Face Generation Using GANs

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Abstract

Generative Adversarial Networks (GANs) are a powerful tool for generating realistic images, and they have been used in a variety of applications such as image synthesis, style transfer, and super-resolution. In this report, we utilize a method for generating anime faces using GANs. We found that the model was able to generate images that were similar to real anime faces, with a high degree of realism and similarity.

1. Introduction

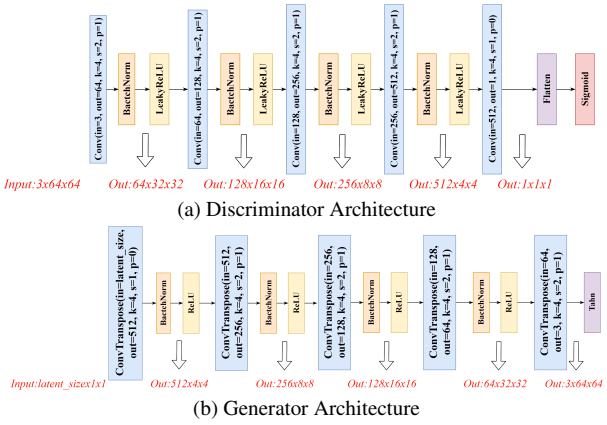
Anime, a term derived from the English word animation, refers to a style of Japanese animation that has become increasingly popular worldwide. Anime characters are known for their distinctive and unique facial features, which include large eyes, small mouths, and round faces. Generative Adversarial Networks (GANs) are a class of deep learning models that can be used to generate new, previously unseen data that is similar to a given dataset. In this report, we will explore the use of GANs to generate anime faces.

We specifically make the following contribution:

- We use Deep Convolutional Generative Adversarial Networks (DCGANs) and train them on a dataset of Anime faces in order to produce real images.

2. Background

GANs were introduced by Ian Goodfellow et al. [3] in 2014. They consist of two neural networks: a generator and a discriminator. The generator creates new data, and the discriminator attempts to distinguish between the generated data and the real data. The generator and discriminator are trained in an adversarial manner, with the generator trying to create data that is indistinguishable from real data, and the discriminator trying to correctly identify which data is real and which is generated.



(a) Discriminator Architecture

(b) Generator Architecture

Figure 1. Network's architecture

3. Methods

3.1. Dataset

In order to generate anime faces using GANs, we first used a dataset of Anime Face Dataset [5]. It includes 36,740 anime face images, with each image being of size 64x64 pixels in 3-channel RGB format.

3.2. Preprocessing

We preprocessed the images by resizing and normalizing them. Each image is also cropped at its center and resized to ensure equal input size for all samples.

3.3. Model Architecture and Hyperparameters

The GAN architecture used in this project was the popular DCGAN [6] (Deep Convolutional Generative Adversarial Network) model. The generator network consisted of several transposed convolutional layers, while the discriminator network consisted of several convolutional layers. Figure 1 depicts the architecture of generator and discriminator networks.

Both networks were trained using the Adam optimizer with a learning rate of 0.0002 and a batch size of 64. According to instructions, all network weights are randomly assigned using a normal distribution with a mean of 0 and a

Figure 2. Network losses during training for DCGAN model.

standard deviation of 0.02. Other hyperparameters consist of Latent Factor Size = 512, Beta1 = 0.5, and Beta2 = 0.999.

4. Results

The GAN was able to generate anime faces that were similar to the faces in the training dataset. The generated faces had distinctive anime features such as large eyes and round faces. However, some of the generated faces had distorted or unrealistic features, indicating that the model could benefit from further training or a larger dataset.

The models were trained using the Google Colab platform [1], which offered free access to several GPUs. It should be noted that this access was limited in nature which in turn affected the quality of the experiments run. The project's experiments included the DCGAN approach ran for 40 epochs (DCGAN).

Figure 2 shows the training losses for each DCGAN network. Figure 3 also displays a few sample DCGAN generated images.

5. Conclusion

In this report, we have explored the use of GANs to generate anime faces. We have shown that GANs can be used to generate anime faces that are similar to the faces in the training dataset. However, further research is needed to improve the quality of the generated faces and to address limitations such as the small dataset size.

6. Future Work

In the future, some possible ideas for improving GANs' performance include:

- Explore other GAN architectures, such as StyleGAN [4] or BigGAN [2], which have been shown to generate high-resolution and highly realistic images.

Figure 3. The sample images produced by DCGAN in the latest epoch.

- Larger dataset of anime faces to improve the quality of the generated faces.
- Longer epoch model training. Simply training models for longer periods of time may produce better results.
- Adjust hyperparameters. The majority of the hyperparameters for models used in this project were taken from previously published works and were barely, if at all, modified. Fine-tuning parameters may also necessitate a significant increase in time and computational power.

References

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