Anime Character Generation Using Generative Learning

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Problem Statement:

Anime characters show a large variety of features in their visual character designs. The mangaka who write mangas with these anime characters adds all kinds of facial features with ranging styles of art using a vast spectrum of hairstyles, hair colours, eye designs, face structures and other facial features. These characters are all of the human imagination and are a creation of the artistic manga artists. The development of generative learning in the field of deep learning in the past decade has opened the possibilities wide for all kinds of image creations with a completely mahine origin. This project focuses on using generative learning for the generation of anime characters non-existent in the vast plethora that manga and anime currently has to offer. A huge set of existing characters will be used to train the discriminator in the task of accepting or rejecting the synthesized images. This project sticks to only the generation of facial and hair areas of a character and not the entire visual character design. This project is also restricted to only human-like faces (anime have all kinds of imaginable creatures!!)

Dataset and meta-data:

This task calls for a huge dataset of character faces with different designs to train the network to generate images of a wide variety of facial features.
Three datasets were considered:
1. High-Resolution Anime Faces Dataset (512x512): This dataset has a collection of 302,652 high resolution anime character faces. However, the dataset (16GB) is too large for the scope of this project.
   Source:
   https://www.kaggle.com/datasets/subinium/highresolution-anime-face-dataset-512x512
2. Anime Face Dataset: This dataset has images of resolution 64x64. There are 63,632 instances. Given the heavy dependency of generative learning on GPUs and the large training time, this dataset was set aside in favor of the 3rd option. All the images have been scraped from www.getchu.com

Source:
https://www.kaggle.com/datasets/splcher/animefacedataset

3. Anime Faces: This dataset has images of resolution 64x654. There are a total of 21,551 faces. This dataset is also formed by images scraped from www.getchu.com. The reason to pick this dataset is given the same image size as the 2nd option by about 1/3rd the dataset in terms of size. This should make any training and iterative process 3 times faster.

Source:

https://www.kaggle.com/datasets/soumikrakshit/anime-faces
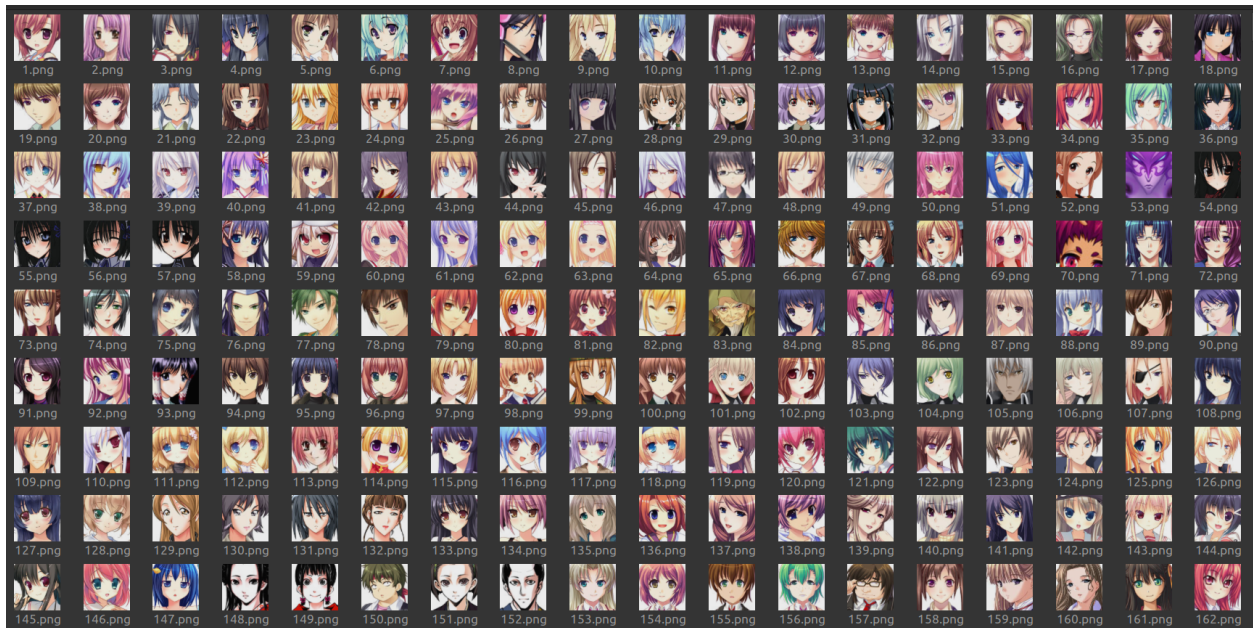
Preprocessing:

The dataset is available for download from kaggle in a collection of png files. For the data input, these must be given in tensors.

1. Load all files from the input directory
2. Store all images in tensors
3. Normalize all images

Note: If any other preprocessing measures are demanded by a particular base model during literature review those specific measures will be taken.

Objectives:

☐ Generate images that are quite clearly identifiable as human-like faces.

☐ Generate faces with a wide variety of features encoded in the input feature vector.

☐ Avoid the problem of mode collapse. In this type of issue, the generator generates images quite close to a small set of unique output images. The aim is to output a wide range of features.

☐ Avoid the problem of finished gradient. In this type of issue, the discriminator, one of the competing players in this learning race, becomes quite good that the gradients vanish. The generator gets stuck in its performance and hardly makes learning progress.