

Neural Style Transfer using CNN

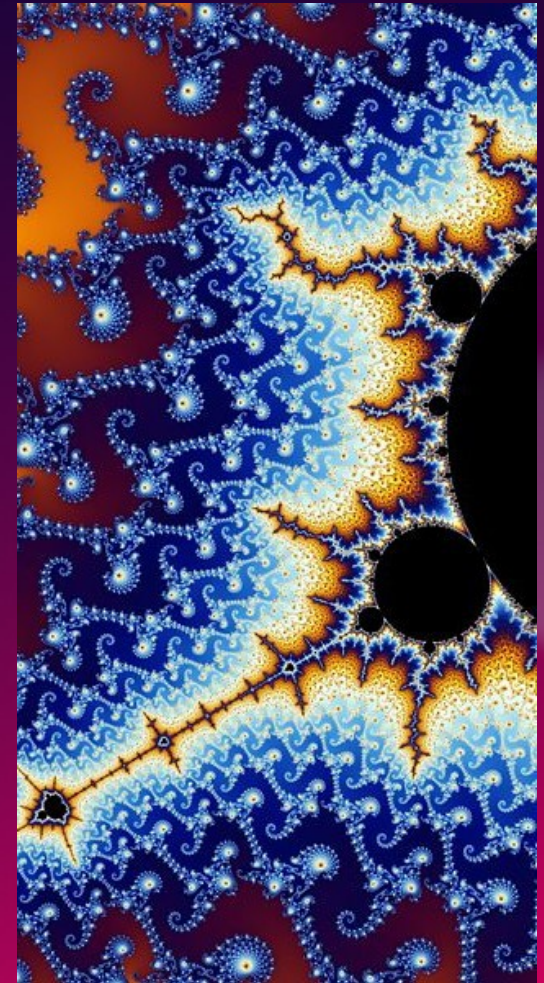
Image reconstruction

www.deepart.io

www.deepdreamgenerator.com

Development of creative AI

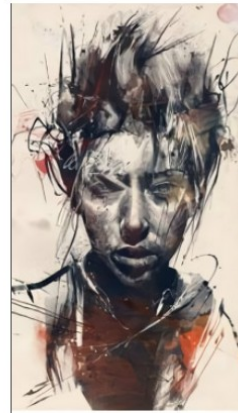
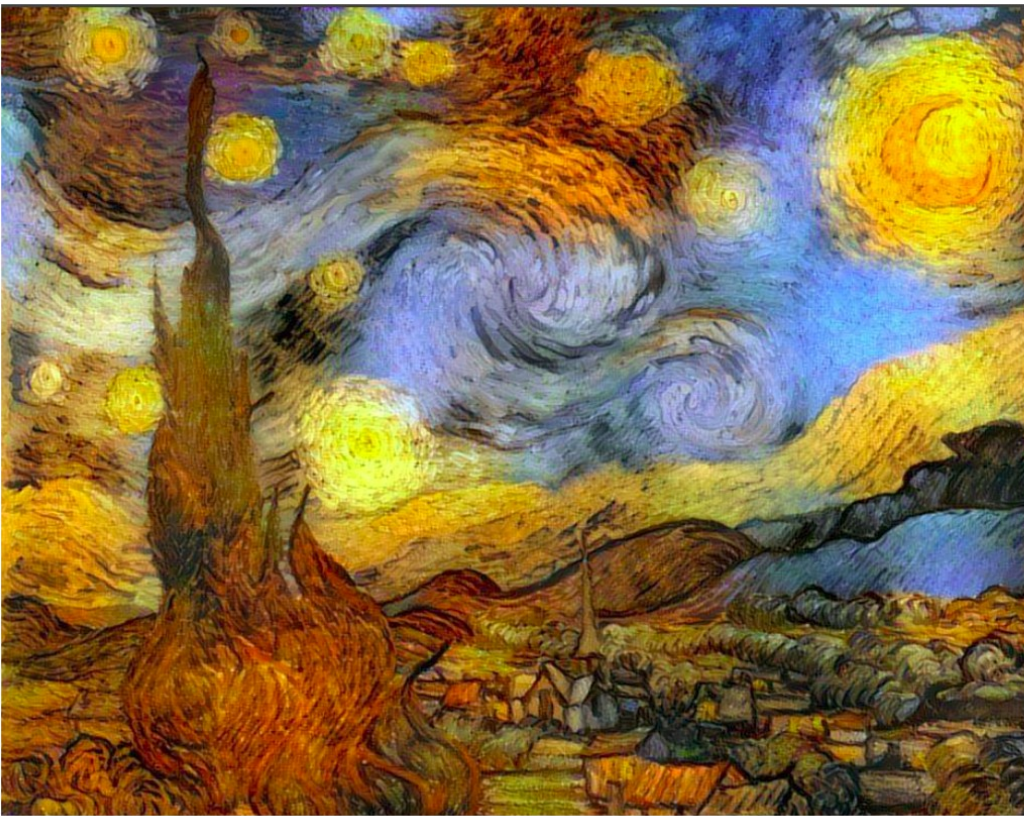
- 1952: Ben Laposky, 'Oscillons' oscilloscope
- 1965: Frieder Nake, Hommage à Paul Klee
- 1970: Univ. of London, Exp.Com.Dep.
- 1978: Fractals, eg. Mandelbrot
- 1980: James Faure Walker, 'Dark Filament'
- 1985: Digital Artwork, Andy Warhol
- 1992: First New York Digital Salon
- 1998: Digital Art Museum, Wolfgang Lieser
- 2003: Launch of second life
- 2008: TV Art for the Digital Generation
- 2008: Synthetic organisms
- 2018: AI artwork sells for \$432,500, Christie's



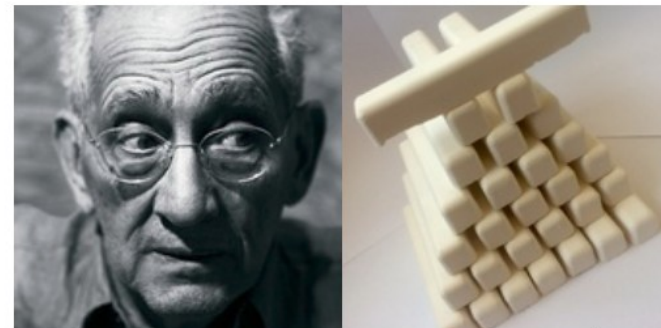
Neural Style Transfer (NST)

Neural style transfer is an optimization technique used to take two images—a content image and a style reference image (such as an artwork by a famous painter)—and blend them together so the output image looks like the content image, but “painted” in the style of the style reference image.

Examples from www.deepdreamgenerator.com



Examples from www.deepart.io



Art movement and styles

- Surrealism
- Impressionism
- Cubism
- Pop Art
- Naturalism
- Abstract
- Dada/Dadaism
- Expressionism
- Minimalism
- Classicism



www.artyfactory.com

- Faces
- Cars
- Houses
- Dogs
- Cats
- Chairs
- Tables
- Books
- Plants

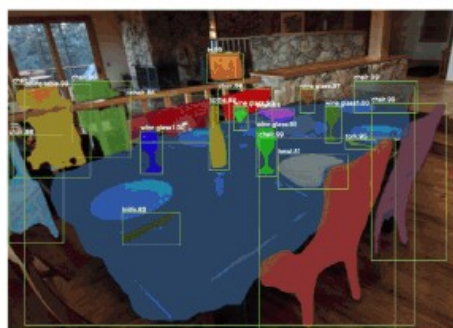
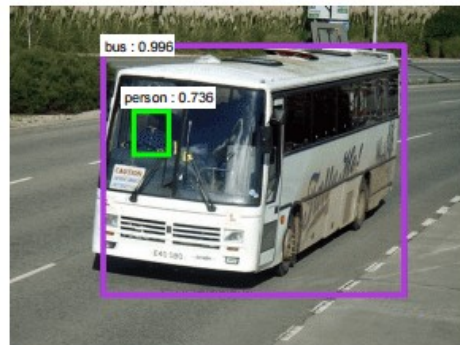
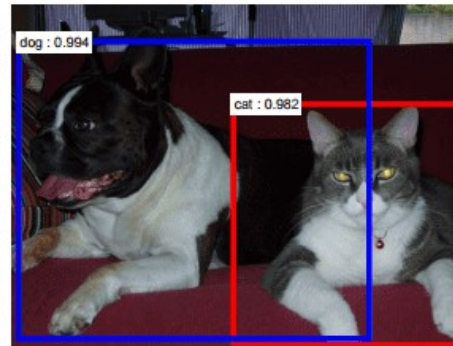
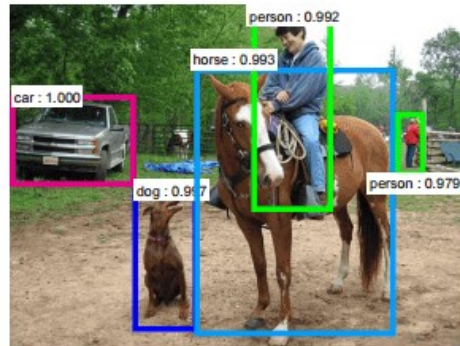
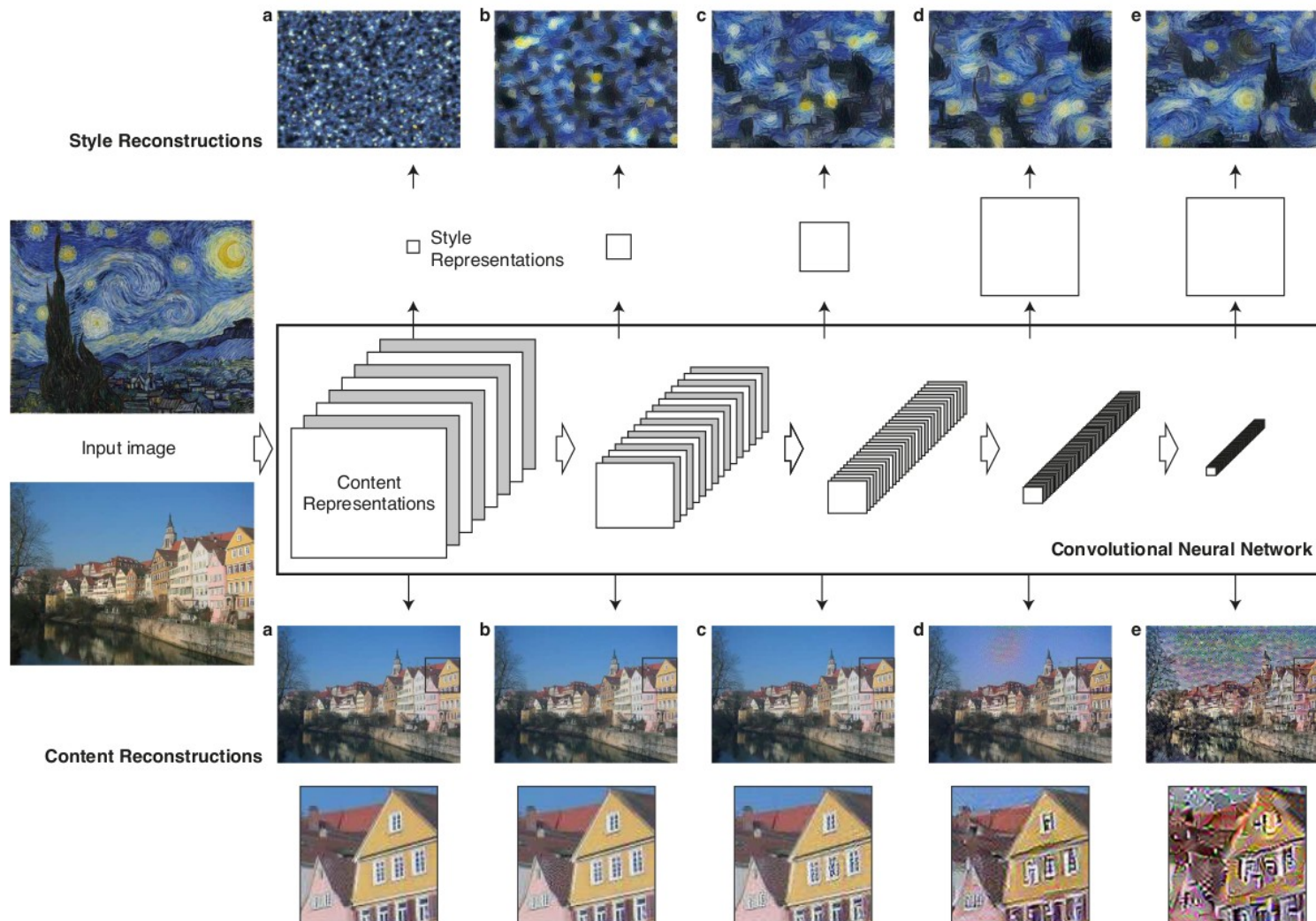
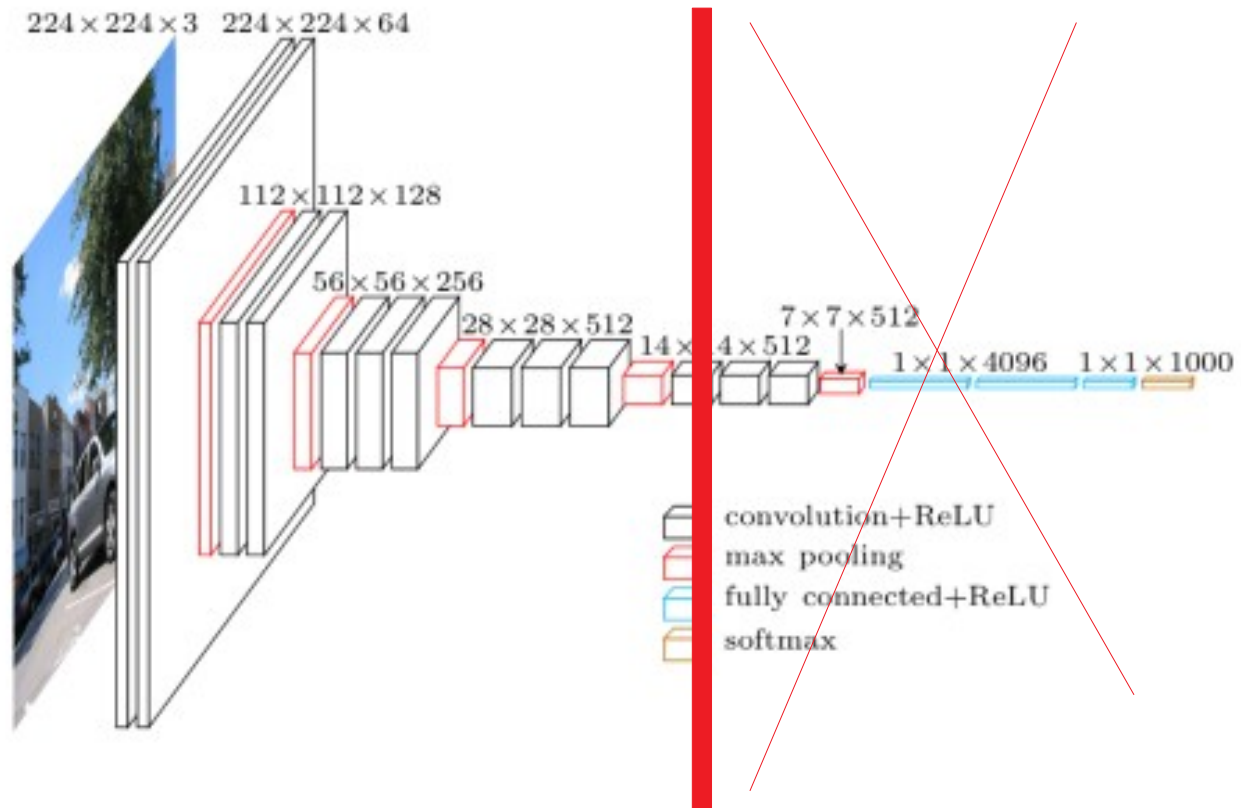


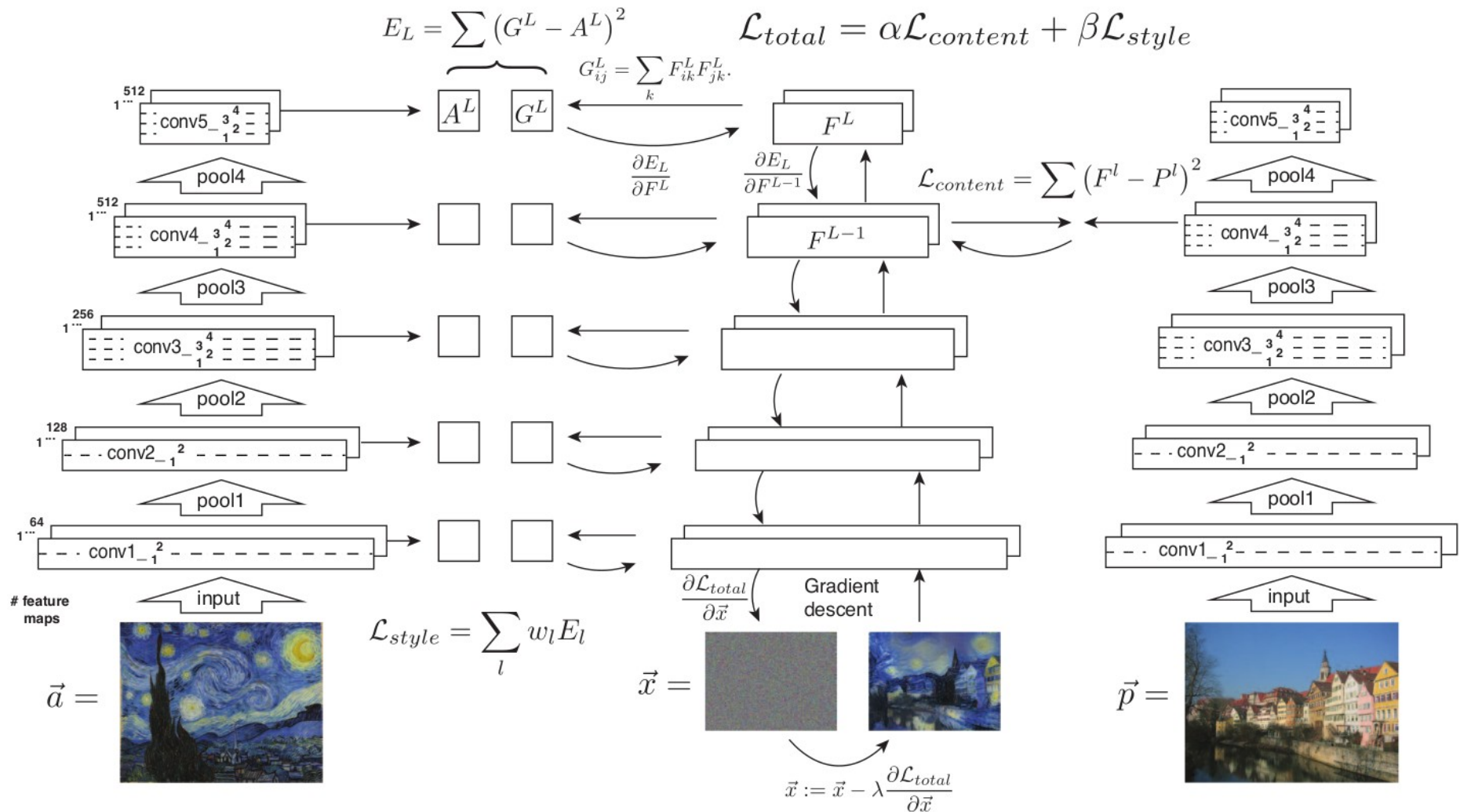
Image representation in a CNN



VGG19



Style transfer algorithm



Gram Matrix

Where the (i,j) th element of the style matrix is computed by computing the element wise multiplication of the i th and j th feature maps and summing across both width and height. In the figure, red cross denotes element wise multiplication and the red plus sign denotes summing across both width height of the feature maps.

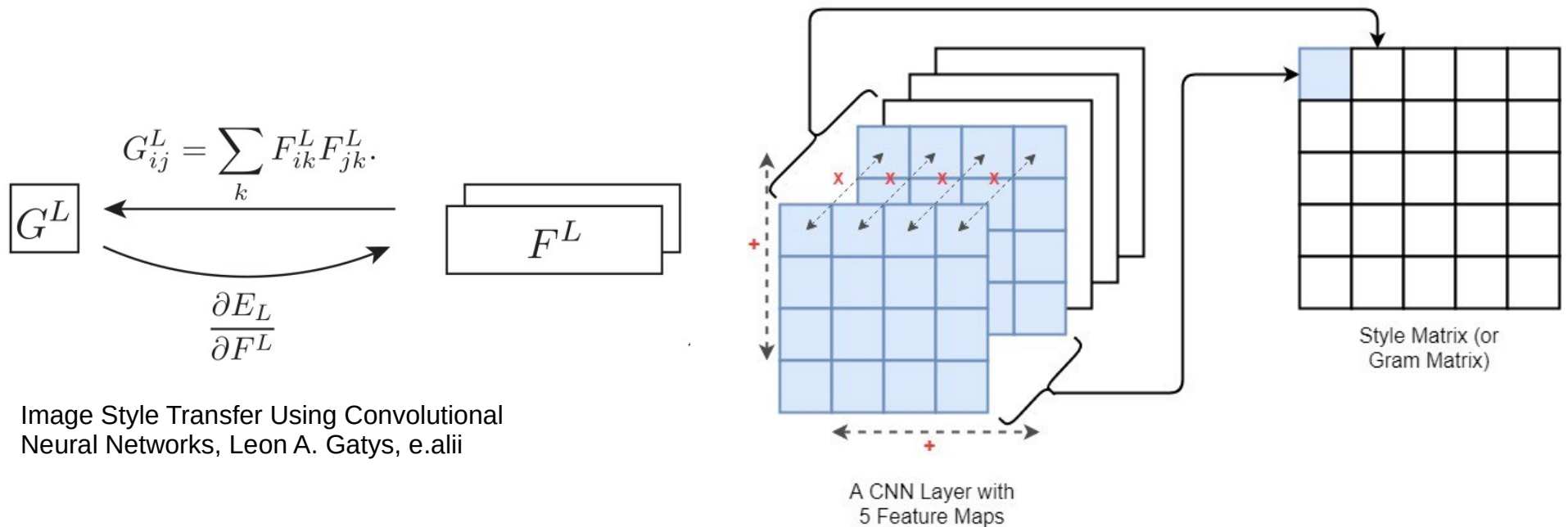


Image Style Transfer Using Convolutional
Neural Networks, Leon A. Gatys, et al.

How the Style Matrix is Computed for a CNN Layer with 5 Feature Maps

Definition of a Loss function

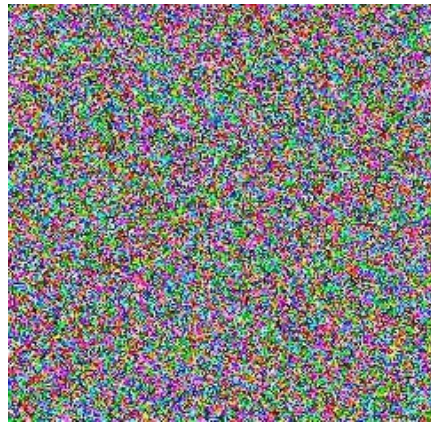
$$\mathcal{L}_{total} = \alpha \mathcal{L}_{content} + \beta \mathcal{L}_{style}$$

$$\mathcal{L}_{content} = \sum (F^l - P^l)^2$$

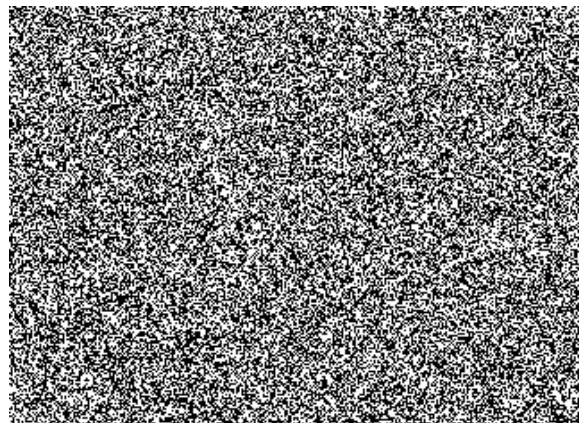
$$\mathcal{L}_{style} = \sum_l w_l E_l$$

$$\vec{x} := \vec{x} - \lambda \frac{\partial \mathcal{L}_{total}}{\partial \vec{x}}$$

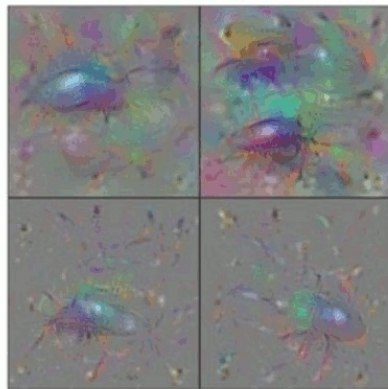
Image reconstruction from white noise of random color image



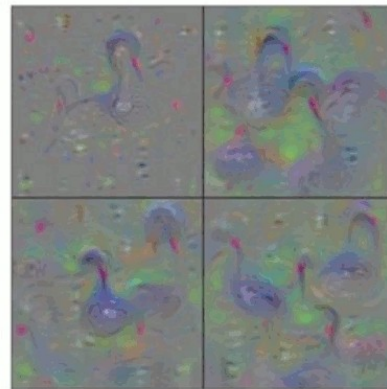
www.yosinski.com



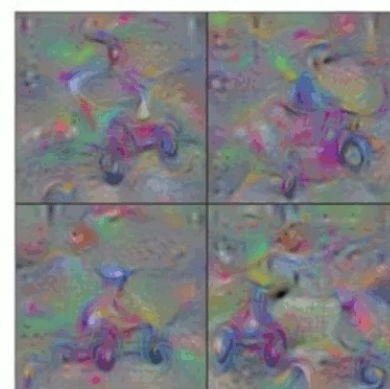
www.iceyboard.no-ip.org



Ground Beetle



Black Swan



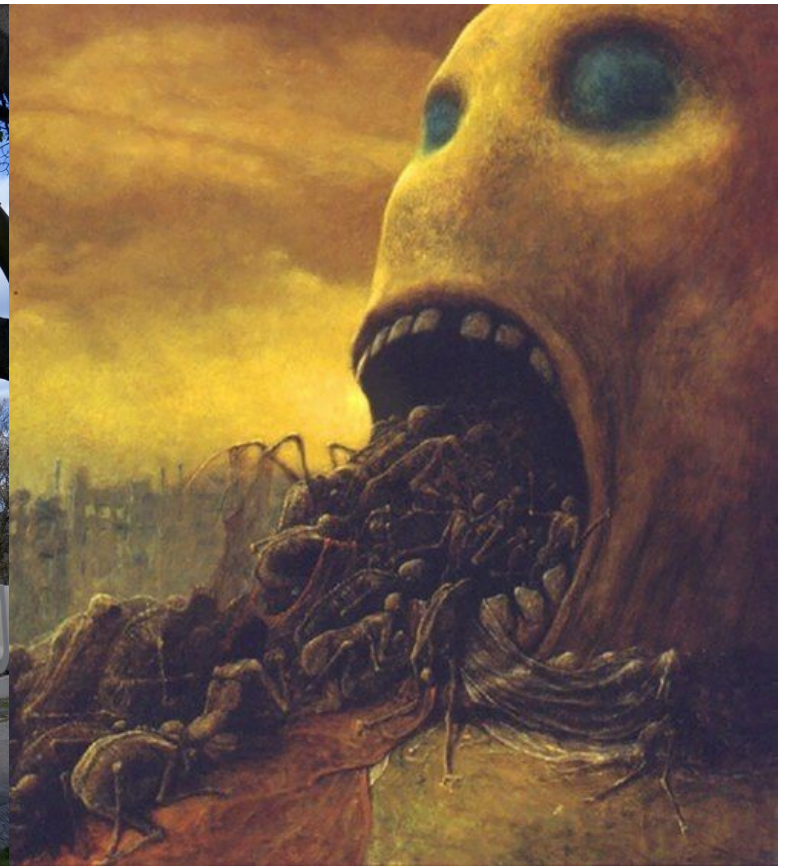
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www.yosinski.com

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www.berliner-woche.de



www.i.pinimg.com

The new Beuth



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