# Artistic Style Transfer - Midterm Report

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Abstract

Artistic style transfer is to apply the style of one image, the style image, typically a painting with special texture, to another image, the content image. The generated image will preserve the content presented in the content image while having the same style and texture of the style image. This project will explore the use of convolutional neural networks in the task of artistic style transfer.
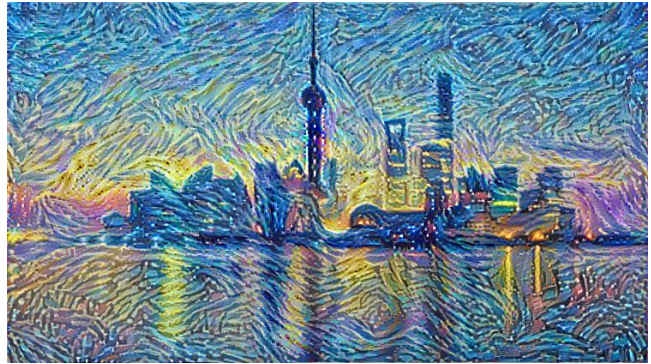
1. Current Progress

Currently, a simple model proposed by Gatys et al [1] has been built. It takes in two images, a style image, and a content image, and generates an output image of contents in the content image, but in the same style as the style image. Below are some sample outputs.

2. Difficulties

In a deep learning neural network. generally the shallow layers can extract some more basic, foundamental features of the input, while the deeper layers can extract some more abstractive features. This model, developed according to this idea, defines style loss as the difference between the output of deeper hidden layers when the content image and the style image are passed into the pre-trained VGG model, then this loss is used to modify the content image. Yet to do this, both the style image and the content image need to be able to fit in the VGG model. In order to generate an image of the same size as the input, a model with the same structure as the VGG model except the input size is created and the weights of the VGG model are loaded to this model. The input size is determined when the content image is loaded into this model. However, the style image may still not be able to fit in this model. The current solution is to resize the style image, but resizing will lead to loss in image quality and distortion, which are not desirable. A better solution is to extract the style [3], which will be explored in next step. Another major disadvantage of this model is that this model is slow to run. It may take over half an hour to generate an image of 1200×800. Therefore, another direction to improve this model is to accelerate this process and produce real-time style transfer [2] [4]

3. Update Plan

The current progress of this project matches the expectation in the proposal, so no change will be made.

References

[1] Leon A. Gatys, Alexander S. Echer, and Matthias Bethge. A neural algorithm of artistic style. *CVPR*, 2016.

[2] Justin Johnson, Alexandre Alahi, and Li Fei-Fei. Perceptual losses for real-time style transfer and super-resolution. 2016.

[3] Dmitry Ulyanov, Vadim Lebedev, Andrea Vedaldi, and Victor Lempitsky. Texture networks: Feed-forward synthesis of textures and stylized images. 2016.

[4] Dmitry Ulyanov, Andrea Vedaldi, and Victor Lempitsky. Instance normalization: The missing ingredient for fast stylization. 2016.