Image Style Transfer using Convolutional Neural Networks

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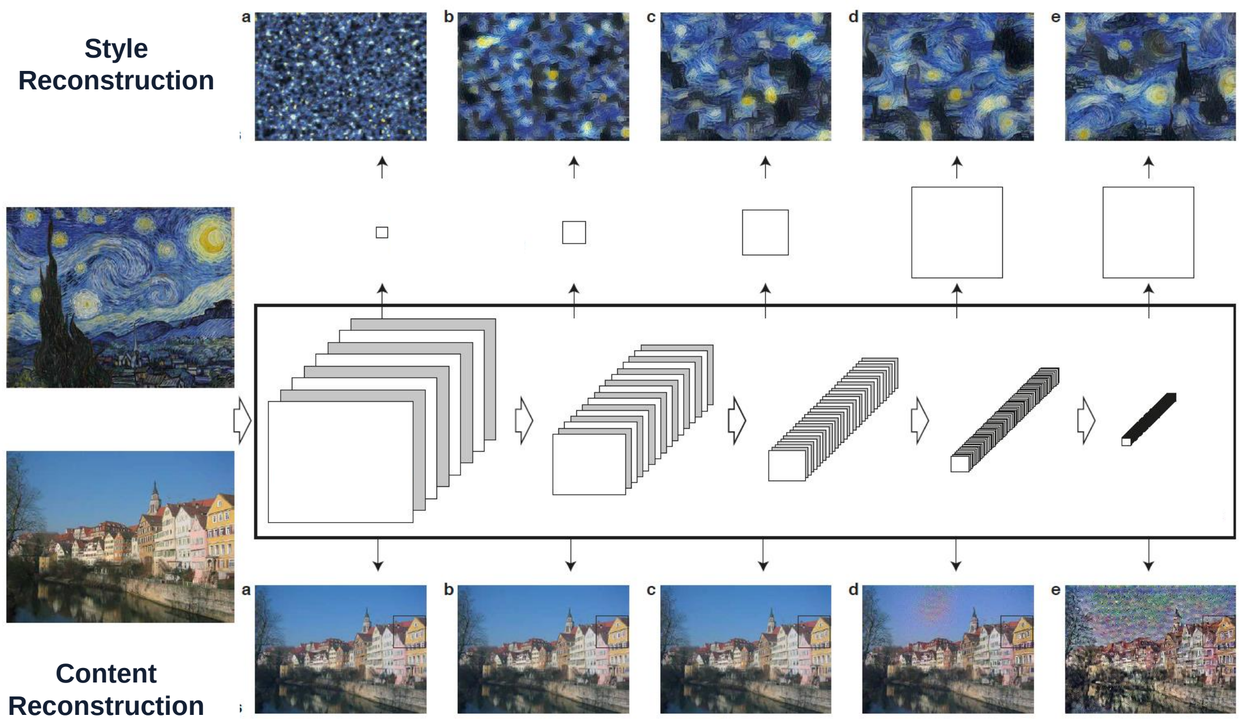
Architecture



Style Loss Function

$$E_l = \frac{1}{4N_l^2 M_l^2} \sum_{i,j} \left(G_{ij}^l - A_{ij}^l\right)^2$$

Feature correlations

$$\mathcal{L}_{\text{style}}(\vec{a}, \vec{x}) = \sum_{l=0}^{L} w_l E_l$$

Style layer weights

Content Loss Function

$$\mathcal{L}_{\text{content}}(\vec{p}, \vec{x}, l) = \frac{1}{2} \sum_{i,j} \left(F_{ij}^l - P_{ij}^l\right)^2$$

Convolutional layer outputs

$$\mathcal{L}_{total} = \alpha \mathcal{L}_{content} + \beta \mathcal{L}_{style}$$

Results

Der Schrei, Edvard Munch, 1893

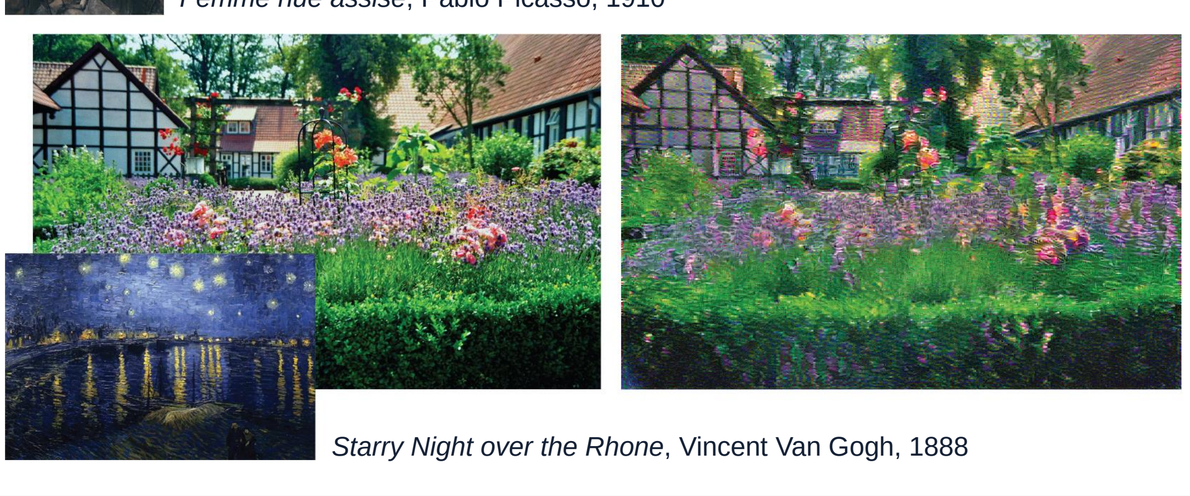
The Starry Night, Vincent Van Gogh, 1889

Femme nue assise, Pablo Picasso, 1910

Color Preservation

Style image is transformed to match the color histogram of the content image.

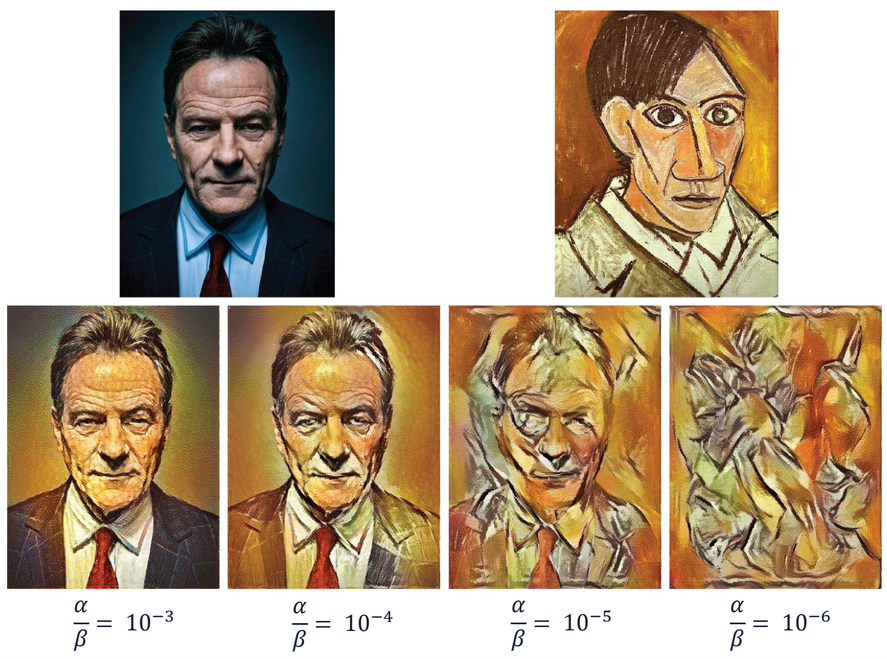
Femme nue assise, Pablo Picasso, 1910



Starry Night over the Rhone, Vincent Van Gogh, 1888

Content vs Style

$$\mathcal{L}_{total} = \alpha \mathcal{L}_{content} + \beta \mathcal{L}_{style}$$



References

1. Gatys, Leon A., Alexander S. Ecker, and Matthias Bethge. "Image style transfer using convolutional neural networks." *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2016.
2. Gatys, Leon A., et al. "Preserving color in neural artistic style transfer." *arXiv preprint arXiv:1606.05897* (2016).
3. GitHub repository: https://github.com/ckmarkoh/neuralart_tensorflow
4. GitHub repository: https://github.com/leongatys/PytorchNeuralStyleTransfer
5. GitHub repository: https://github.com/jcjohnson/neural-style

Acknowledgements

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GitHub Student Developer Pack