

Style transfer

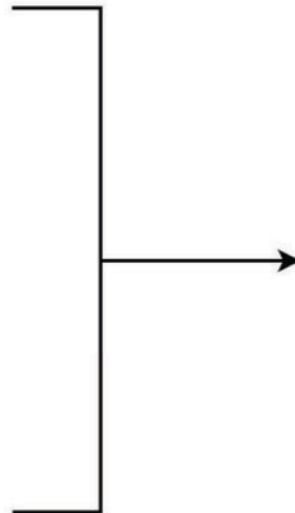
: A machine learning technique for transferring the reference style image onto the input image.



Content Image



Style Image



Generated image

Minimize the objective function:

$$\mathcal{L}_{\text{total}} = \underbrace{\sum_{\ell=1}^L \alpha_{\ell} \mathcal{L}_c^{\ell}}_{\text{Content}} + \Gamma \underbrace{\sum_{\ell=1}^L \beta_{\ell} \mathcal{L}_s^{\ell}}_{\text{Style}}$$

$$\text{with: } \mathcal{L}_c^{\ell} = \frac{1}{2N_{\ell}D_{\ell}} \sum_{ij} (F_{\ell}[O] - F_{\ell}[I])_{ij}^2$$
$$\mathcal{L}_s^{\ell} = \frac{1}{2N_{\ell}^2} \sum_{ij} (G_{\ell}[O] - G_{\ell}[S])_{ij}^2$$

Limitation of Gaty's algorithm: “Spillovers”



**When there are differences in content
between the input and reference images**

Augmented style loss

with semantic segmentation

$$\mathcal{L}_{\text{total}} = \sum_{l=1}^L \alpha_l \mathcal{L}_c^\ell + \Gamma \sum_{l=1}^L \beta_l \mathcal{L}_{s+}^\ell$$

$$\mathcal{L}_{s+}^\ell = \sum_{c=1}^C \frac{1}{2N_{\ell,c}^2} \sum_{ij} (G_{\ell,c}[O] - G_{\ell,c}[S])_{ij}^2$$

Style transfer of complex images



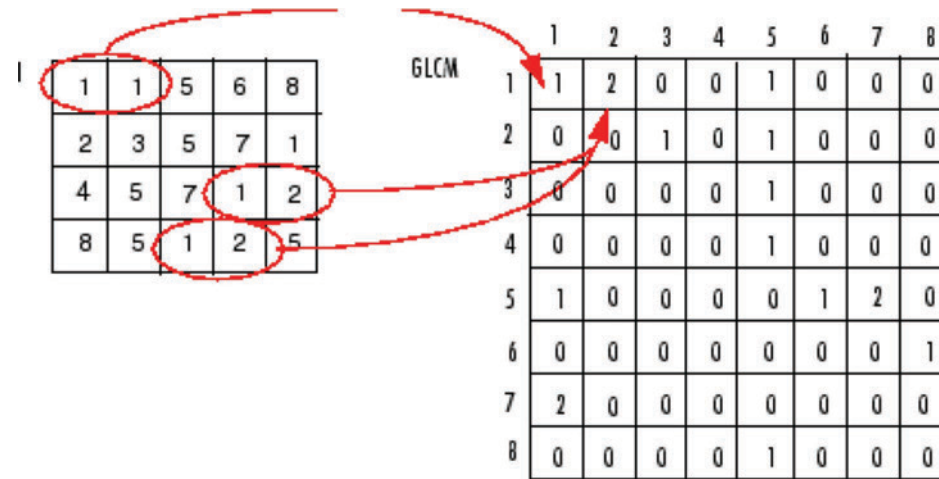
Input image



Reference image

Texture segmentation based on gray level co-occurrence matrix (GLCM)

A tabulation of how often different combinations of pixel brightness values occur.



Process used to create the GLCM

Texture Segmentation (GLCM)

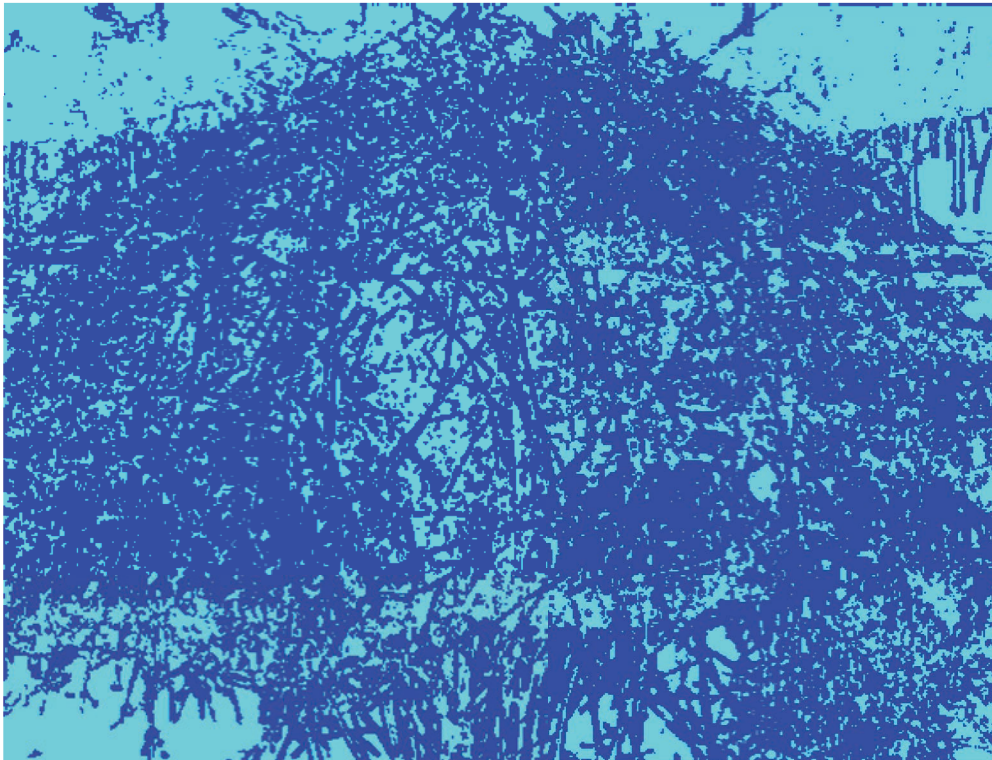


Input image

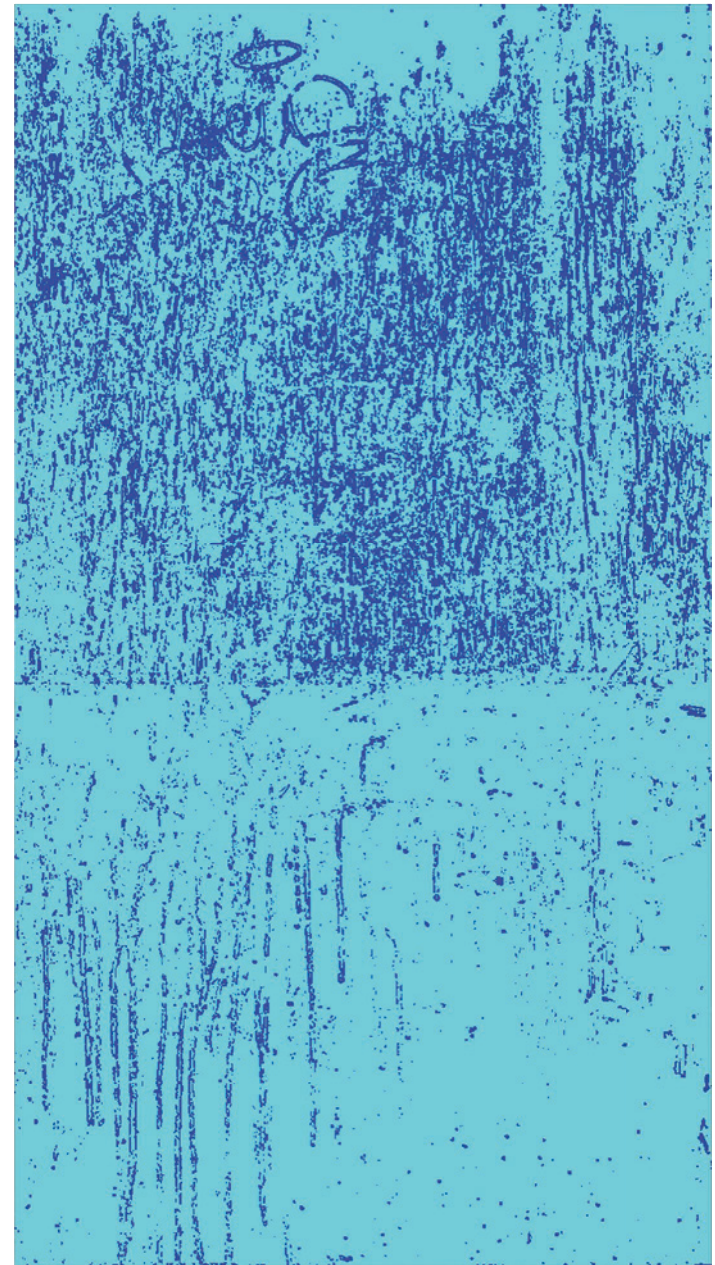


Reference image

Texture segmentation Results



Input image



Reference image

Style transfer (comparison)



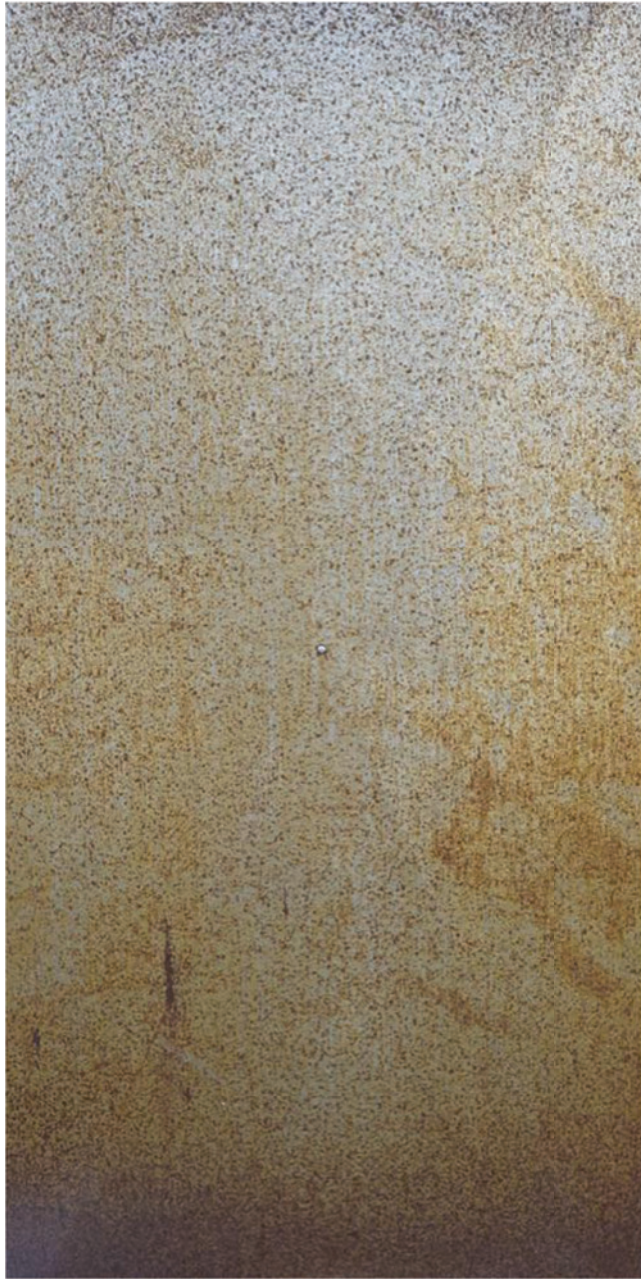
Input image



Without segmentation



With segmentation



Style

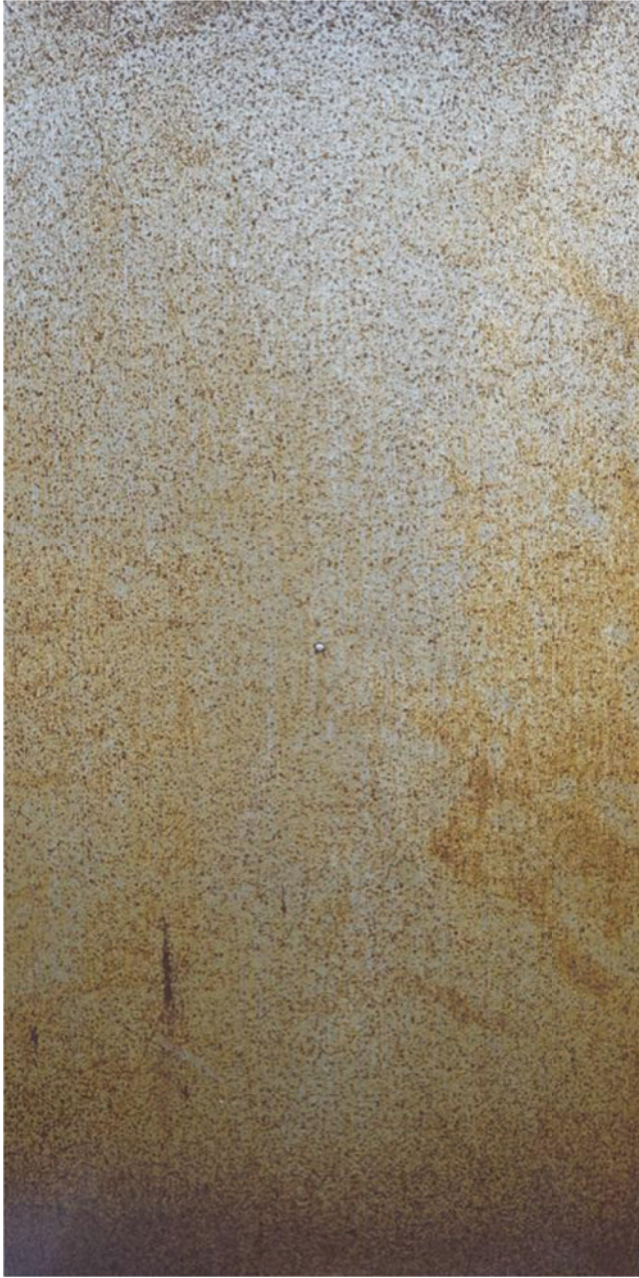


Content



Style transfer

With photorealism regularization



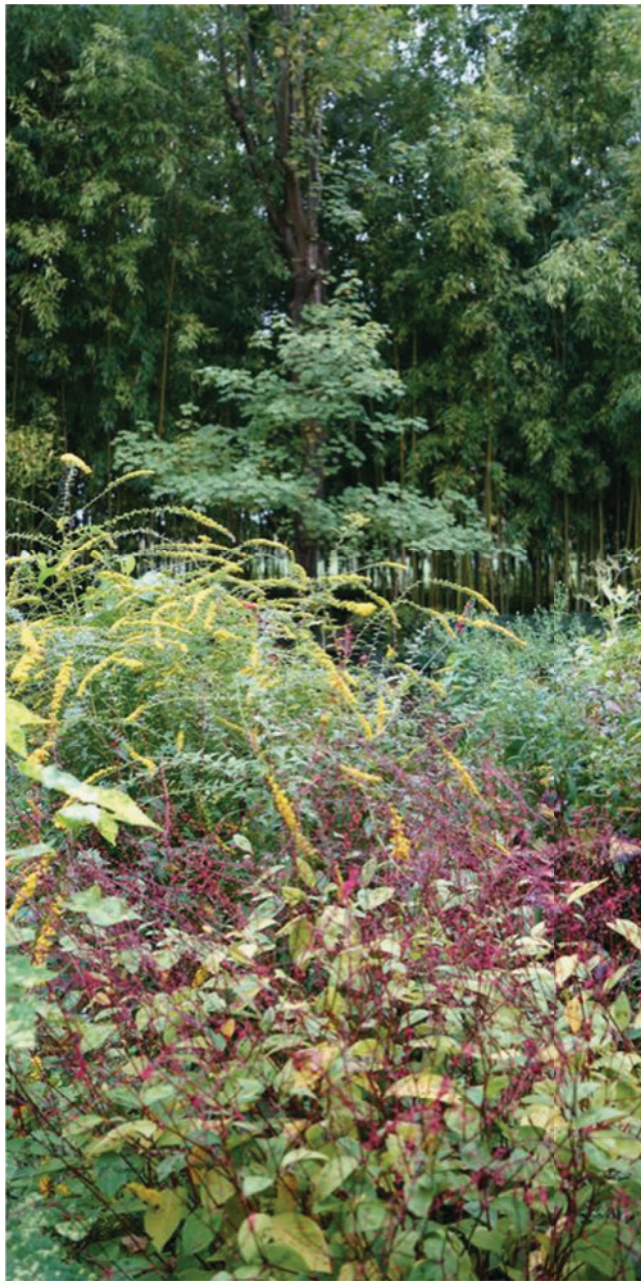
Style



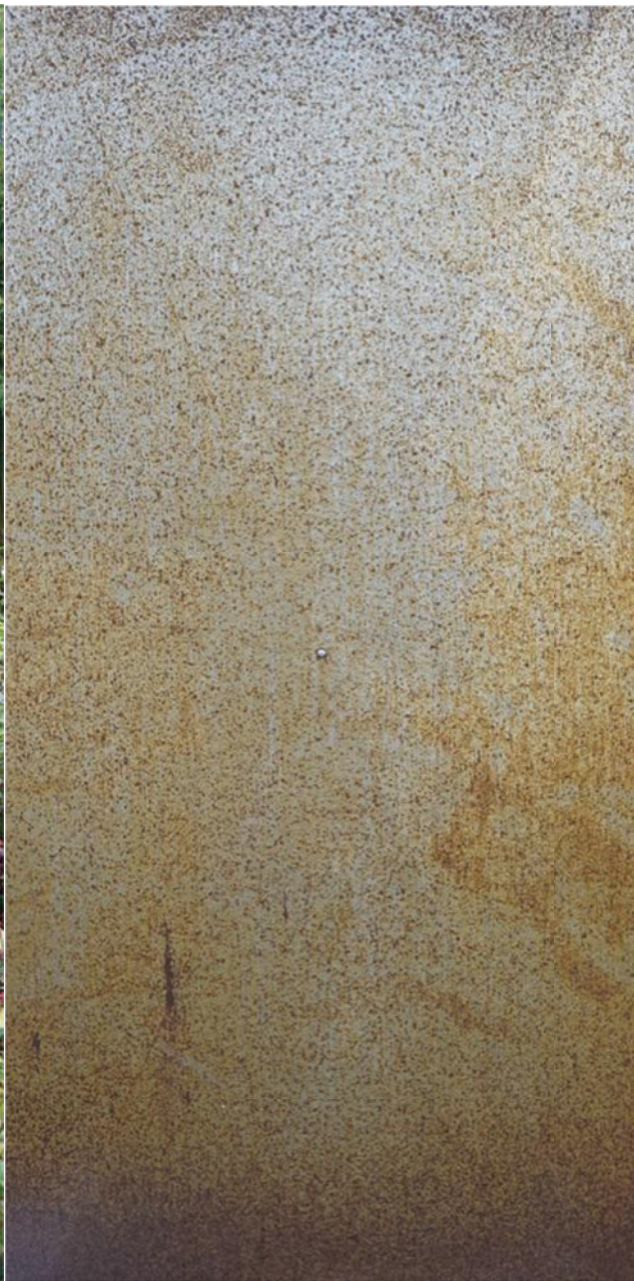
Content



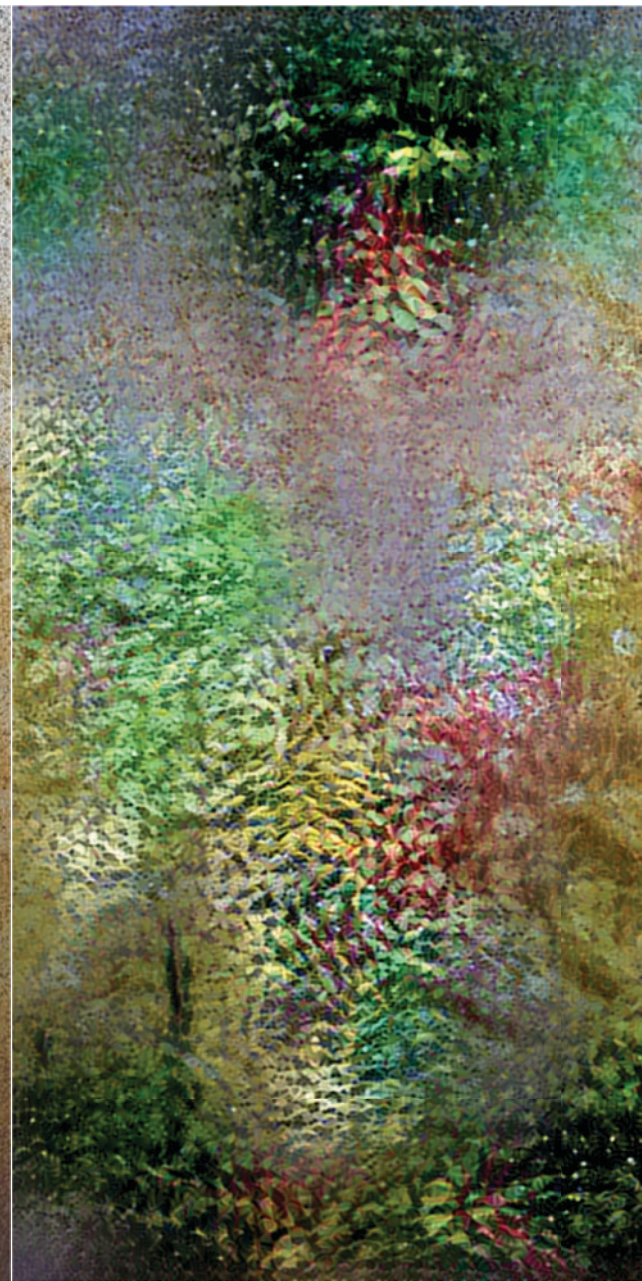
Style transfer



Style



Content



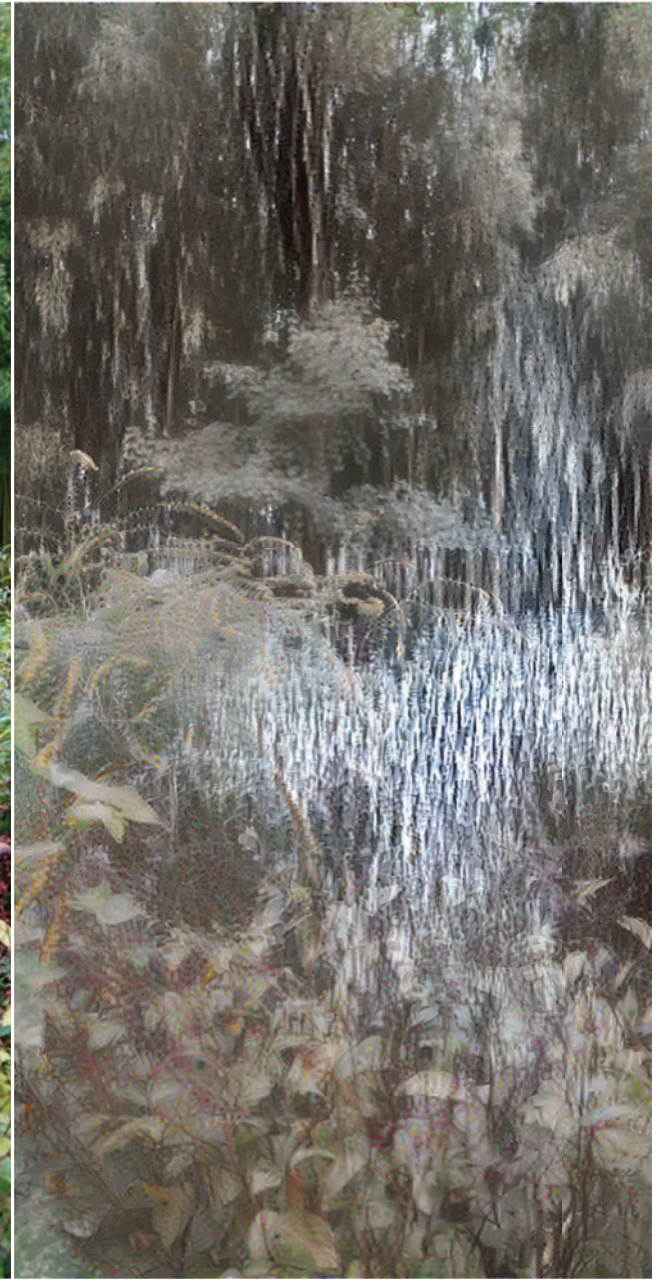
Style transfer



Style



Content



Style transfer

With photorealism regularization



Style



Content



Style transfer