Self-Stylized Neural Painter

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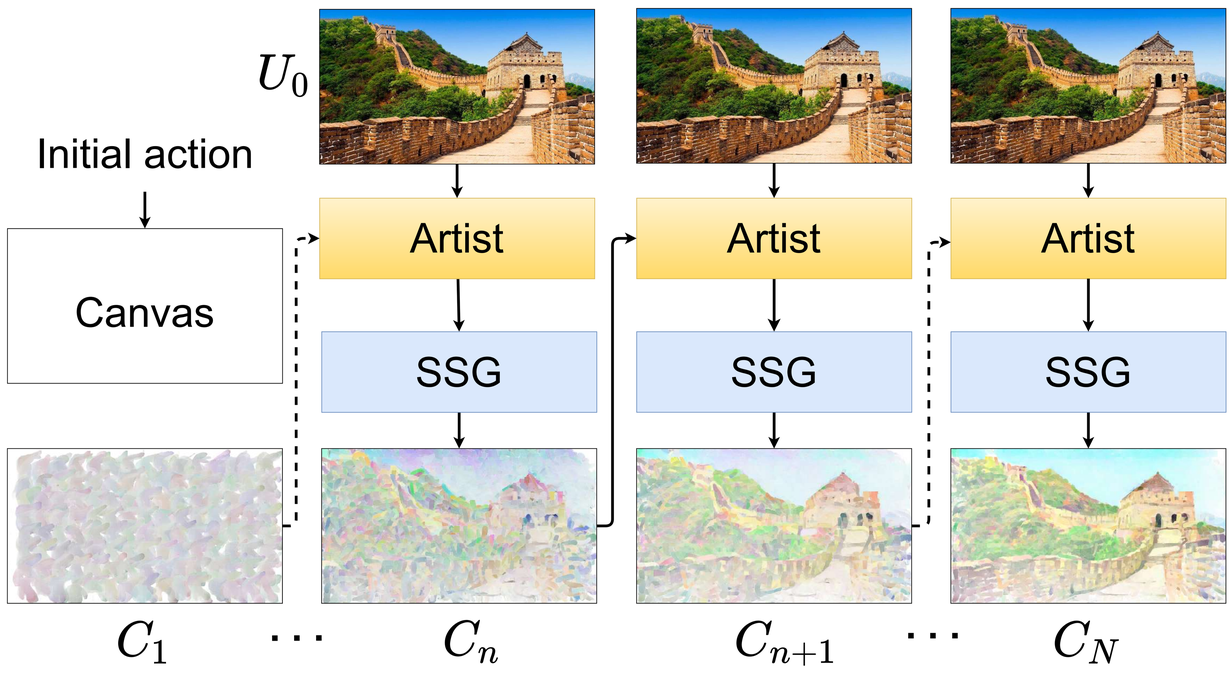
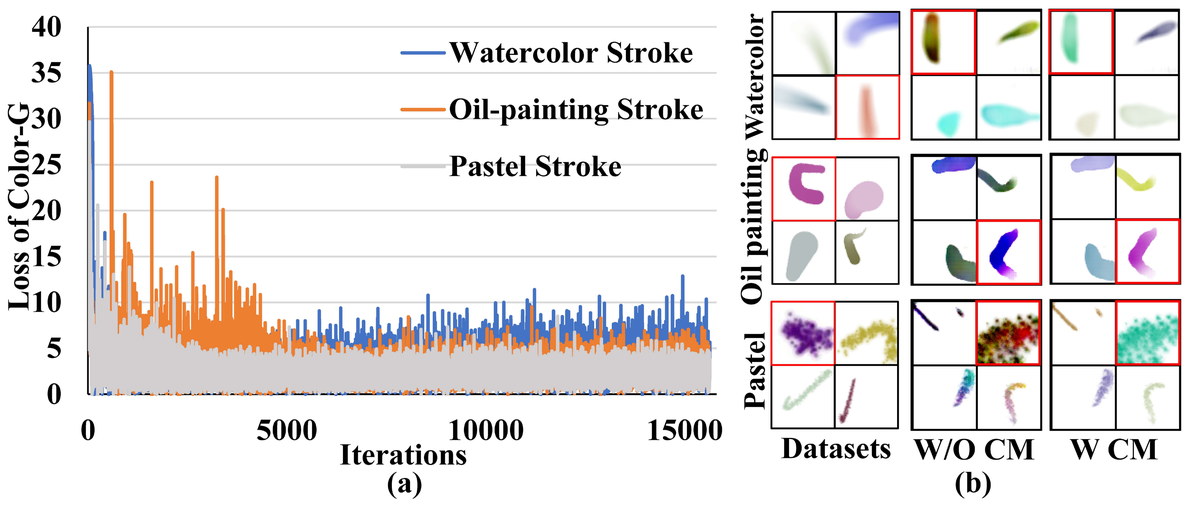
Overview

Self-Stylized Neural Painter (SSNP), a deep neural network that automatically creates stylized artworks in a stroke-by-stroke manner. Our SSNP consists of digit artist, canvas, and style-stroke generator (SSG). By using SSG to generate style strokes, SSNP creates different styles paintings based on the given images.

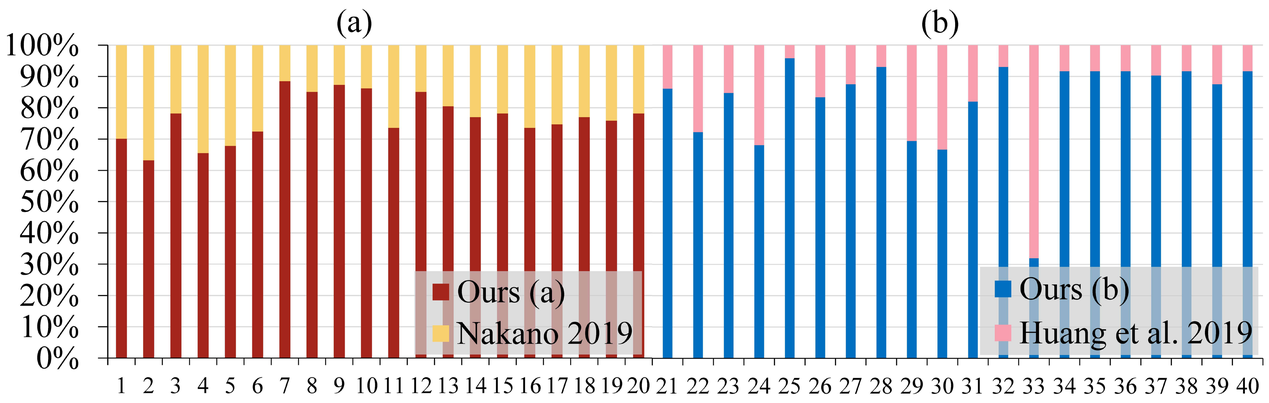


Learning-to-paint process. The terms of U_0, C_n and N denote the reference image, a certain state of the canvas, and the painting times, respectively. The artist optimizes the strokes generated by SSG to continually paint the whole canvas. The painting quality becomes better with the increased n.

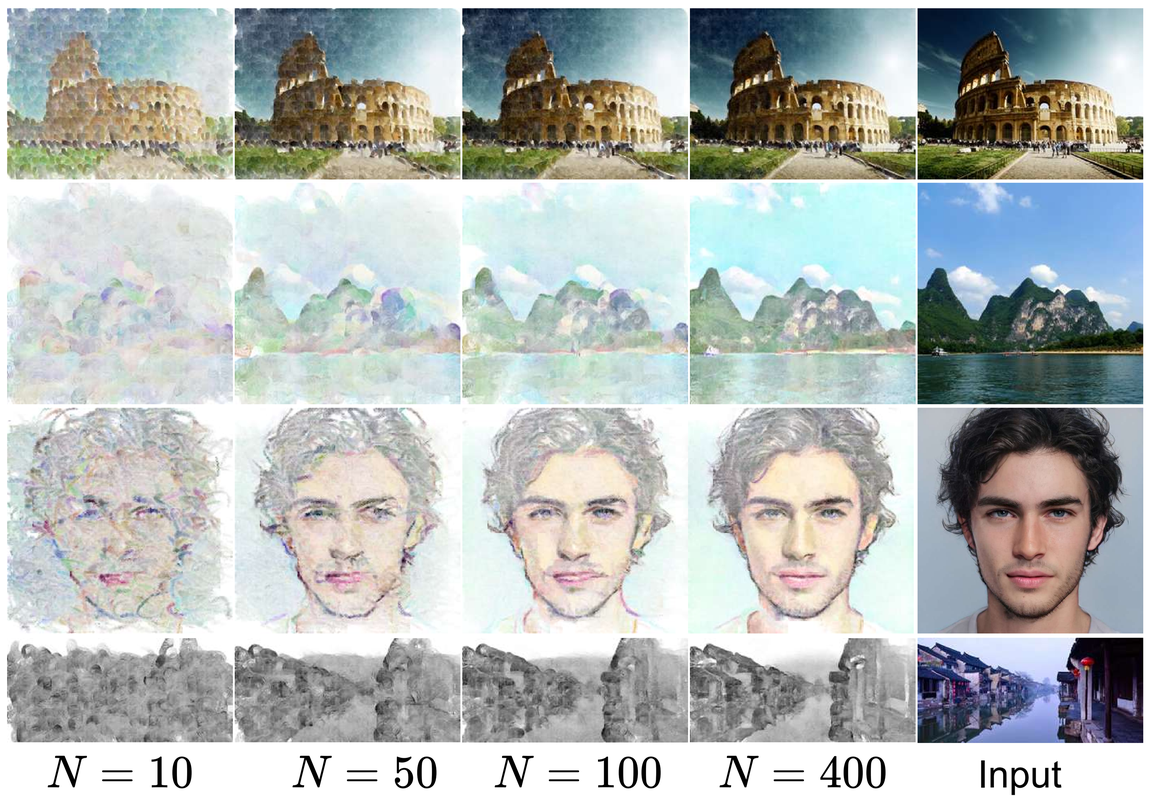


The training process of SSG. (a) plots the loss of SSG component with iterations on three stroke datasets; (b) shows stroke samples generated by two comparative methods: SSG with coloring module (W CM) and without coloring module (W/O CM). Images with red borders in the second column and the third column denote the strokes with mixed colors and pure colors generated by SSG W/O CM and W CM, respectively. SSG W/O CM generates stained-color strokes while the pure-color strokes generated by SSG W CM are close to human artists' strokes, thereby being beneficial to improve the quality of the generated paintings.

Experiments & Evaluation



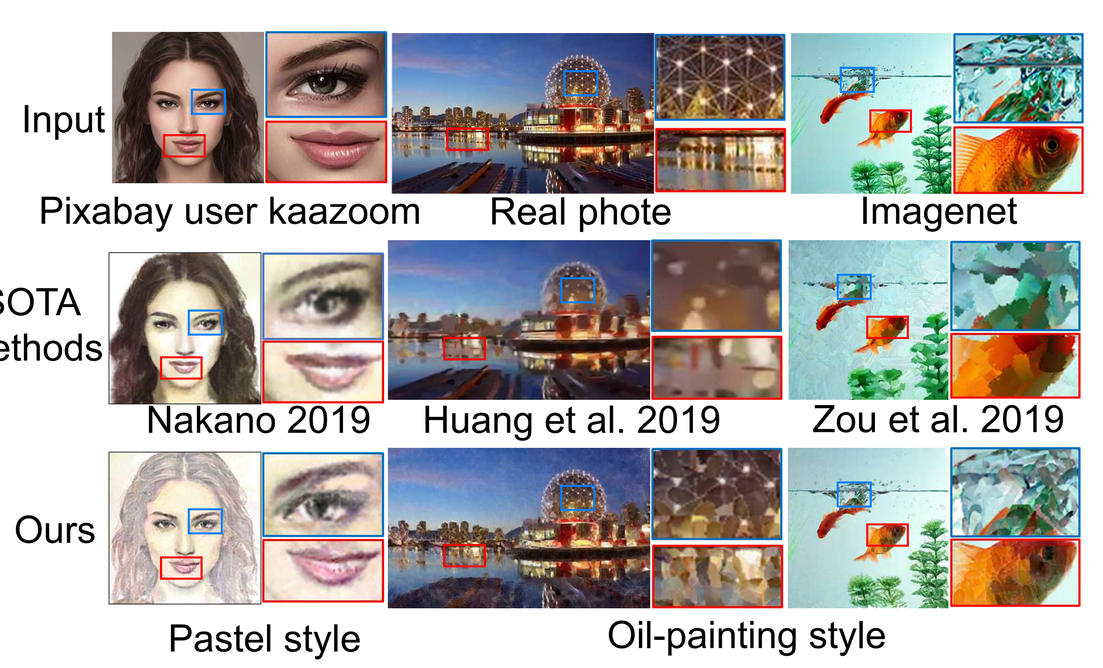
User study I of the art-style recognizability



Painting process with 400 iterations. The last column shows the input reference images. The painter learns to paint in a coarse-to-fine manner (generating images from left to right). Here, N is the number of painting times. When $N = 10$, the painter learns to paint 10 times, and the painted image has a coarse painting quality. The quality of the painting becomes better with the increment of . The rows from top to bottom show oil paintings, watercolor paintings, pastel paintings, and ink-wash paintings, respectively. Input image of the man is from Pixabay user kaazoom.

User study II of content details and stroke textures

Items	Methods	μ	σ	95% confidence interval	
				Lower Bound	Upper Bound
Content	Nakano [Nakano 2019]	3.505	0.242	3.403	3.607
	Ours	**3.690**	0.176	3.616	**3.764**
	Huang et al. [Huang et al. 2019]	2.735	0.131	2.68	2.79
	Ours	3.549	0.248	3.445	3.654
Stroke	Nakano [Nakano 2019]	3.603	0.284	3.483	3.722
	Ours	**3.737**	0.218	3.645	**3.829**
	Huang et al. [Huang et al. 2019]	2.691	0.133	2.635	2.747
	Ours	3.473	0.213	3.383	3.562



Both the visual comparison and the user studies demonstrate that our results are better than the compared methods. In user study I, most participants vote our results for easier recognizing the art style than the compared images. In user study II, our results obtain higher scores on both content details and stroke textures than the compared ones. For the visual comparison, our results contain more details and clearer stroke textures than the compared methods on both pastel-painting style and oil-painting style.