A Review of Style Migration Based on GAN Networks

EECE7370 Final Project

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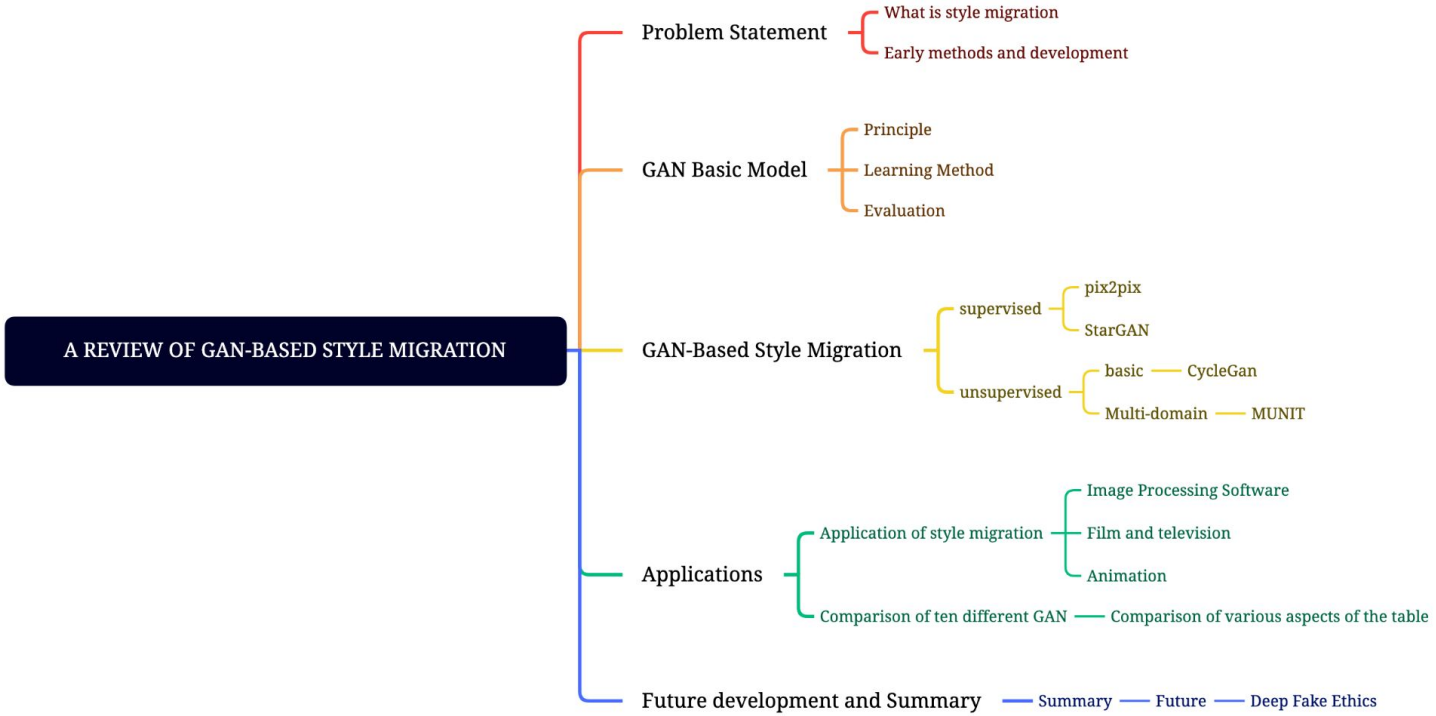
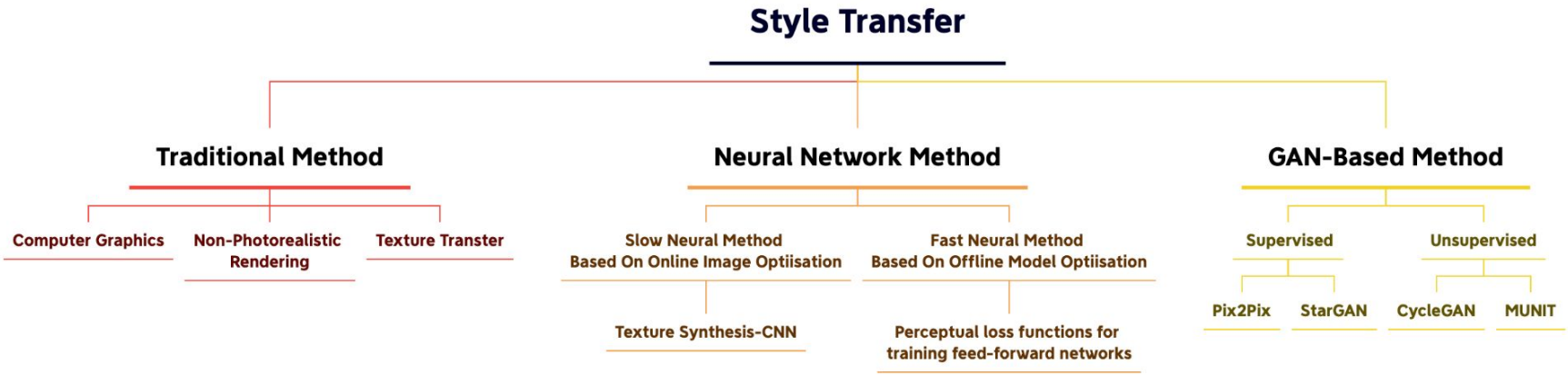
Content


A REVIEW OF GAN-BASED STYLE MIGRATION
Problem Statement
What is style migration
Early methods and development
GAN Basic Model
Principle
Learning Method
Evaluation
GAN-Based Style Migration
supervised
pix2pix
StarGAN
unsupervised
basic
CycleGan
Multi-domain
MUNIT
Applications
Application of style migration
Image Processing Software
Film and television
Animation
Comparison of ten different GAN
Comparison of various aspects of the table
Future development and Summary
Summary
Future
Deep Fake Ethics

Style Migration Development History



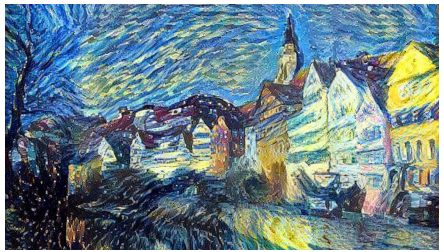
Control the brush stroke size in NST

Since the emergence of NST algorithms, there are also some researches devoted to improving current NST algorithms by controlling perceptual factors (e.g., stroke size control, spatial style control, and colour control)

(a)Content

(b)Style

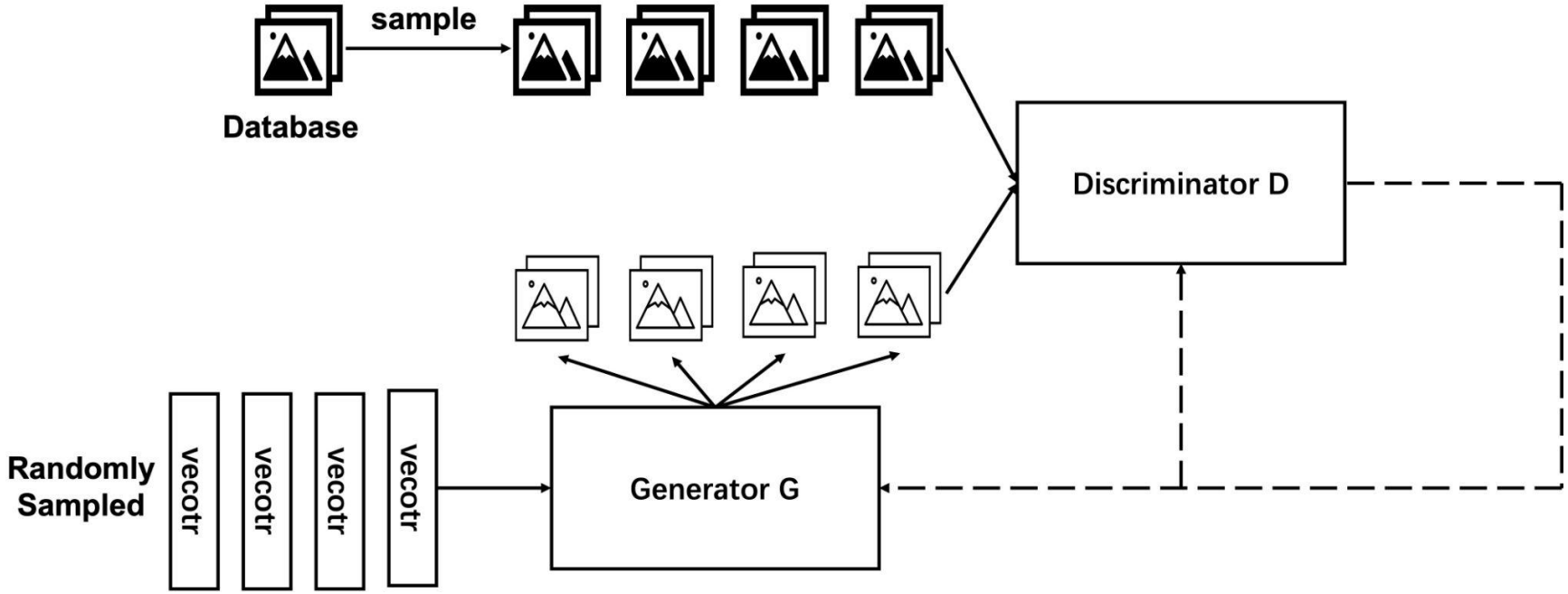
(c)Small Stroke



(d)Large Stroke

Y. Jing, Y. Yang, Z. Feng, J. Ye, Y. Yu and M. Song, "Neural Style Transfer: A Review," in IEEE Transactions on Visualization and Computer Graphics, vol. 26, no. 11, pp. 3365-3385, 1 Nov. 2020, doi: 10.1109/TVCG.2019.2921336.

GAN algorithm



Goodfellow I, Pouget-Abadie J, Mirza M, et al. Generative adversarial networks[J]. Communications of the ACM, 2020, 63(11): 139-144.

GAN algorithm

The generator captures the potential distribution of real data samples and generates new data samples; the discriminator is a binary classifier that discriminates whether the input is real data or generated samples.

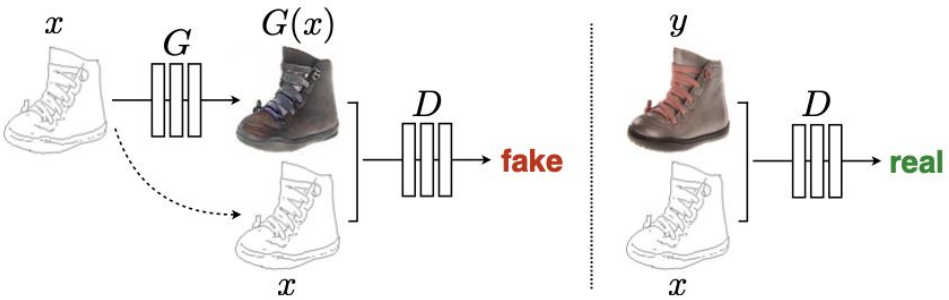
Both the generator and the discriminator can be used in deep neural networks, which are currently a hot research activity.

Algorithm 1 GAN algorithm [9]

for number of training iterations **do**
  for k steps **do**
    •Sample minibatch of m noise samples $z^{(1)}, ..., z^{(m)}$ from noise prior $p_g(z)$.
    •Sample minibatch of m examples $x^{(1)}, ..., x^{(m)}$ from data generating distribution $p_{data}(x)$.
    •Update the discriminator by ascending its stochastic gradient:
    $\nabla_{\theta_d} \frac{1}{m} \sum_{i=1}^{m} [\log D(x^{(i)}) + \log (1 - D(G(z^{(i)})))]$
  end for
  •Sample minibatch of m noise samples $z^{(1)}, ..., z^{(m)}$ from noise prior $p_g(z)$.
  •Update the generator by descending its stochastic gradient:
  $\nabla_{\theta_g} \frac{1}{m} \sum_{i=1}^{m} \log (1 - D(G(z^{(i)})))$
end for

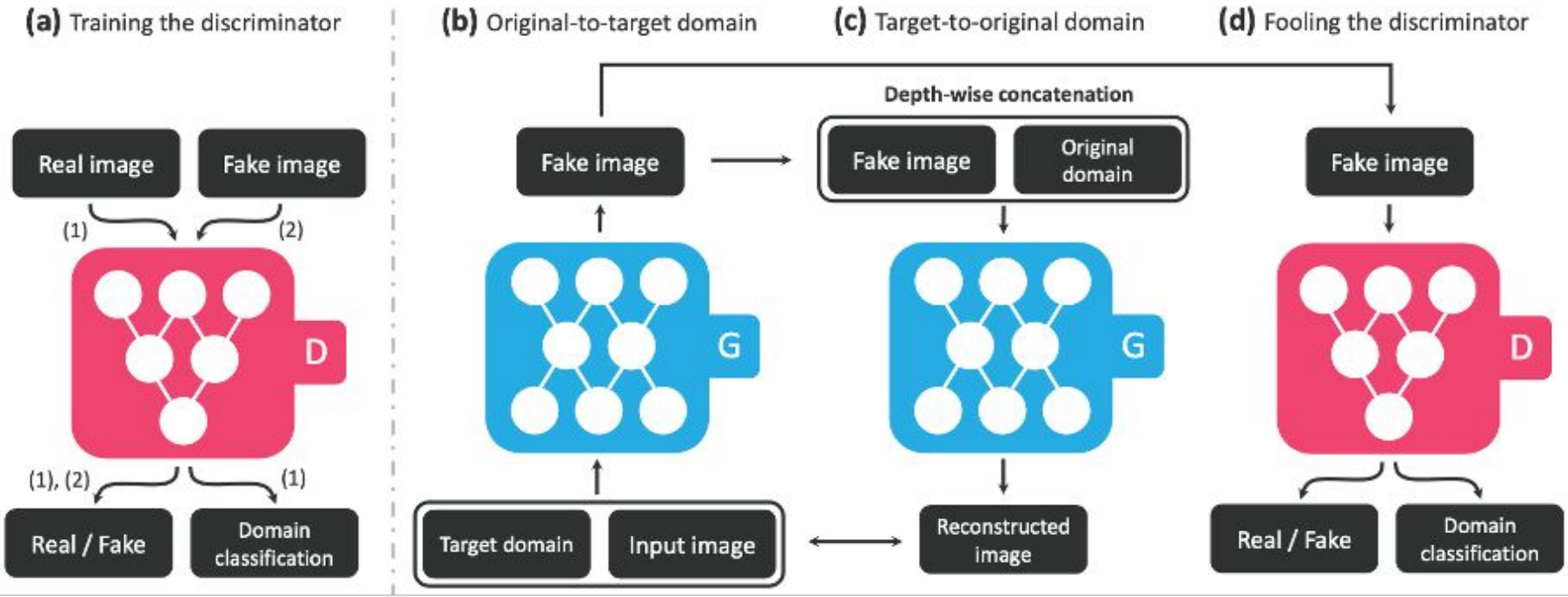
Goodfellow I, Pouget-Abadie J, Mirza M, et al. Generative adversarial networks[J]. Communications of the ACM, 2020, 63(11): 139-144.

Pix2Pix algorithm



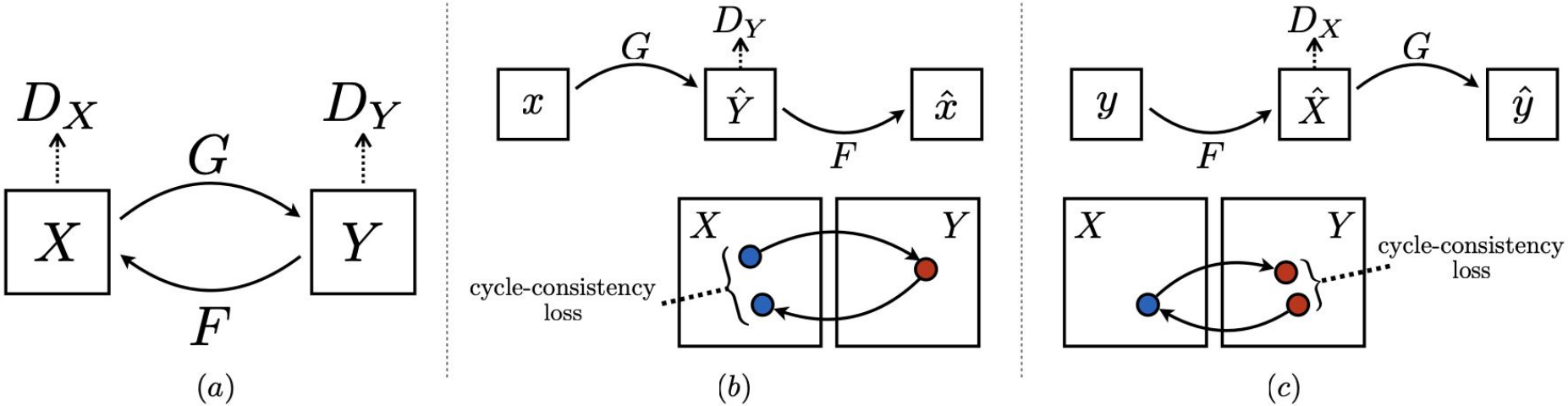
Phillip Isola, Jun-Yan Zhu, Tinghui Zhou, and Alexei A Efros. Image-to-image translation with conditional adver- sarial networks. In Proceedings of the IEEE conference on computer vision and pattern recognition, pages 1125–1134, 2017.

StarGAN algorithm



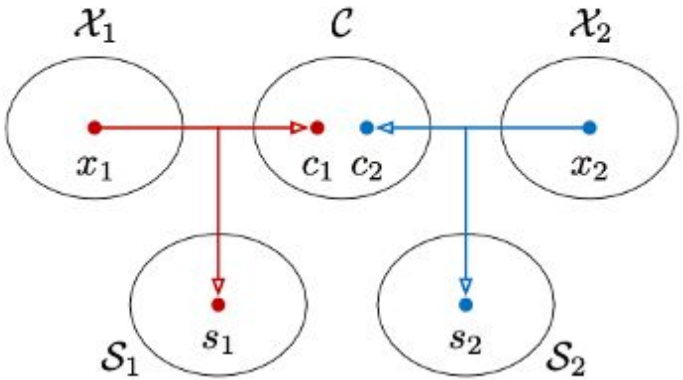
Choi Y, Choi M, Kim M, et al. Stargan: Unified generative adversarial networks for multi-domain image-to-image translation[C]2018

CycleGAN algorithm

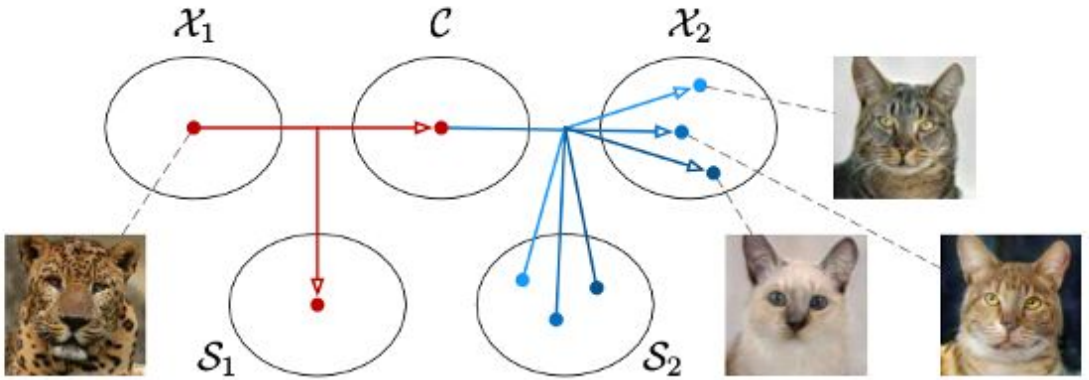


Jun-Yan Zhu, Taesung Park, Phillip Isola, and Alexei AEfros. Unpaired image-to-image translation using cycle- consistent adversarial networks. In Proceedings of the IEEE international conference on computer vision, pages 2223– 2232, 2017.

MUNIT algorithm



(a) Auto-encoding



(b) Translation

Huang, Xun, et al. "Multimodal unsupervised image-to-image translation." *Proceedings of the European conference on computer vision (ECCV)*. 2018.

Application

- **Photo and Video Editors**
  - Photo-to-Animation Translation
  - Photo-to-Oil Paintings
  - AI Generate Faces
- Text Style Transfer
- Video Gaming
- Virtual Reality

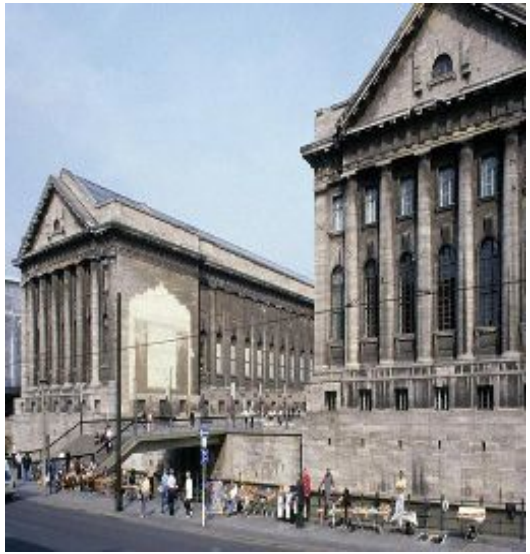
Photo and Video Editors

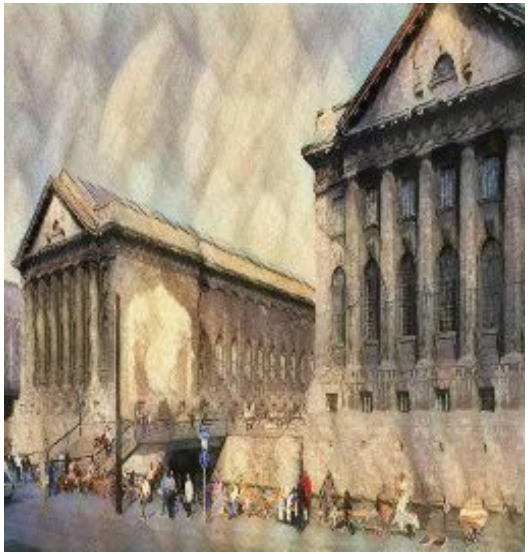
Photo-to-Animation Translation

Chen J, Liu G, Chen X. AnimeGAN: a novel lightweight GAN for photo animation[C]//International symposium on intelligence computation and applications. Springer, Singapore, 2020: 242-256.

Photo and Video Editors

Photo-to-Oil Paintings





Xu, Wenju, et al. "Drb-gan: A dynamic resblock generative adversarial network for artistic style transfer." *Proceedings of the IEEE/CVF International Conference on Computer Vision*. 2021.

Photo and Video Editors

AI Generate Faces

Goodfellow et al., 2014; Radford et al., 2016; Liu&Tuzel, 2016; Karras et al., 2018;

Reference(part)

[1] Jie Chen, Gang Liu, and Xin Chen. Animegan: a novel lightweight gan for photo animation. In International symposium on intelligence computation and applications, pages 242–256. Springer, 2020.

[2] Yunjey Choi, Minje Choi, Munyoung Kim, Jung-Woo Ha, Sunghun Kim, and Jaegul Choo. Stargan: Unified genera- tive adversarial networks for multi-domain image-to-image translation. In Proceedings of the IEEE conference on computer vision and pattern recognition, pages 8789–8797, 2018.

[3]Goodfellow Ian, Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, and David Warde-Farley. Generative adversarial nets.” in advances in neural information processing systems. 2014.

[4]Huang, Xun, et al. "Multimodal unsupervised image-to-image translation." *Proceedings of the European conference on computer vision (ECCV)*. 2018.

[5] Phillip Isola, Jun-Yan Zhu, Tinghui Zhou, and Alexei A Efros. Image-to-image translation with conditional adver- sarial networks. In Proceedings of the IEEE conference on computer vision and pattern recognition, pages 1125–1134, 2017.

[6]Choi, Yunjey, et al. "Stargan: Unified generative adversarial networks for multi-domain image-to-image translation." *Proceedings of the IEEE conference on computer vision and pattern recognition*. 2018.

[7]Y. Jing, Y. Yang, Z. Feng, J. Ye, Y. Yu and M. Song, "Neural Style Transfer: A Review," in IEEE Transactions on Visualization and Computer Graphics, vol. 26, no. 11, pp. 3365-3385, 1 Nov. 2020, doi: 10.1109/TVCG.2019.2921336.

[8] Xu, Wenju, et al. "Drb-gan: A dynamic resblock generative adversarial network for artistic style transfer." *Proceedings of the IEEE/CVF International Conference on Computer Vision*. 2021.

[9]Chen J, Liu G, Chen X. AnimeGAN: a novel lightweight GAN for photo animation[C]//International symposium on intelligence computation and applications. Springer, Singapore, 2020: 242-256.