Multiple Artistic Style Transfer

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Introduction

- With current deep learning techniques, given two images, it is perfectly possible for a computer to recognize the specific content of the image. But the style of an image is a very abstract thing.
- The human eye can very effectively distinguish the styles of different painters of different genre paintings.
- For a computer, essentially, those are some pixels. The essence of a multi-layered network is actually to find out more complex and more intrinsic features, so the image style can theoretically extract some interesting features that may be contained in the image through a multi-layer network.

Method

- **The cost function of content:**

$$L_{content}(p, x, l) = \frac{1}{2}\sum_{ij}\left(F_{ij}^{l} - P_{ij}^{l}\right)$$

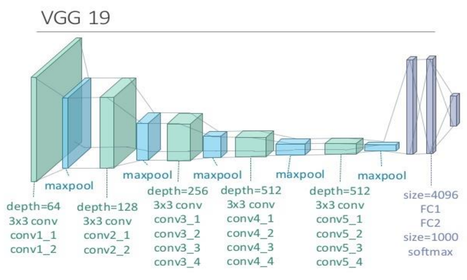
- **The cost function of style:**

$$L_{style}(a, x) = \sum_{l=0}^{L} w_l E_l$$

- **The total function:**

$$L_{total}(p, a, x) = \alpha L_{content}(p, x) + \beta\left[L_{style1}(a, x) + L_{style2}(a, x)\right]$$

The structure of VGG 19 network



Future work

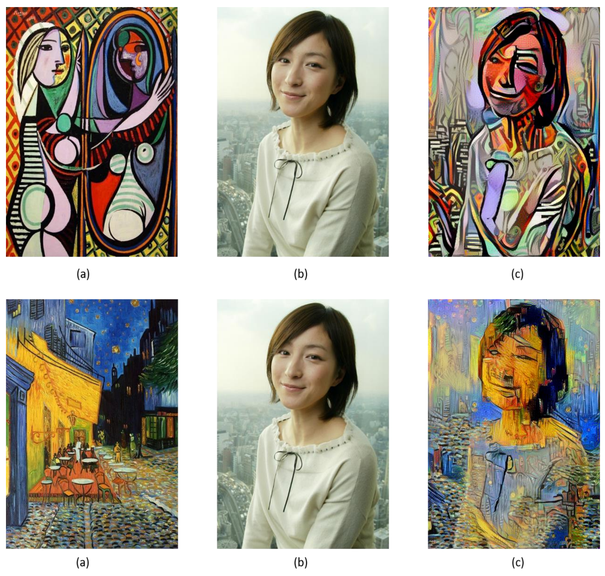
- Focus on different style transfers on different part of the image, such as transferring the face to Monet, while changing her cloth to Picasso.
- Separating the image into several parts like cloth and facial regions, and applying an algorithm on those two regions separately.

Reference

[1] L. A. Gatys, A. S. Ecker, and M. Bethge, A Neural Algorithm of Artistic Style. Computer Vision and Pattern Recognition, Aug 2015.

[2] L. A. Gatys, A. S. Ecker, and M. Bethge. Image style transfer using convolutional neural networks. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, Jun 2016.

Result



(a) Output image with Cafe Terrace at Night.
(b) Output image with two styles of artworks.
(c) Output image with Girl before a Mirror.

Different steps of iteration