Transfer Human Face into Cat/Dog Face

The main aim of this task was transferring human face into cat/dog face. In this task, CycleGAN from Keras is used and the dataset was the face images of human, cat and dog.

Preprocessing

Before training, data preprocessing is performed. Since CycleGAN shows its best performance with the pixel range from -1 to 1, the image dataset is normalised from [0, 255] to [-1, 1]. Furthermore, the dataset is resized into 128*128. Also, data augmentation is implemented giving the rotation, horizontal flip and brightness changes so that it could avoid overfitting. Additionally, when the data is loaded, it is shuffled with the buffer size of 10% of each dataset's size.

Problems & Solutions

The challenge was the quality of results, as it often overfitting and underfitting. For example, when epoch value is too large i.e., epoch=100, it starts to overfit and the loss value increases more than the first epoch or visualisation image turns out to be changed too much so it just destroys the original image. To overcome this problem, several approaches are adopted. By augmenting the data and using all the cat and dog image as train set, the model's loss decreased astonishingly Also, changing the size of image from 64*64 to 128*128 prevent from colour changes too dark.

Furthermore, after changing the image size bigger, it started to occur underfitting – after transferring the human face does not have many changes even with colours. This happens because the model is not learning the features of cat and dogs, as well as the model is too simple. Therefore, some of hyperparameters were changed. For instance, increasing learning rate – 0.01, 0.001, 0.0002, 0.0001 – and increasing the filter – 16, 64, 68 – the number of residual blocks – 6, 9, 10 – helped to overcome underfitting. Additionally, trying with 5 or 10 epochs made the model learn more without overfitting.

Results

In conclusion, Figure 1 shows the results, and the final architecture is as follows,

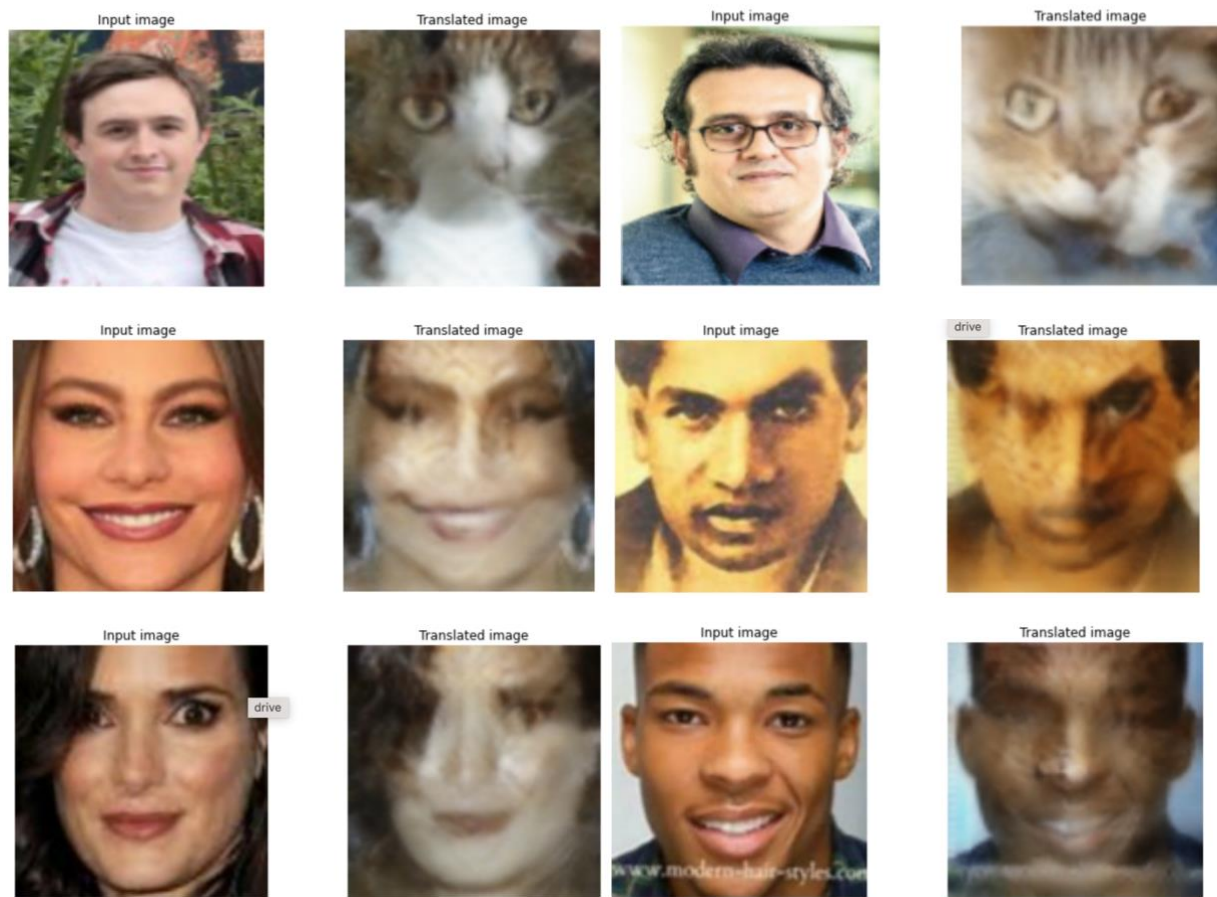- Generator/Discriminators: filters=68, num_residual_blocks=10
- Learning rate=0.001 and Epochs=30

Figure 1: Human Face and Transferred Face into Cat/Dog