Baby Face Generator with CycleGAN

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https://youtu.be/dk1Qi7f-L9Y

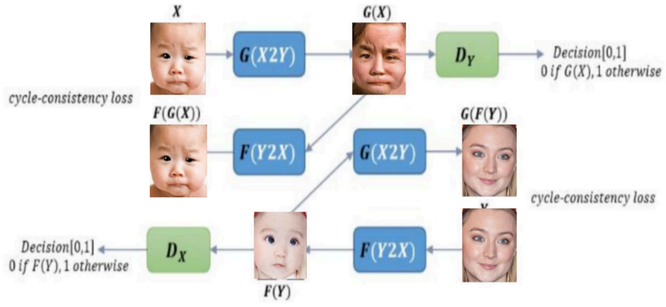
Introduction

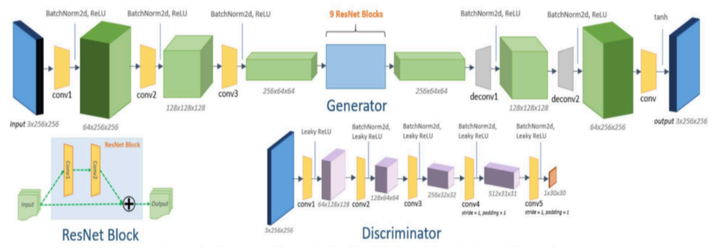
In the study, we explored the possibility of generating baby face with parents pictures using CycleGAN[1]. We tried different datasets and applied transfer learning to improve the performance of our models. It takes parents faces or an adult face and generates the baby style face of the morphed parents face or the single adult face.

Datasets and Preprocessing

We uses 2 datasets for training our model, UTKFace(low quality images) and IMDB-WIKI(high quality).
We uses around 2000 images as the training set, 1000 from age 0-5 as group X, 1000 from age 27-35 as group Y.
We uses OpenCV Face Detection Neural Network[2] to extract faces only from the images to clean up background noisy

Method and Model





$$L_{GAN}(G, D_Y, X, Y) = \mathbb{E}_{y \sim p_{data}(y)}[log D_Y(y)] + \mathbb{E}_{x \sim p_{data}(x)}[\log(1 - D_Y(G(x)))],$$

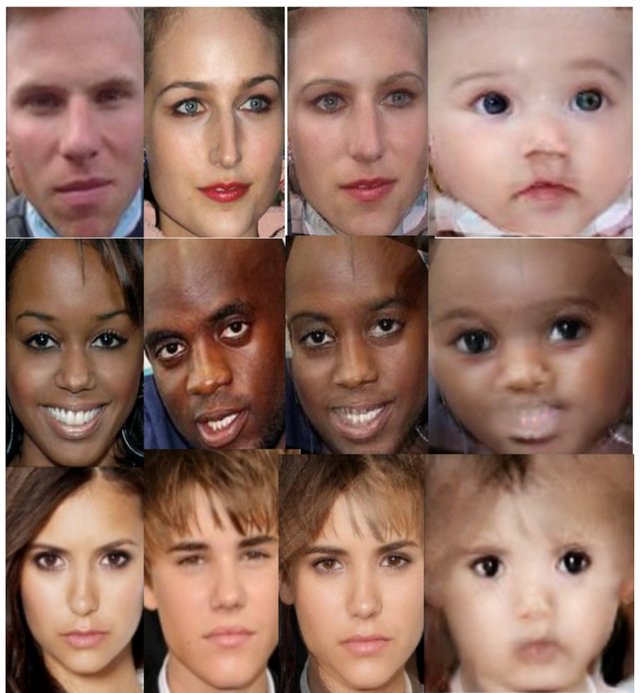
$$L_{GAN}(F, D_X, Y, X) = \mathbb{E}_{x \sim p_{data}(x)}[log D_X(x)] + \mathbb{E}_{y \sim p_{data}(y)}[\log(1 - D_X(F(y)))],$$

$$L_{cyc}(G, F) = \mathbb{E}_{x \sim p_{data}(x)}[\|F(G(x)) - x\|_1] + \mathbb{E}_{y \sim p_{data}(y)}[\|G(F(y)) - y\|_1],$$

$$G^*, F^* = \arg \min_{G,F} \max_{D_X, D_Y} [L_{GAN}(G, D_Y, X, Y) + L_{GAN}(F, D_X, Y, X) + \lambda L_{cyc}(G, F)],$$

Results

model	source	Epochs	Cropped	Pretrained
1	UTKFace	155	No	No
2	UTKFace	10	Yes	No
3	IMDB-WIKI	100	Yes	No
4	IMDB-WIKI	155	Yes	Yes



Conclusion and Future Work

- CycleGAN could work well in baby face generation. The quality of dataset and data preprocessing could influence the performance significantly. Transfer learning from similar model could help with training.
- The generated pictures are not perfect. We could try with large training set.

Reference

[1] Jun-Yan Zhu, Taesung Park*, Phillip Isola, and Alexei A. Efros. "Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks", in IEEE International Conference on Computer Vision (ICCV), 2017.*
[2] https://github.com/kb22/Create-Face-Data-from-Images
[3] Jie Chen, Junwen Bu, Yu Zhao. AgingGAN: Age Progression with CycleGAN.

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