



Chinese Painting Generation Using Generative Adversarial Networks

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Introduction: Which Picture is Fake?

Example (*Reconstructing Problem*): reconstruct a Chinese painting from its edge map

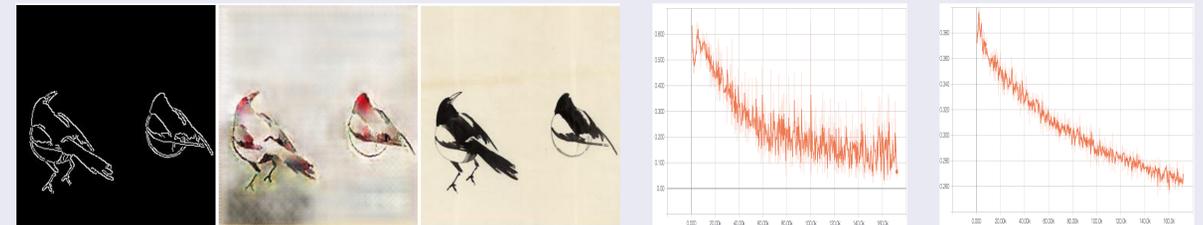


- Left: Our input (edge of the target painting).
- Middle and Right: One original painting, the other 'drawn' by computer.
- Guess which is the real one?

The 'fake' image is generated by Generative adversarial networks (GANs). The purpose of our project is to generate realistic-looking Chinese paintings using different types of GANs.

cGANs performance

Edges → Paintings:



Left three images: Input Edge, Fake Painting, True Painting
Right two images: Loss of Discriminator, Loss of Generator

- Tones and colorization methods of Chinese paintings are learned.
- Sometimes cGANs have an effect on sharpening in the spectral dimension, i.e. making images more colorful.

Datasets and Preprocessing

Scratching: All the Chinese paintings are scratched from Google and Baidu. The dataset is cleaned to prevent repeated and unrelated images.

Reshaping: All images are shaped to be 256×256 .

Edge Extracting: The edges are extracted by Canny edge detection.

Implemented Methods

cGANs: Used for image-to-image translation (edge → painting, black white painting → colored painting)

- Condition on an input image and generate a corresponding output image.

DCGANs: Used for creating new paintings from noise.

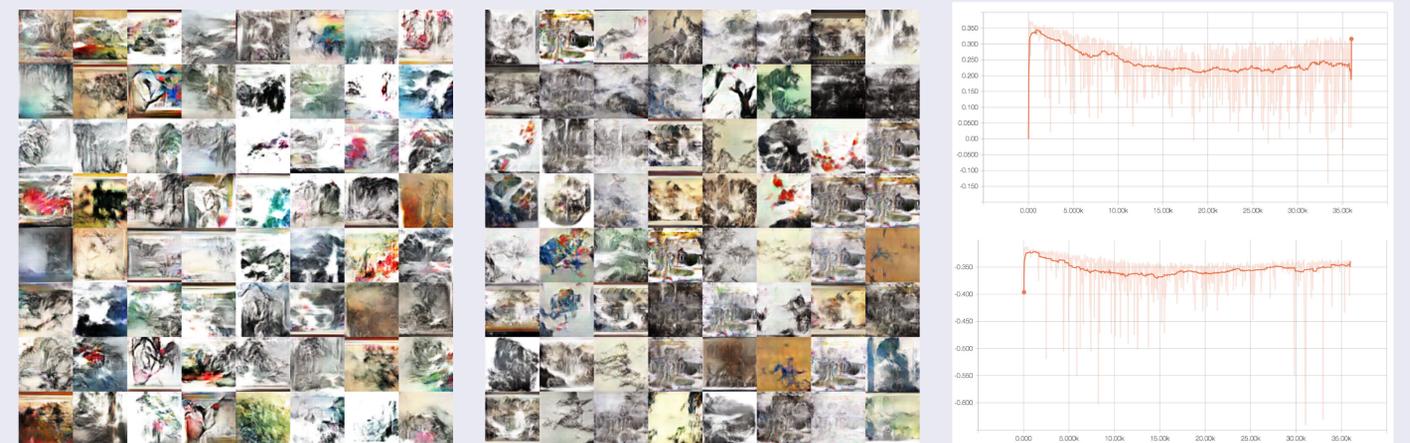
- Both the generator and discriminator use the deep convolutional neural network architecture.

WGANs: Used for creating new paintings from noise.

- Remove log in the loss formula in the original GANs paper.
- Do not apply sigmoid at the output of D .
- Clip the weight of D to $[-0.01, 0.01]$.

Performance of DCGANs and WGANs

Generating Paintings: Generate paintings using our full dataset of Chinese Paintings.



Left: Paintings generated by WGAN Middle: Paintings generated by DCGAN
Top Right: Loss of Discriminator of WGAN Bottom Right: Loss of Generator of WGAN

- DCGAN and WGAN give results with similar qualities.
- WGAN is more stable while training.
- WGAN is slightly slower in training than DCGAN.