Chinese Character Style Transfer with conditional GAN

1. Introduction

We propose a model which transforms a character from a typeface A to another typeface B given a few character pairs written in A and B respecitvely. We uses conditional GAN (cGAN) [3] to generate stylized character image with unaltered text meaning.

1.1. Motivation

Unlike typefaces for English characters, it takes tremondous effort to design new Chinese typefaces. This is due to the simple fact that there are more than 4,000 commonly used Chinese characters [4] that have to be designed. Using this model, only a few reference style characters have to be designed manually. The model can generate the rest with consistent style.

2. Related Work

Some of the previous methods use backpropagation on an initial random noise image [1] or train a feedforward network [5] to transfer low-level texture style from a reference image to another. There are also exceptional result on articist or photorealistic image generation and translation using GANs and its derivatives [2][6].

3. Method

3.1. Formulation

In this model, a generator G and a discriminator D will be trained. The given sample transform is $T : A \rightarrow B$ where A and B are small subset of the characters in two typefaces. G will take T and another character C_A in typeface A as input to generate an image C_B. D then learns to discrimate between C_B and other characters in typeface B with C_A as input.

Note that C_A acts as the constraint vector in the cGAN such that the discriminator will be able to tell the difference between a transformed version of C_A and a random character that has the appearance of typeface B. Without this constraint, *model collapse* will happen as there are a lot of freedom in the Chinese character model.

3.2. Data

There are abundant free Chinese fonts available online for download in .ttf format. The images of the characters can be extracted from the font file. A few of the typefaces will be reserved for testing and validation purposes. To make the generation more stable and the fact that we will generate C_A automatically from character encodings,
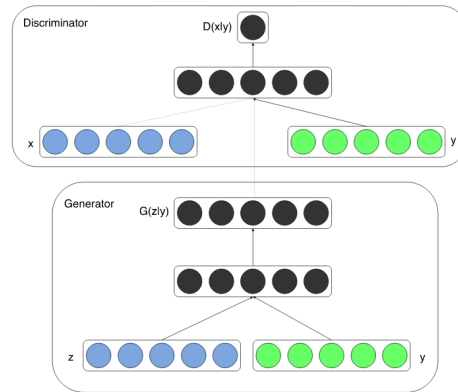

Figure 1. Conditional GAN. Taken from [3] In our model, C_A acts as the y vector in the figure.

the typeface A can be fixed. In this case, we consider using MingLiU, a common typeface that has clear strokes

References

[1] L. A. Gatys, A. S. Ecker, and M. Bethge. A neural algorithm of artistic style. *CoRR*, abs/1508.06576, 2015. 1

[2] P. Isola, J. Zhu, T. Zhou, and A. A. Efros. Image-to-image translation with conditional adversarial networks. *CoRR*, abs/1611.07004, 2016. 1

[3] M. Mirza and S. Osindero. Conditional generative adversarial nets. *CoRR*, abs/1411.1784, 2014. 1

[4] C. L. E. Section. Lexical items with eng. explanations for fundamental chin. learning in hk schools. www.edbchinese.hk. 1

[5] D. Ulyanov, V. Lebedev, A. Vedaldi, and V. S. Lempitsky. Texture networks: Feed-forward synthesis of textures and stylized images. *CoRR*, abs/1603.03417, 2016. 1

[6] J. Zhu, T. Park, P. Isola, and A. A. Efros. Unpaired image-to-image translation using cycle-consistent adversarial networks. *CoRR*, abs/1703.10593, 2017. 1