



# A Study on Few-Shot Style Transfer for Handwriting Chinese Synthesis Using Conditional GAN

Liangyu Liu <sup>1,2</sup>, Yusuke Tanimura <sup>2,1</sup>, Hidemoto Nakada <sup>2,1</sup>

1: The University of Tsukuba

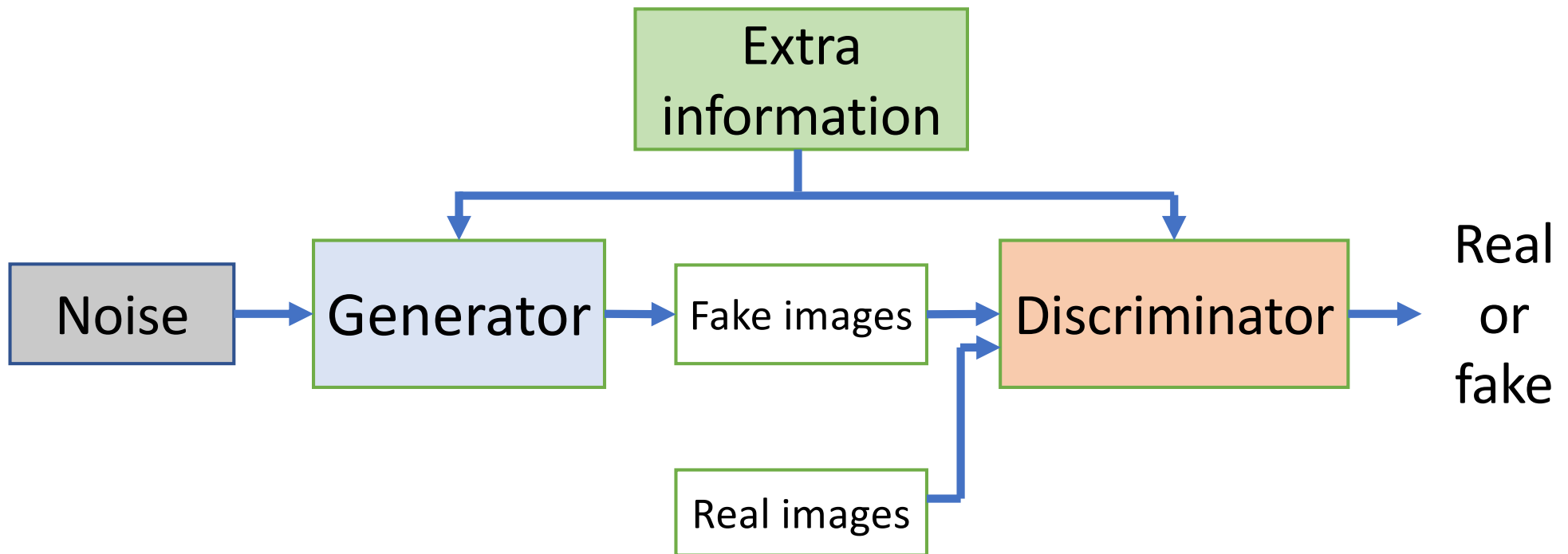
2: The National Institute of Advanced Industrial Science and Technology (AIST)

## Abstract

- The goal is synthesizing handwritten fonts with few samples.
- Zi2Zi[1] which achieve this with Conditional GAN suffered from occasional badly-formed results.
- We try to cope with this problem by increasing training fonts while keeping the size of training dataset.
- SSIM and PSNR score showed that the modified parameter is effective.

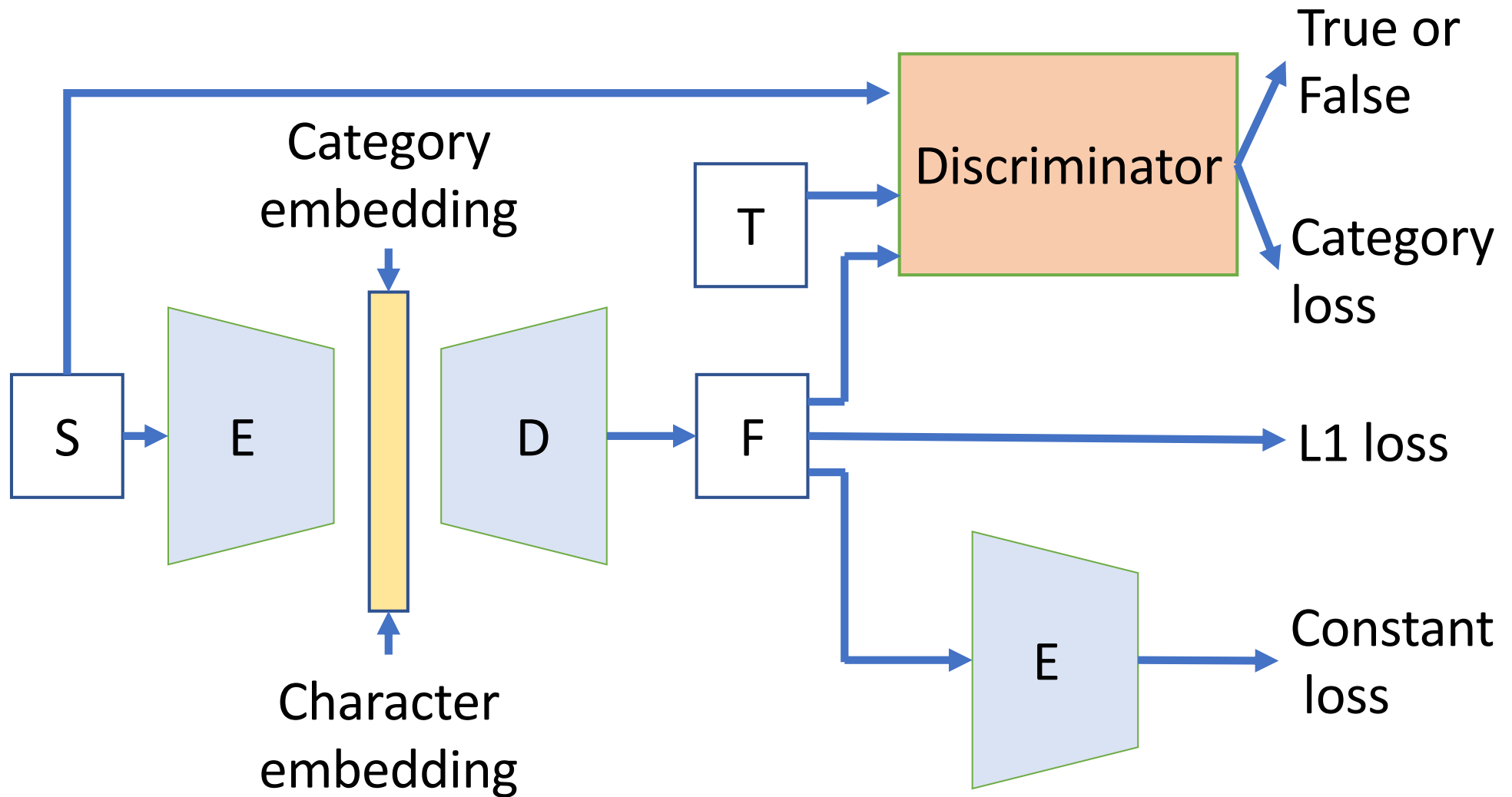
# Conditional GANs

- Extended from generative adversarial network by feeding an extra information to both generator and discriminator.



# Method

- zi2zi model based on pix2pix



# Method

- Analysis of badly generated samples in related work
  - Stroke weight varies in different styles.
  - Some of commonly used parts are shown too many times in the same style
- Our method
  - Avoid learning commonly used characters in too many different styles.
  - Use hard-tipped pen calligraphy as training set since their stroke weights are similar.
- Loss function
  - g loss for generator
  - d loss for discriminator
  - L1 loss

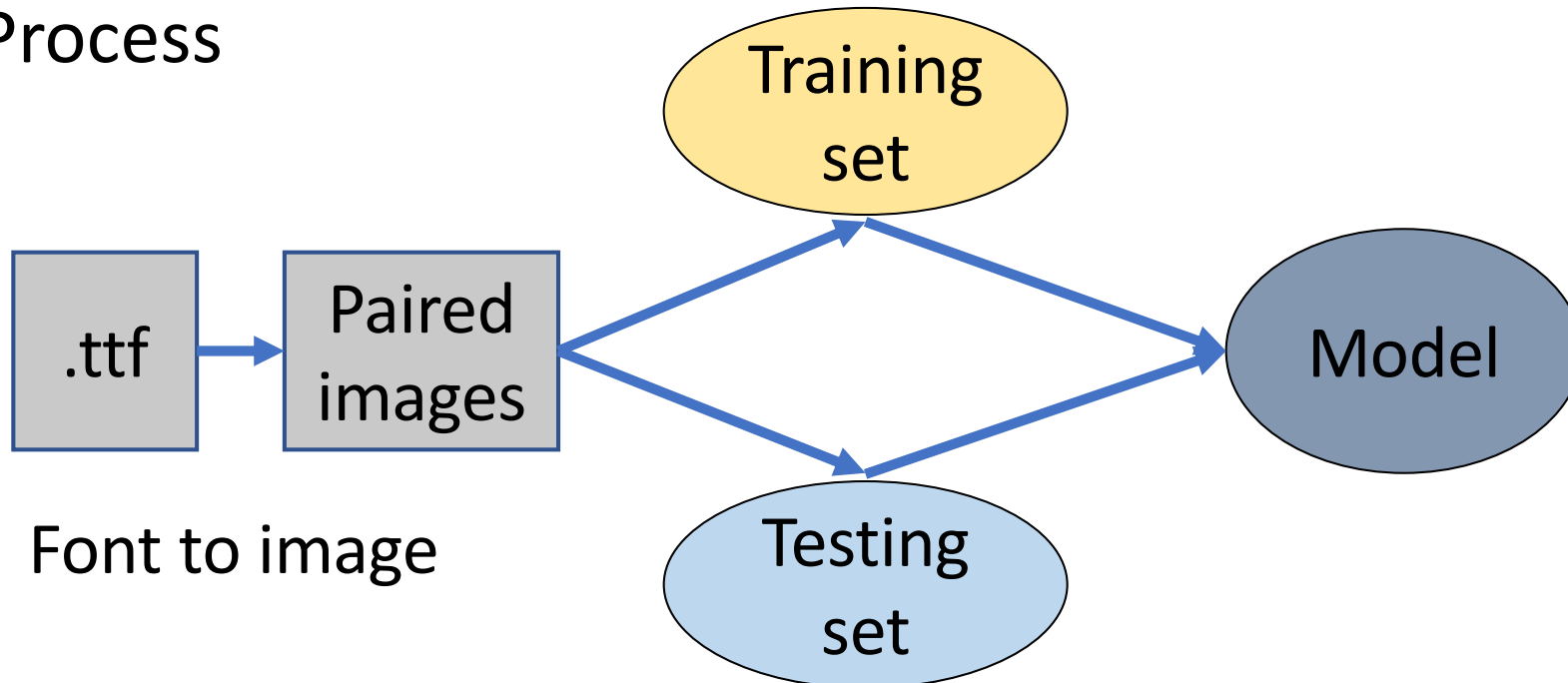


# Experiment

- Dataset

- Training set Original: 30 fonts, 500 samples.  
Training set Ours: 50 fonts, 300 samples.
- Use all hard-tipped pen calligraphy as training data.

- Process



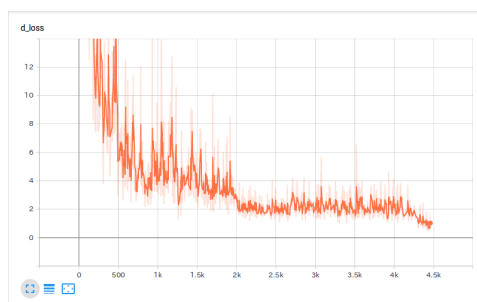
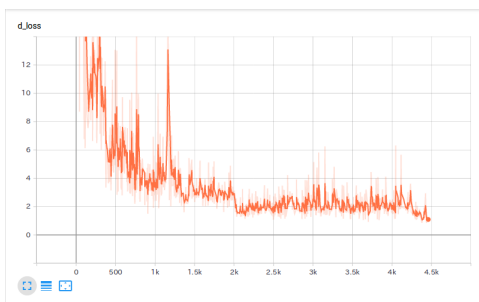
# Result

- Loss

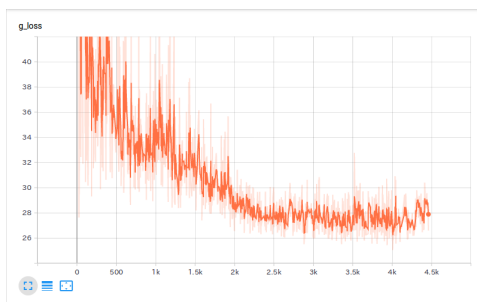
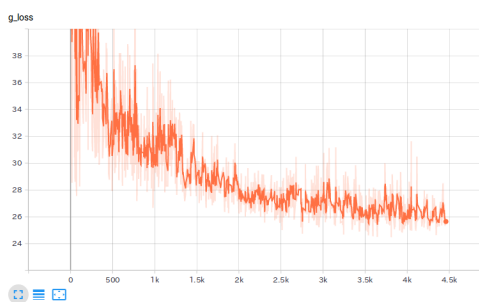
Original

Ours

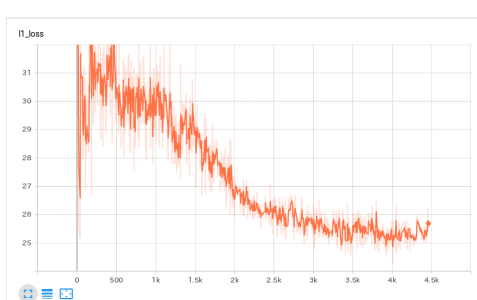
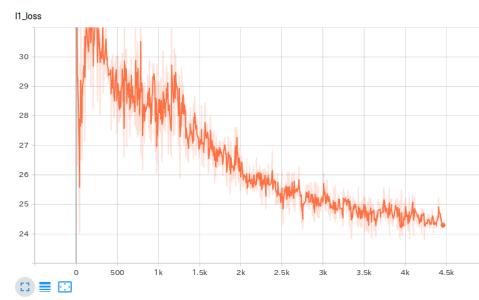
d\_loss



g\_loss



L1\_loss



- Generated samples

炭	炭	仔	仔
奠	奠	椅	椅
棵	棵	盈	盈
典	典	乞	乞
姨	姨	娅	娅
川	川	耒	耒

Original

ours

# Result

- Test

Original		Ours	
揉	揉	干	干
漱	漱	倦	倦
距	距	拒	拒
框	框	放	放
葱	葱	久	久
诈	诈	沟	沟
弦	弦	资	资
聘	聘	伎	伎
Ground truth	Generated	Ground truth	Generated

- Evaluation

	SSIM	PSNR
Original	0.5433	8.8846
Ours	0.5476	9.8267

# Conclusion

- The initial results showed that the modified parameter is effective to improve the performance in handwritten fonts synthesis.
- For future work, we plan to try more training methods and datasets to do more comparisons. Furthermore, we plan to use the model to create .ttf format fonts.

Reference:

[1] Learning Chinese Character style with conditional GAN  
<https://github.com/kaonashi-tyc/zi2zis>

This paper is based on results obtained from a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO).

This work was supported by JSPS KAKENHI Grant Number 19K11994.