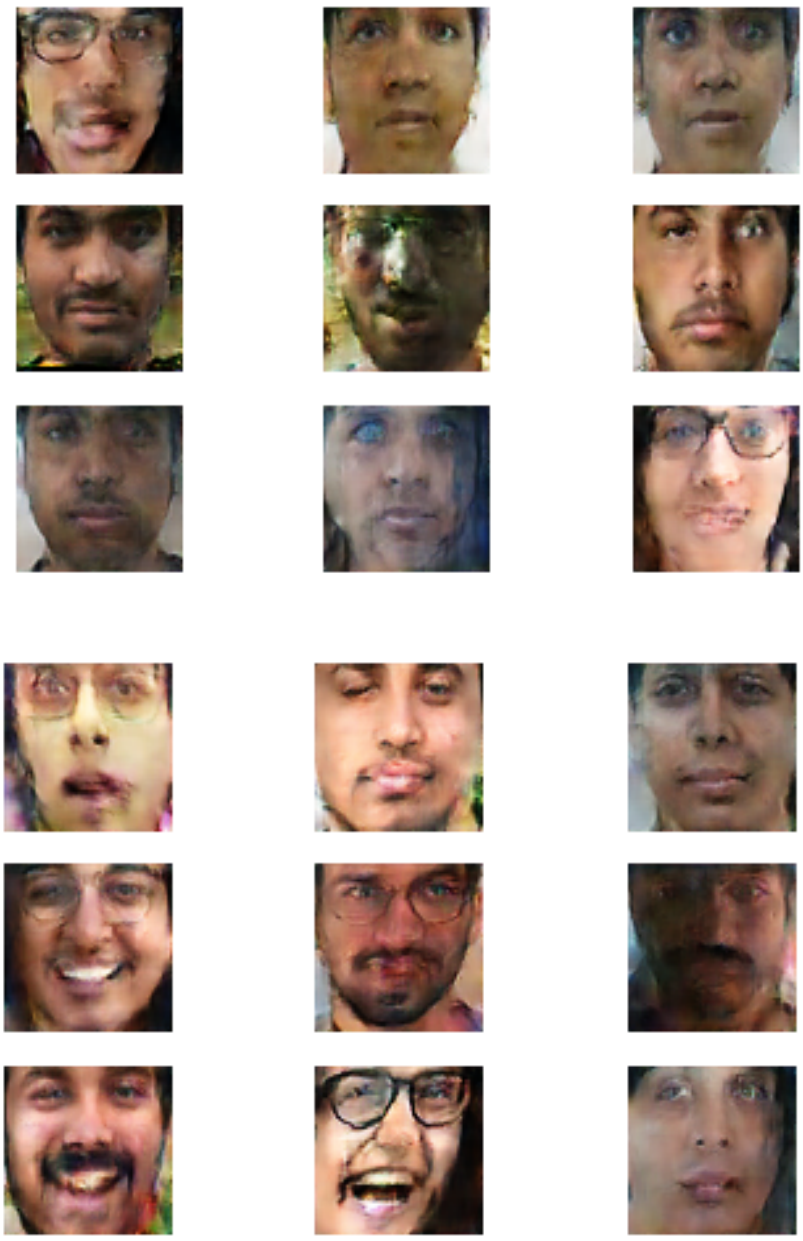

Figure 2.2: GAN generated images - 2 and 3

We tried increasing the size of our dataset using the CELEB-A dataset but the results were not good as shown below:

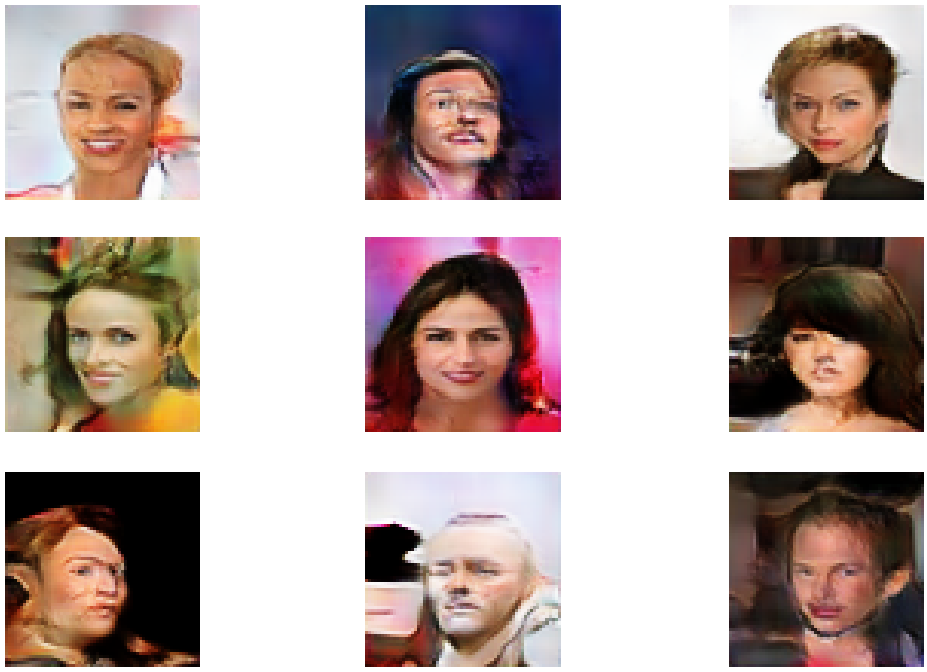

Figure 2.3: GAN generated images - 4

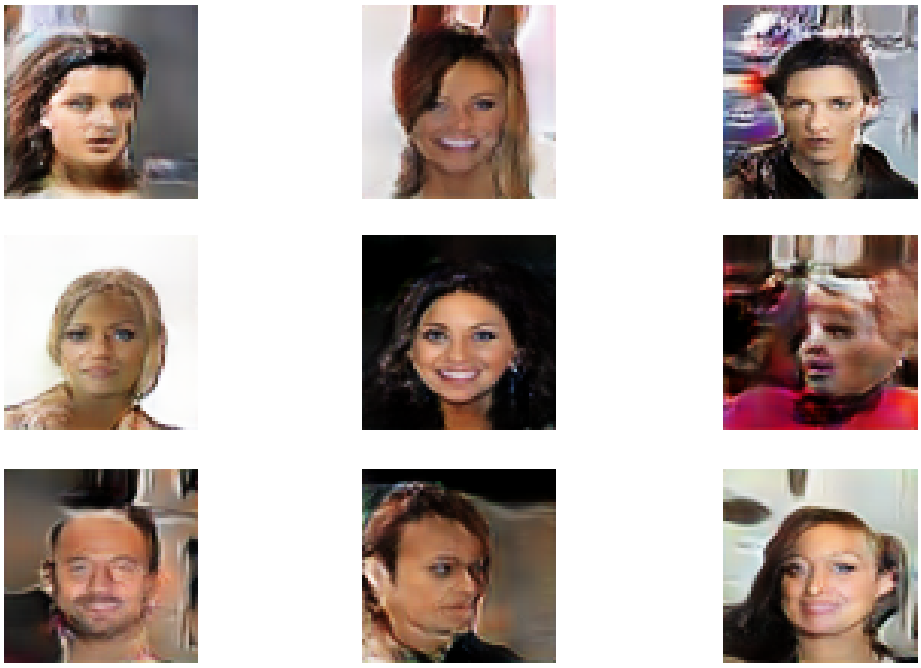

Figure 2.4: GAN generated images - 5