Cartoonisation d'images

Avancement

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Recherche

Article scientifiques

A Neural Algorithm of Artistic Style

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In fine art, especially painting, humans have mastered the skill to create unique visual experiences through composing a complex interplay between the content and style of an image. Thus far the algorithmic basis of this process is unknown and there exists no artificial system with similar capabilities. However, in other key areas of visual perception such as object and face recognition near-human performance was recently demonstrated by a class of biologically inspired vision models called Deep Neural Networks.[1,2] Here we introduce an artificial system based on a Deep Neural Network that creates artistic images of high perceptual quality. The system uses neural representations to separate and recombine content and style of arbitrary images, providing a neural algorithm for the creation of artistic images. Moreover, in light of the striking similarities between performance-optimised artificial neural networks and biological vision,[3–7] our work offers a path forward to an algorithmic understanding of how humans create and perceive artistic imagery.

CartoonGAN: Generative Adversarial Networks for Photo Cartoonization

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Abstract

In this paper, we propose a solution to transforming photos of real-world scenes into cartoon style images, which is valuable and challenging in computer vision and computer graphics. Our solution belongs to learning based methods, which have recently become popular to stylize images in artistic forms such as painting. However, existing methods do not produce satisfactory results for cartoonization, due to the fact that (1) cartoon styles have unique characteristics with high level simplification and abstraction, and (2) cartoon images tend to have clear edges, smooth color shading and relatively simple textures, which exhibit significant challenges for texture-descriptor-based loss functions used in existing methods. In this paper, we propose CartoonGAN, a generative adversarial network (GAN) framework for cartoon stylization. Our method takes unpaired photos and cartoon images for training, which is easy to use. Two novel losses suitable for cartoonization are proposed: (1) a semantic content loss, which is formulated as a sparse regularization in the high-level feature maps of the VGG network to cope with substantial style variation between photos and cartoons, and (2) an edge-promoting adversarial loss for preserving clear edges. We further introduce an initialization phase, to improve the convergence of the network to the target manifold. Our method is also much more efficient to train than existing methods. Experimental results show that our method is able to generate high-quality cartoon images from real-world photos (i.e., following specific artists' styles and with clear edges and smooth shading) and outperforms state-of-the-art methods.

(a) Original scene (b) Our result

Figure 1. An example of cartoon stylization. (a) A real-world scene whose corresponding cartoon image appears in the animated film "Your Name". (b) Our result that transforms the photo (a) to the cartoon style. Note that our training data does not contain any picture in "Your Name".

1. Introduction

Cartoons are an artistic form widely used in our daily life. In addition to artistic interests, their applications range from publication in printed media to storytelling for children's education. Like other forms of artworks, many famous cartoon images were created based on real-world scenes. Figure 1 shows a real-world scene whose corresponding cartoon image appeared in the animated film "Your Name". However, manually recreating real-world scenes in cartoon styles is very laborious and involves substantial artistic skills. To obtain high-quality cartoons, artists have to draw every single line and shade each color region of target scenes. Meanwhile, existing image editing software/algorithms with standard features cannot produce satisfactory results for cartoonization. Therefore, specially designed techniques that can automatically transform real-world photos to high-quality cartoon style images are very helpful and for artists, tremendous amount of time can be saved so that they can focus on more creative work. Such tools also provide a useful addition to photo editing software such as Instagram and Photoshop.

Stylizing images in an artistic manner has been widely studied in the domain of non-photorealistic rendering [25]. Traditional approaches develop dedicated algorithms for specific styles. However, substantial efforts are required to produce fine-grained styles that mimic individual artists. Recently, learning-based style transfer methods (e.g. [6]), in which an image can be stylized based on provided examples, have drawn considerable attention. In particular, the power of Generative Adversarial Networks (GANs) [38] formulated in a cyclic manner is explored to achieve high-quality style transfer, with the distinct feature that the model is trained using unpaired photos and stylized images.

Although significant success has been achieved with

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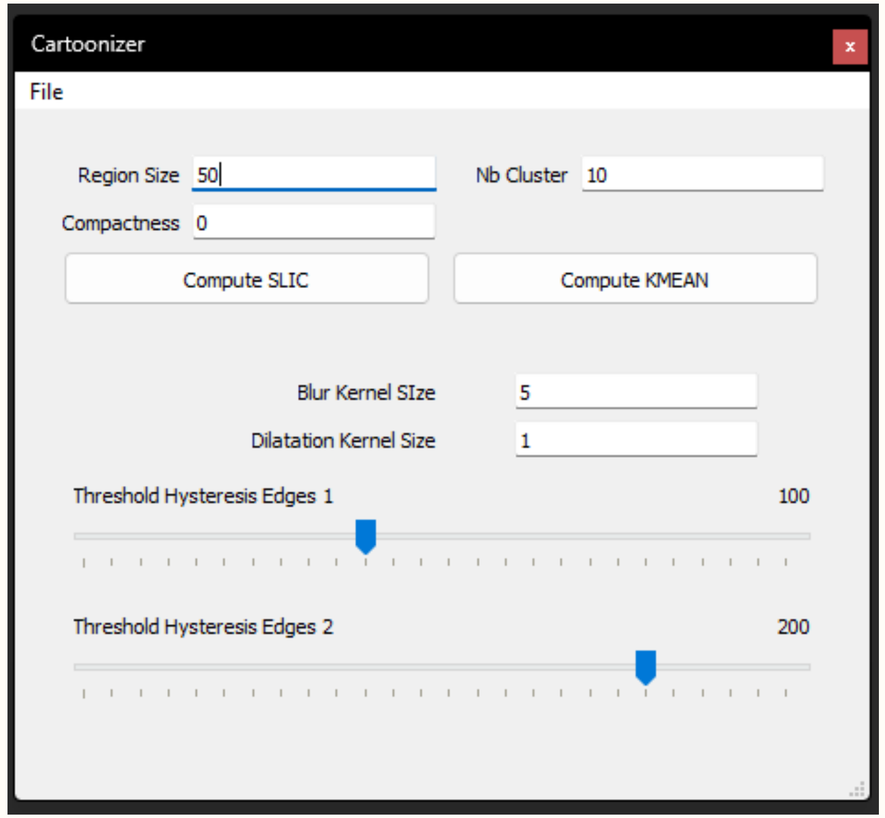
[1] Gatys, L. A., Ecker, A. S., & Bethge, M. (2015). A neural algorithm of artistic style. arXiv preprint arXiv:1508.06576.
[2] Chen, Y., Lai, Y. K., & Liu, Y. J. (2018). Cartoongan: Generative adversarial networks for photo cartoonization. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 9465-9474).

Résultats de notre méthode traditionelle



Transfert de style

VGG19
pré entraîné

$$L_{total}(\vec{p}, \vec{a}, \vec{x}) = \alpha * L_{content}(\vec{p}, \vec{x}) + \beta * L_{style}(\vec{a}, \vec{x})$$

contenu

style

Transfert de style

VGG19
pré entraîné

$$L_{total}(\vec{p}, \vec{a}, \vec{x}) = \alpha * L_{content}(\vec{p}, \vec{x}) + \beta * L_{style}(\vec{a}, \vec{x})$$

contenu

style

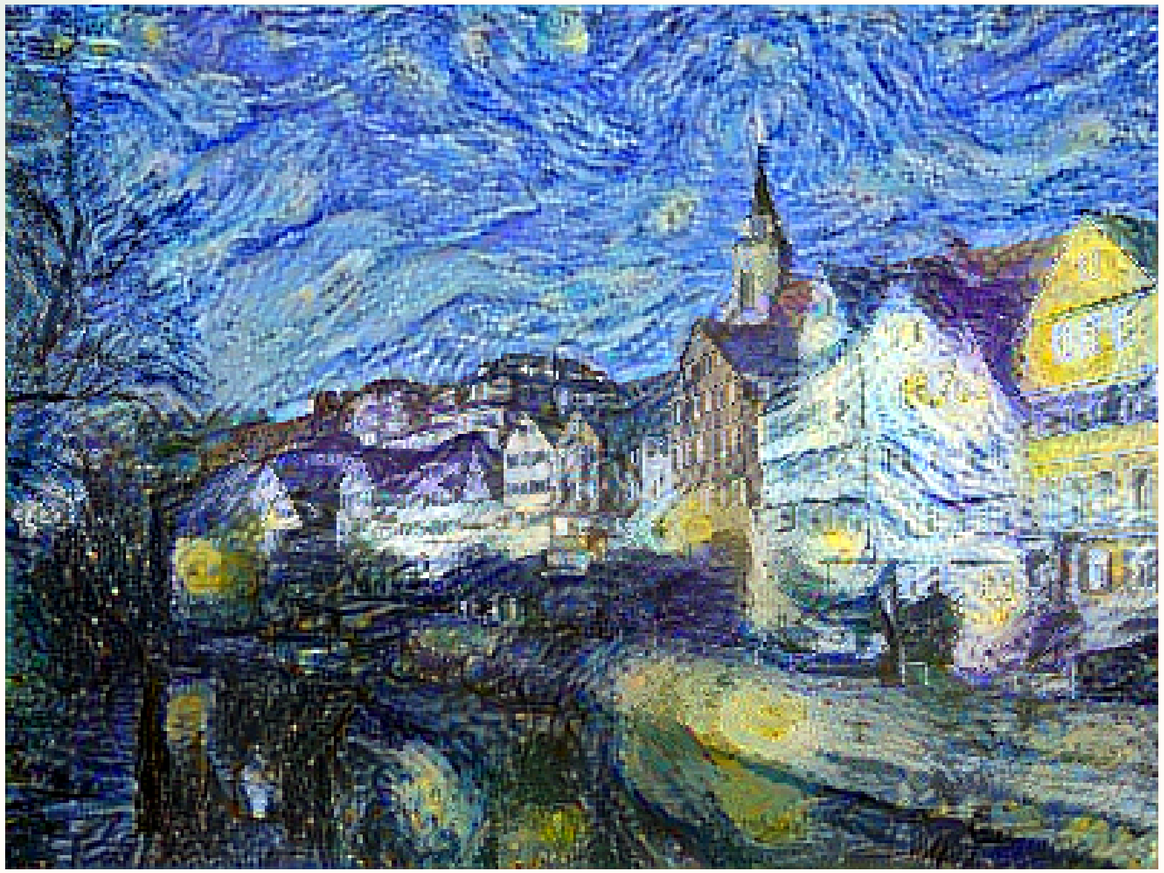
résultat

Transfert de style Cartoon

contenu

style

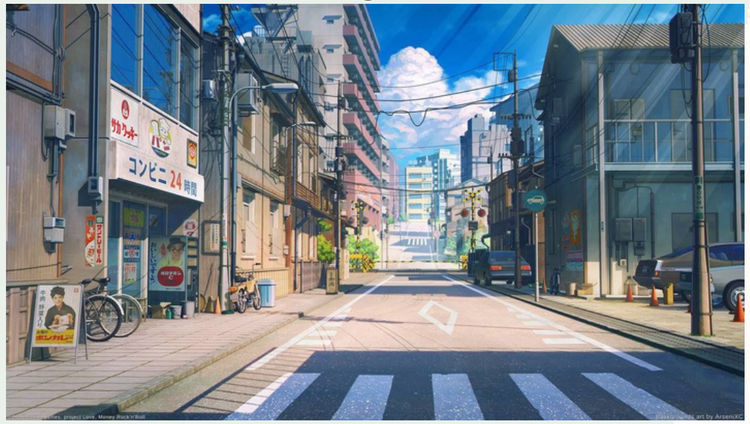
Résultat (Algo 1)



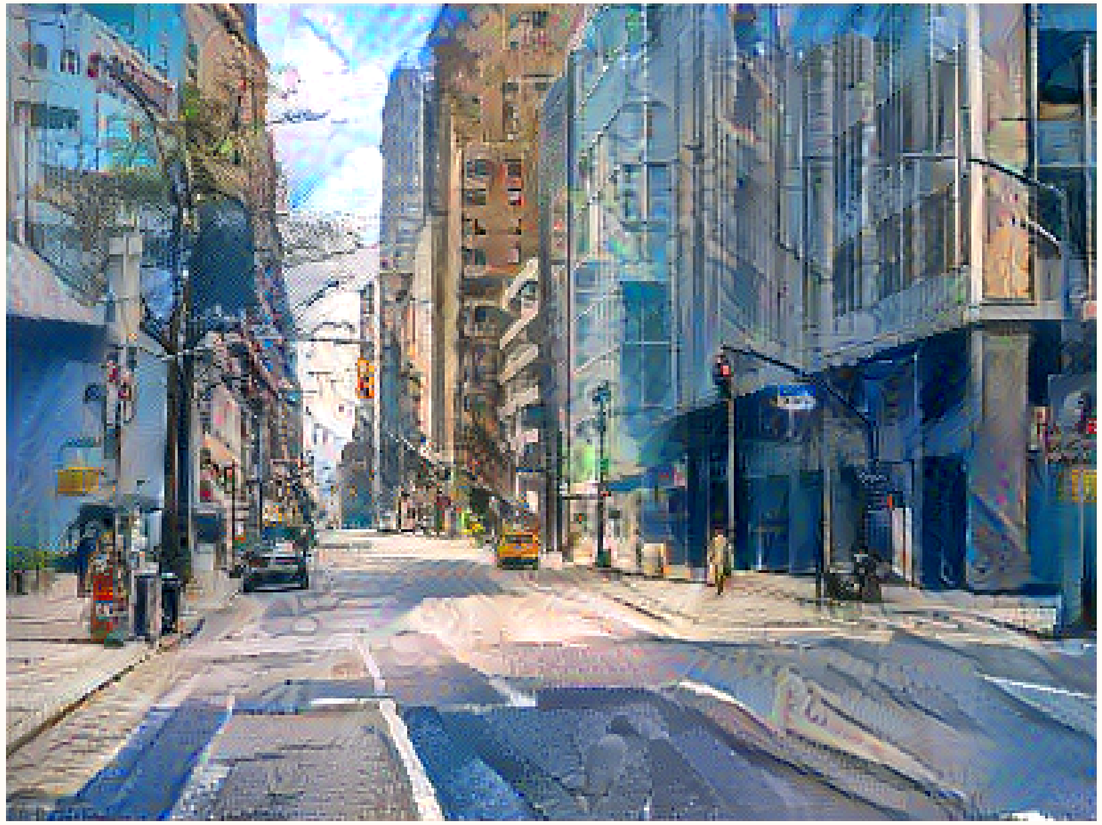
Transfert de style Cartoon

contenu

style



Résultat (Algo 1)



Transfert de style Cartoon

contenu

style

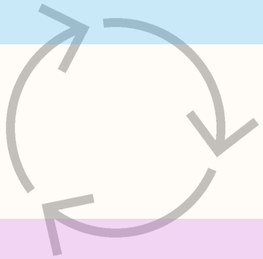
Résultat (Algo 2)

GAN

Generative Adversarial Networks

Generateur G

Génère des images pour tromper D



Discriminateur D

Essaie de discerner si une image est réelle ou créé par G

Cartoon GAN




Cartoon GAN

Résultats obtenus

Cartoon GAN

Résultats obtenus








Des questions ?

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