CIS6930/4930: Deep Learning for Computer Graphics, Fall 2020

Dr. Corey Toler-Franklin

Part II. Deep Colorization with CNNs

Project Report

Team members:

Sanjay Reddy Banda, UF ID: 5878-2239
Suprith Reddy Gurudu, UF ID: 9961-2134
Chandra Sekhar Devarakonda, UF ID: 9092-2981

Implementation:

In this project, we used residual neural network as a CNN to train and evaluate the mean chrominance and colorization of gray images. Initially, we have split the data into training and test data sets with ratio of 9:1, respectively. We have 750 images in total to train and test the model. As CNN requires more data to efficiently train and produce better results, we augmented the data by applying geometric transformations such as flips, random rotations, etc. By do so, the data set size had increased 10 times the original data. We used an image data loader with batch size of 64 to load the data.

Then, we have defined our model using a pre-built model called ResNet, up sampled the network by applying batch normalization and ReLu function and connected network with fully connected layers. We trained our model using the training data set and evaluated losses using mean squared error. Following, we have used Adam optimizer for updating the weights of the neural network. Once the model is trained, the state of the trained model will be stored into a pickle file. Finally, we have predicted the mean chrominance and *(a * b)* channel images using respective pickle (trained model) files. In colorize section, we have merged the *(a * b)* channels with *L* channel (gray image) to get the final predicted result.

Packages Utilized:

Torch ▪ Torchvision ▪ Skimage ▪ Numpy ▪ Matplotlib ▪ Time

Evaluation Results:

Mean Chrominance:

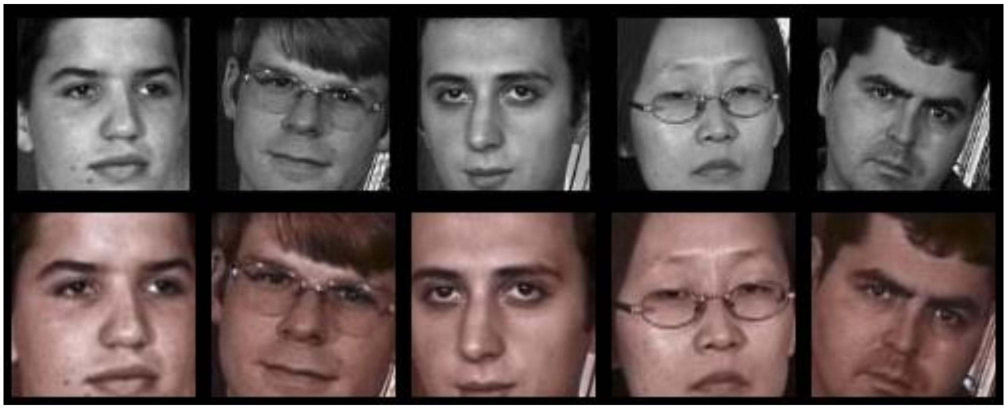
<u>Average Mean Squared Loss:</u> 0.397662014

Predicted ‘a’ mean	*Actual ‘a’ mean*	*Predicted ‘b’ mean*	*Actual ‘b’ mean*
0.5074	0.5479	0.5025	0.5398
0.5072	0.5484	0.5028	0.5365
0.5070	0.5512	0.5033	0.5660
0.5074	0.5331	0.5029	0.5678
0.5078	0.5478	0.5032	0.5497

Colorization:

Average Mean Squared Loss: 0.003386000

Gray Images



Colorized Images

Instructions to Run the Program:

Mean Chrominance:

```
>> python main_mean.py
```

Colorization:

```
>> python main_channel.py
```

** We have used `torch.cuda()` to utilize GPUs in the HiperGator server.