AI6126 Project 1: CelebA Facial Attribute Recognition Challenge

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1 Introduction

The goal of this mini challenge is to identify the attribute label depicted in a facial photograph. The data for this task comes from the CelebA dataset[1], which contains 200 thousand images belonging to 40 attribute labels. Specifically, the challenge data for this course consists of 160,000 images for training, 20,000 images for validation and 20,000 images for testing. The images will be pre-cropped and aligned to make the data more manageable.

2 Experiments

The base code takes reference from [2]. In my experiment, I applied additional 4 data augmentations used in [3][4] for the Contrastive Representation Learning, so there are total 5 data augmentations in my experiment: (1) Random Crop and Resize, (2) Random Horizontal Flip, (3) Random Color Distortions, (4) Random Gray Scale, (5) Random Gaussian Blur.

The model is trained on the Tesla P40. Other parameters are set as following: (1) Base model: ResNet-50, (2) Total Epoch: 90, (3) Batch Size: 256, (4) Learning Rate: Initially 0.1, divided by 10 every 30 epoch, (5) Optimizer: SGD with momentum at 0.9 and weight decay at 0.0001.

3 Results

3.1 Metrics

At the 90th epoch, Train Loss and Validation Loss is 0.210079 and 0.187664 respectively. The Train Accuracy and Validation Accuracy are 90.683480 and 91.741582 respectively. Detailed train and validation metrics are plotted in Figure 1.

3.2 Case Study

Here we take one example, *Dick_Cheney_0008.jpg* shown in Figure 2, from the private test dataset. Table 1 is our model prediction. Almost all the attributes are predicted correctly.
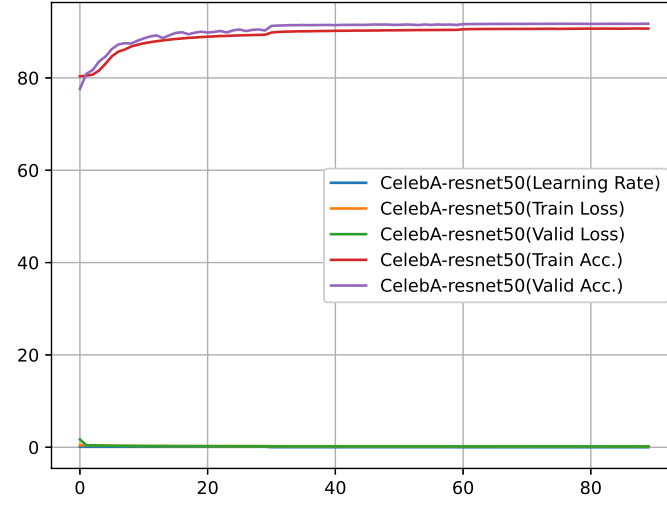
Figure 1: The Training and Validation Performance

Figure 2: An Example in Private Dataset

Attribute	Class	Attribute	Class
5_o_Clock_Shadow	-1	Male	1
Arched_Eyebrows	-1	Mouth_Slightly_Open	-1
Attractive	-1	Mustache	-1
Bags_Under_Eyes	-1	Narrow_Eyes	-1
Bald	1	No_Beard	1
Bangs	-1	Oval_Face	-1
Big_Lips	-1	Pale_Skin	-1
Big_Nose	1	Pointy_Nose	-1
Black_Hair	-1	Receding_Hairline	-1
Blond_Hair	-1	Rosy_Cheeks	-1
Blurry	-1	Sideburns	-1
Brown_Hair	-1	Smiling	-1
Bushy_Eyebrows	-1	Straight_Hair	-1
Chubby	-1	Wavy_Hair	-1
Double_Chin	-1	Wearing_Earrings	-1
Eyeglasses	1	Wearing_Hat	-1
Goatee	-1	Wearing_Lipstick	-1
Gray_Hair	-1	Wearing_Necklace	-1
Heavy_Makeup	-1	Wearing_Necktie	1
High_Cheekbones	-1	Young	-1

Table 1: Model Predictions

References

[1] Ziwei Liu, Ping Luo, Xiaogang Wang, and Xiaoou Tang. Deep learning face attributes in the wild. In *Proceedings of International Conference on Computer Vision (ICCV)*, December 2015.

[2] d li14. face-attribute-prediction. https://github.com/d-li14/face-attribute-prediction.

[3] Ting Chen, Simon Kornblith, Mohammad Norouzi, and Geoffrey Hinton. A simple framework for contrastive learning of visual representations, 2020.

[4] Sthalles. sthalles/simclr. https://github.com/sthalles/SimCLR.