Art Style Transfer Using Neural Networks

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Virtual Vehicle Research GmbH

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Motivation

- Combine two images
- Generate new content image with given style

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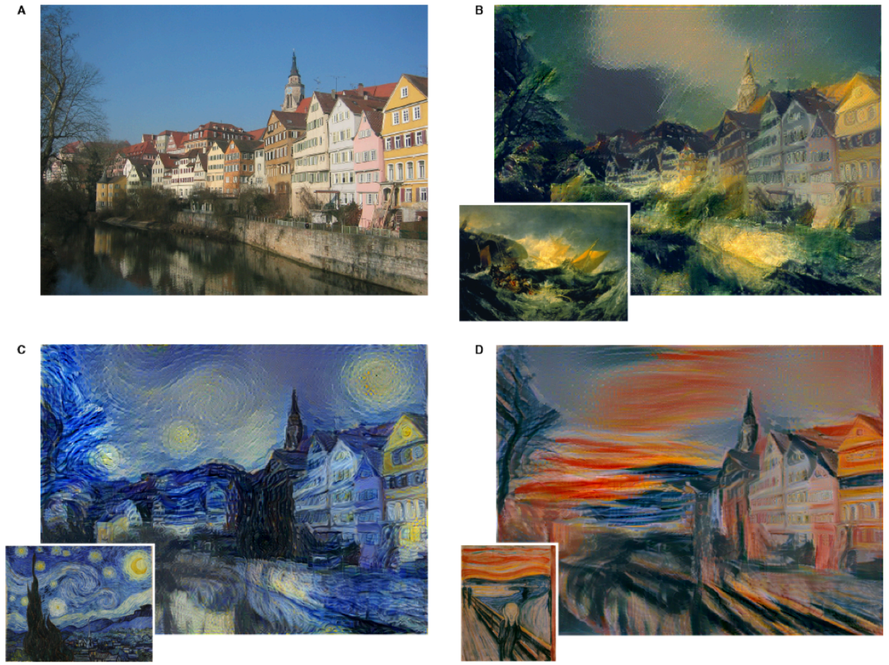
https://github.com/gargimahale/Doodle

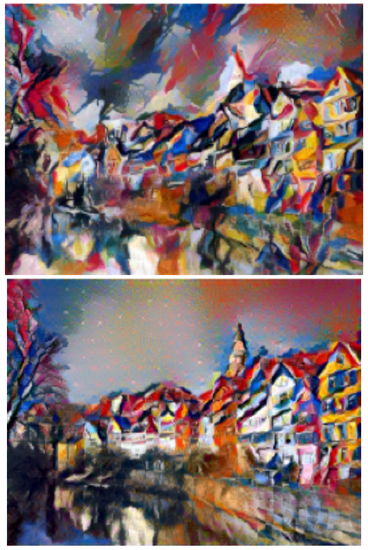
Theory



Gatys, Leon, et al. “A Neural Algorithm of Artistic Style.” Journal of Vision, vol. 16, no. 12, Sept. 2016, p. 326. Crossref: https://doi.org/10.1167/16.12.326.

$$\mathcal{L}_{total}(\vec{p}, \vec{a}, \vec{x}) = \alpha\mathcal{L}_{content}(\vec{p}, \vec{x}) + \beta\mathcal{L}_{style}(\vec{a}, \vec{x})$$

- Images
- Weights



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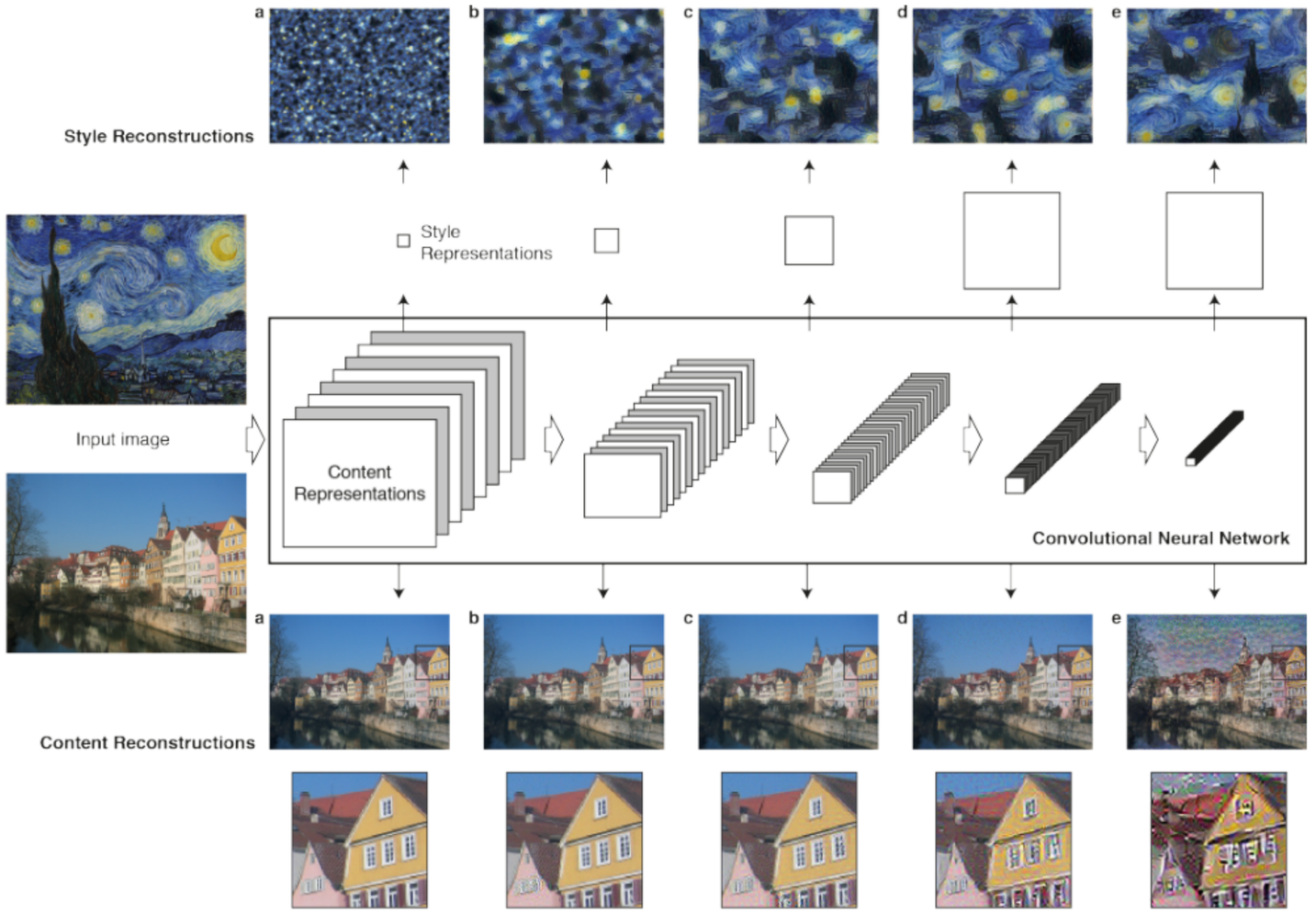
100 *

10.000 *

+ 1 *

CNN processing



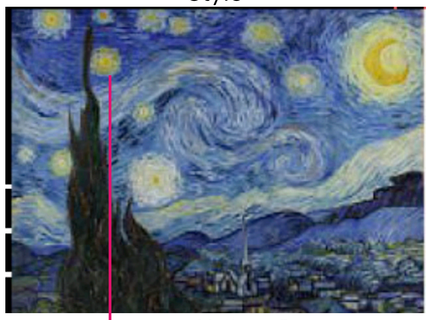
Style Loss

VGG19 Pre-Trained Model

Style Image

512x512

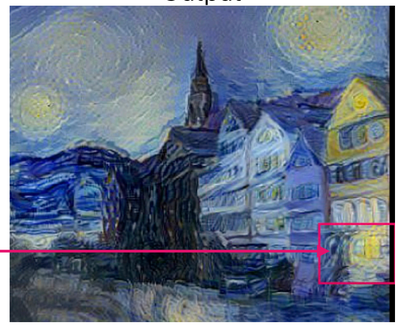
Style



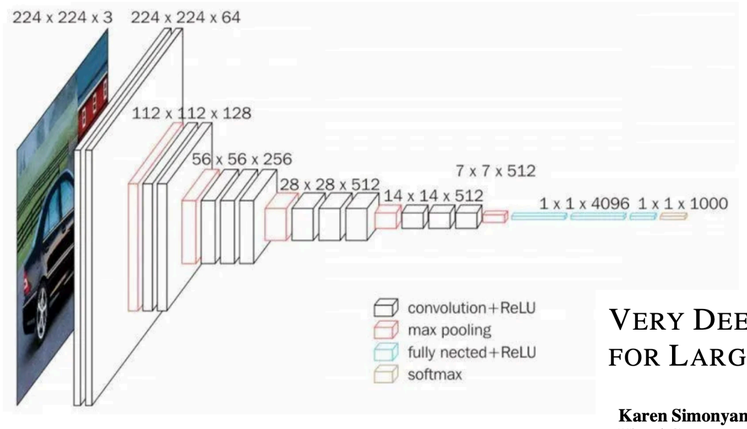
Yellow Start

Correlation with

Output



yellow House Light



VERY DEEP CONVOLUTIONAL NETWORKS FOR LARGE-SCALE IMAGE RECOGNITION

Karen Simonyan* & Andrew Zisserman+
Visual Geometry Group, Department of Engineering Science, University of Oxford
{karen,az}@robots.ox.ac.uk

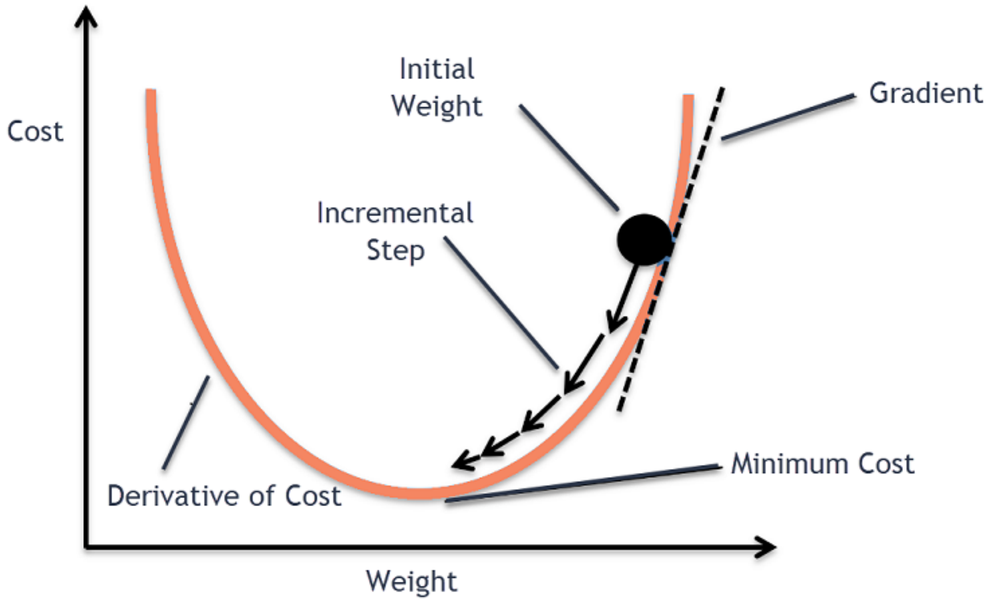
Feature maps (Curves, Edges,..)

Gram matrix Correlations

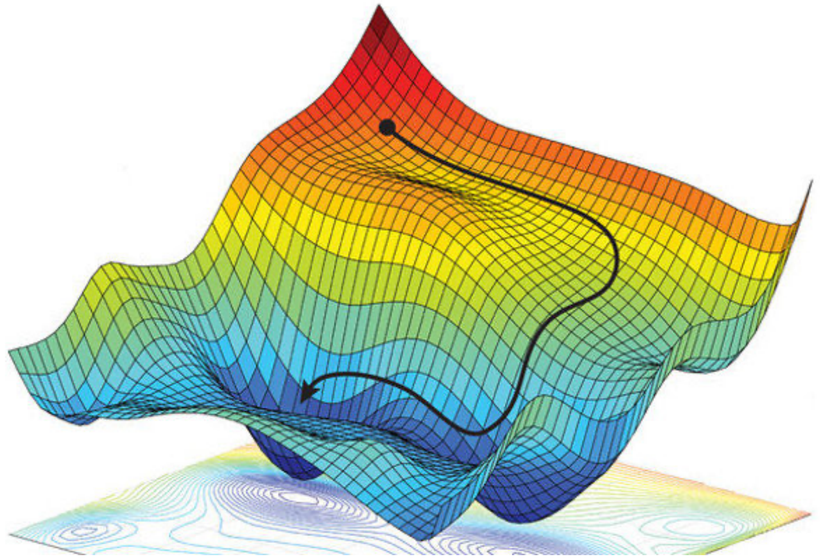
Important Texture of Style Image

Gradient Descent

- Search for best combination of weights in a CNN



https://editor.analyticsvidhya.com/uploads/631731_P7z2BKhdOR-9uyn9ThDasA.png



https://www.researchgate.net/publication/325142728/figure/fig1/AS:766109435326465@1559666131320/Non-convex-optimization-We-utilize-stochastic-gradient-descent-to-find-a-local-optimum.jpg

Art Style Transfer

Main Steps

- Load Style & Content images
- Pass through VGG19 network to extract representations
- Define loss functions for Style & Content individually
- Initial image and iterate by minimizing loss function using gradient decent
- Stop when combination of Style & Content is sufficient

github.com/lauragregorc/ArtsyNN

Implementation & Tryout

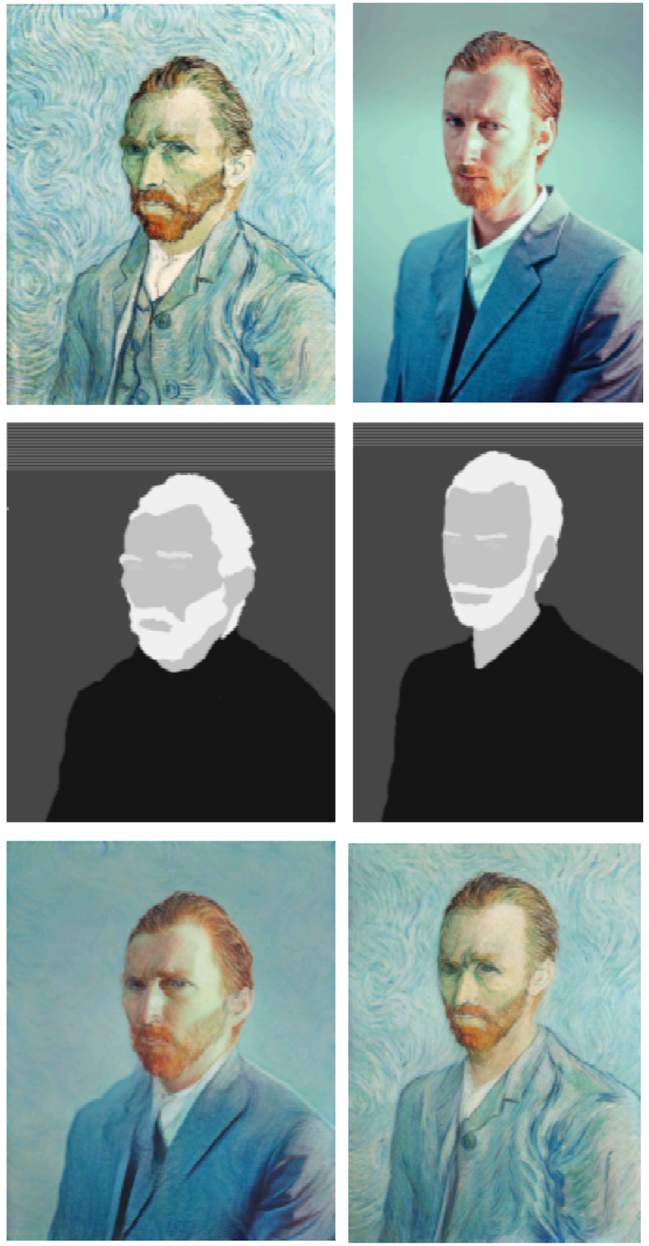
Advanced Method

Champandard, Alex J. "Semantic style transfer and turning two-bit doodles into fine artworks." *arXiv preprint arXiv:1603.01768* (2016).

- Add semantic map of images
- Classes of Areas
- Better understanding of different areas in a image

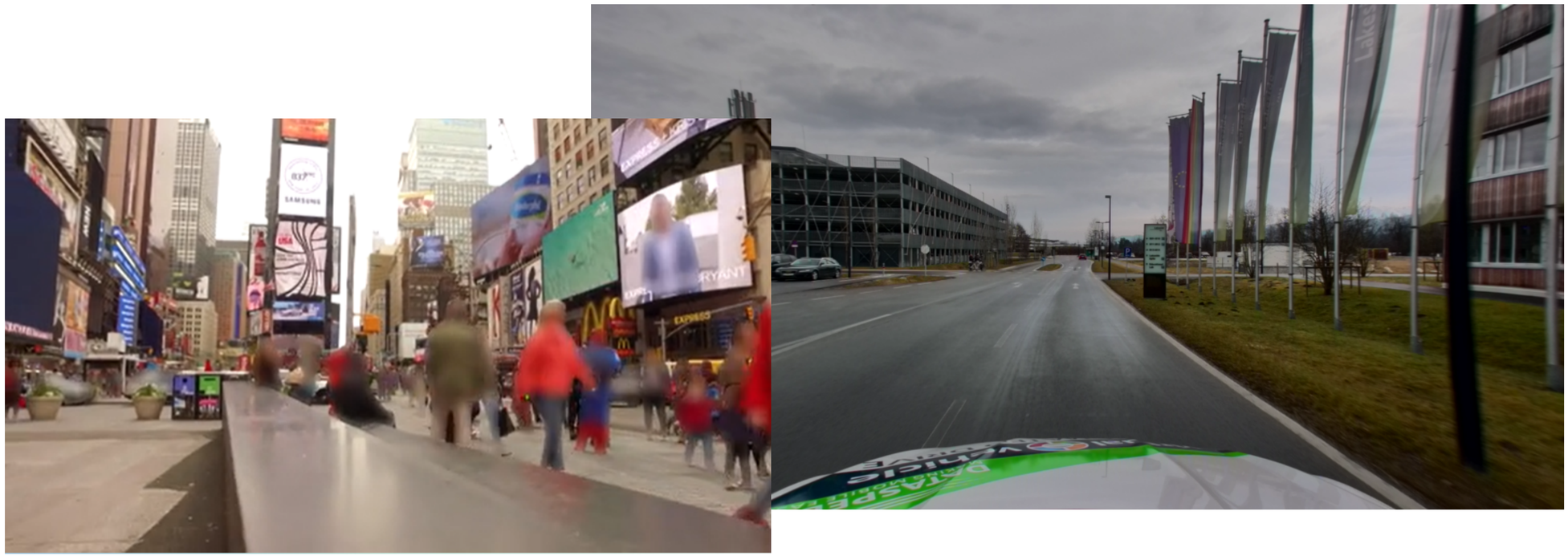
Example in git repository or

https://github.com/alexjc/neural-doodle



Usage in Projects

- Anonymization of people when using autonomous vehicles
- Generate synthetic test/training data for ai models



https://www.celantur.com/

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