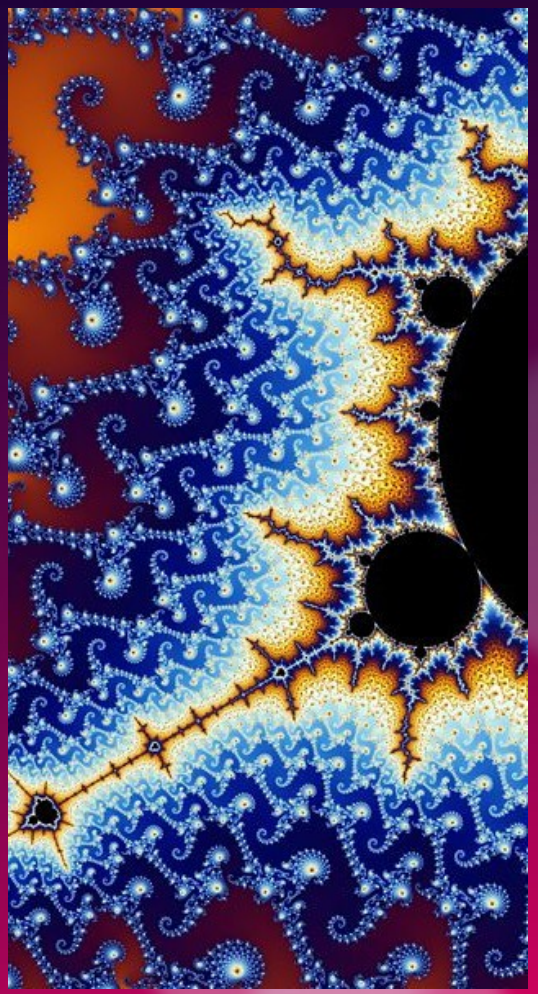
Neural Style Transfer using CNN

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

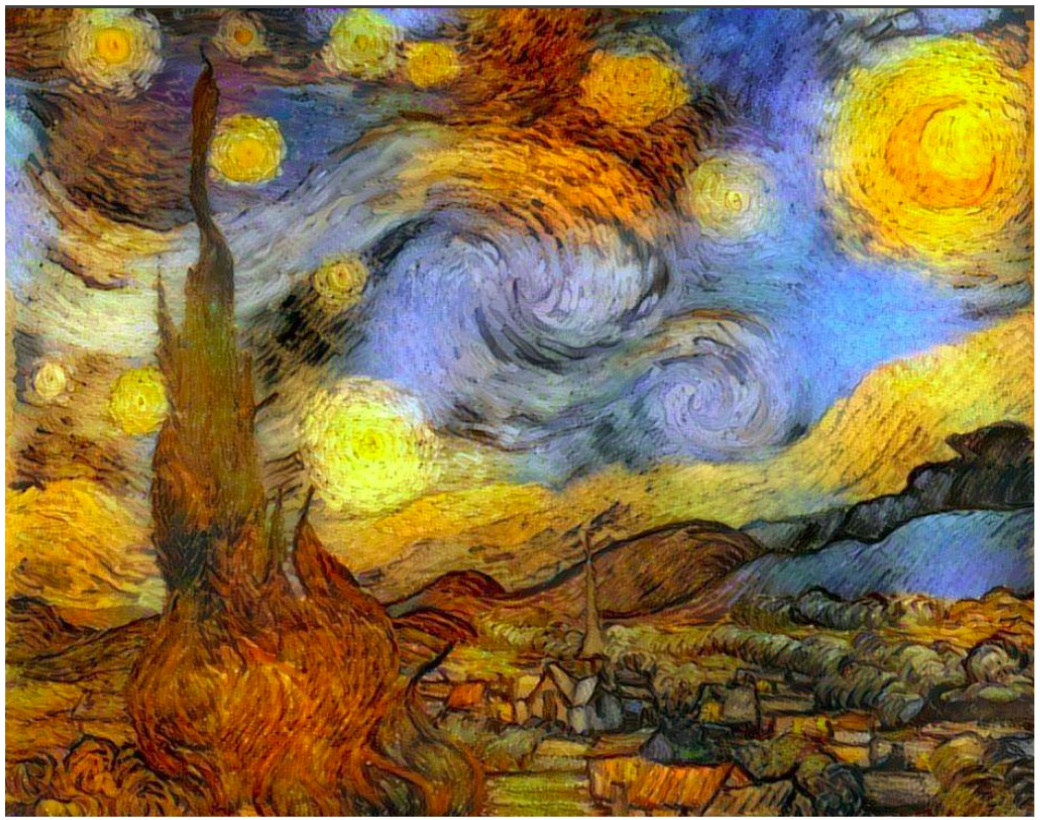


www.wikieducator.org

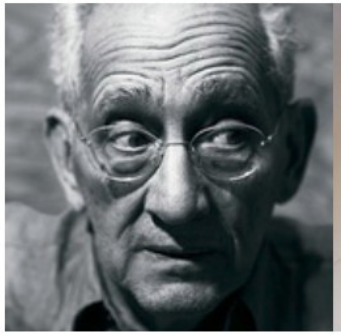
Neural Style Transfer (NST)

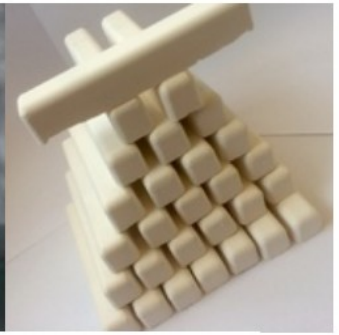
- Neural style transfer is an optimization technique used to take two images—a content image and a style reference image (such as an artwork by a famous painter)—and blend them together so the output image looks like the content image, but “painted” in the style of the style reference image.

Examples from www.deepdreamgenerator.com



Examples from www.deepart.io





Art movement and styles

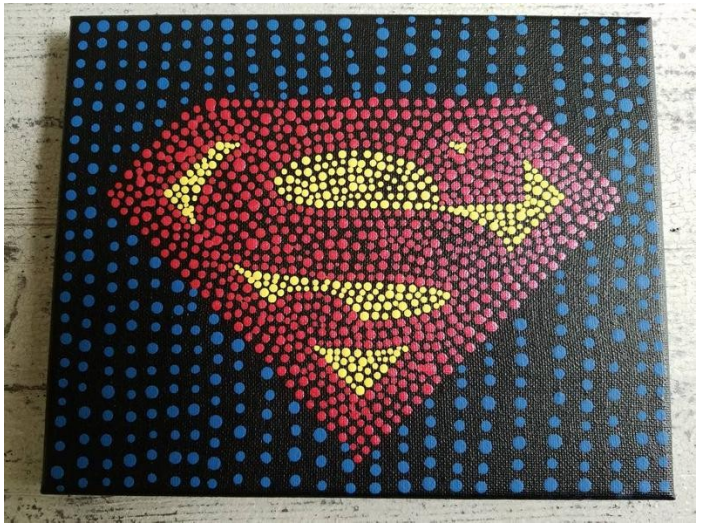
- Surrealism
- Impressionism
- Cubism
- Pop Art
- Naturalism
- Abstract
- Dada/Dadaism
- Expressionism
- Minimalism
- Classicism

www.artyfactory.com

Materials and Technics

Materials:

- Oil pastels.
- Watercolors.
- White colored pencil
- Pointillism with acrylics.
- Drawing with pencils.
- Colored pencils.



www.etsy.com

Technics:

- Underpainting
- Blocking in
- Buliding up texture
- Dry brushing
- Glazing
- Scraper

www.webartacademy.com

Content

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

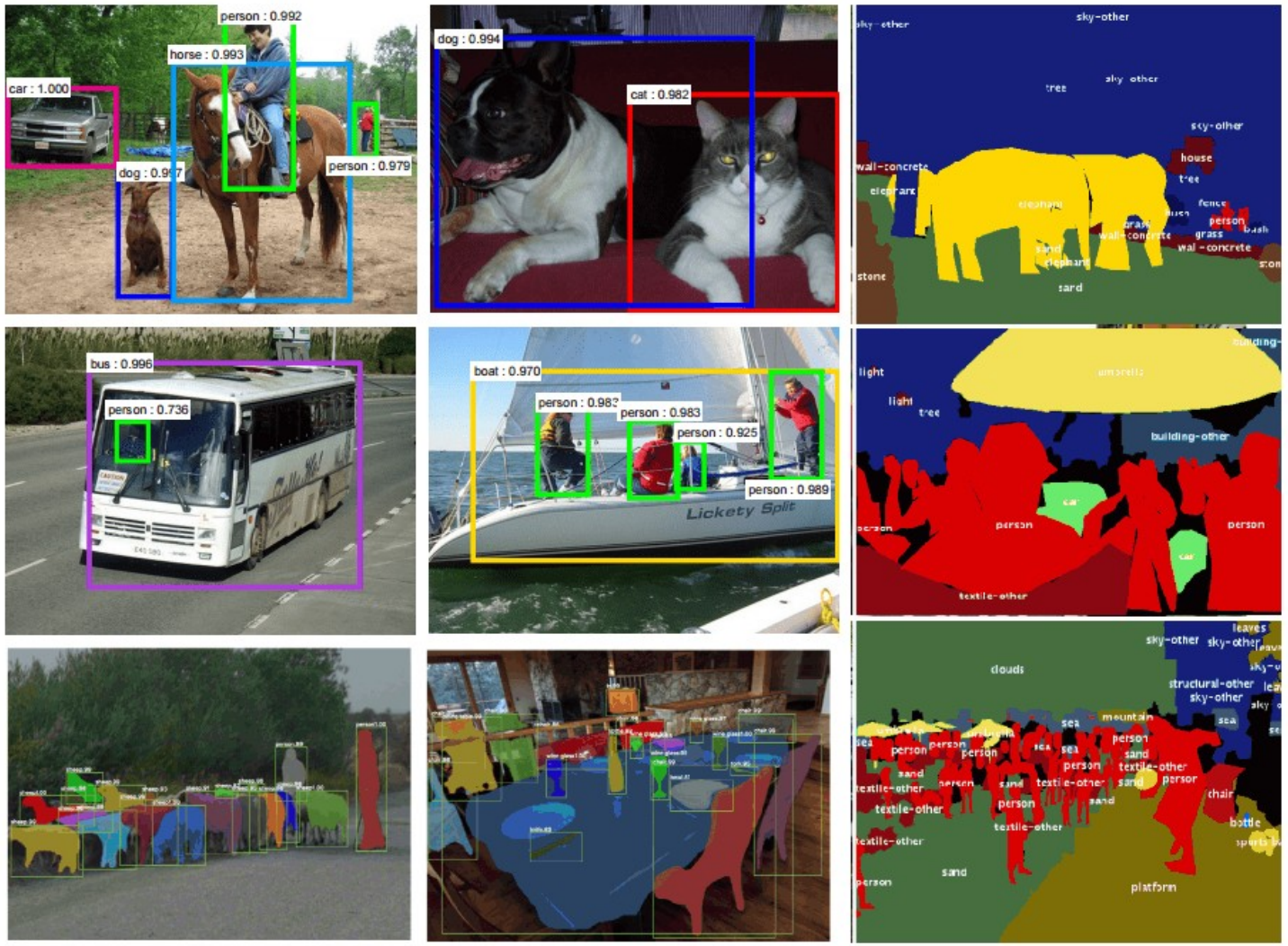


Image representation in a CNN

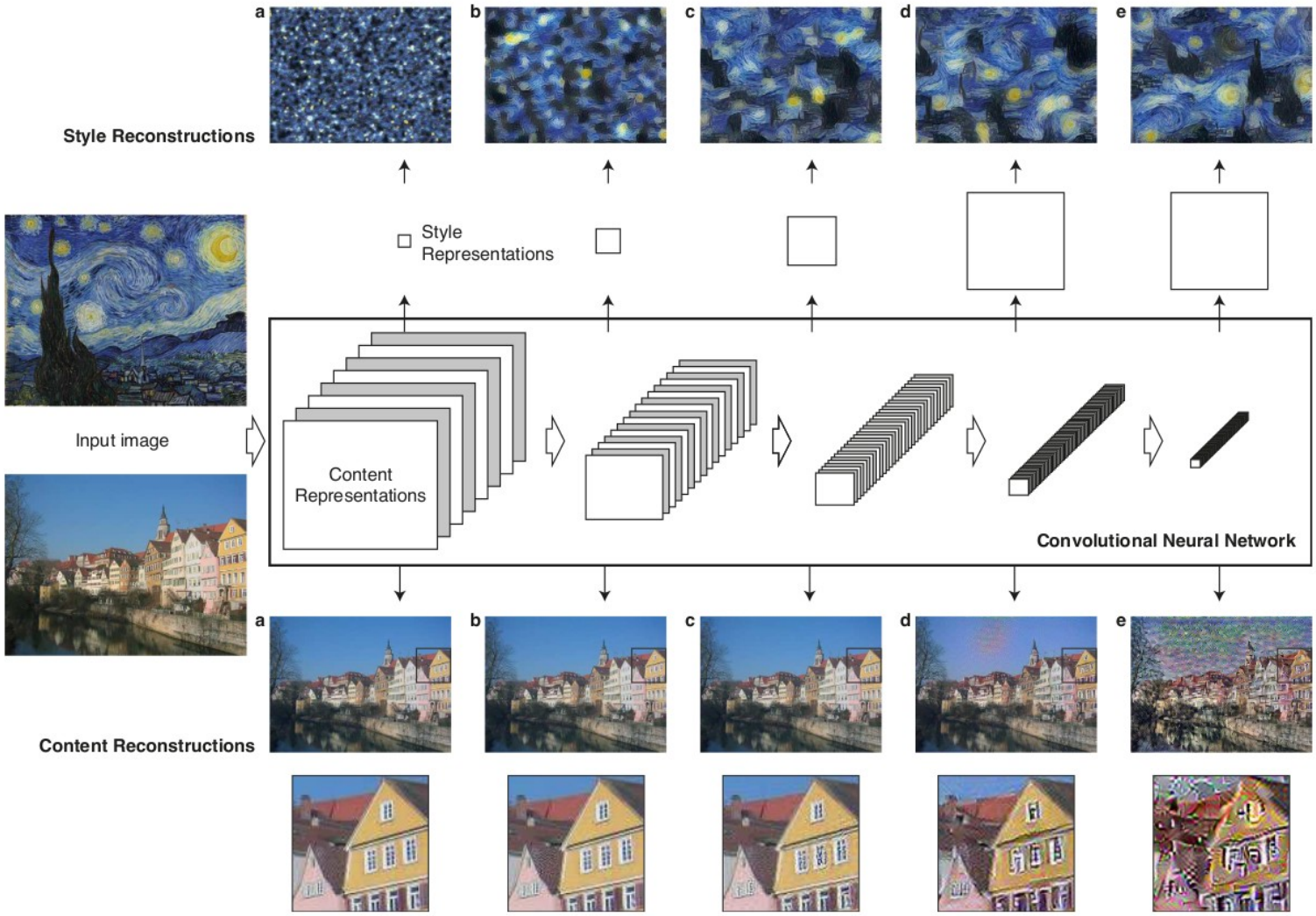
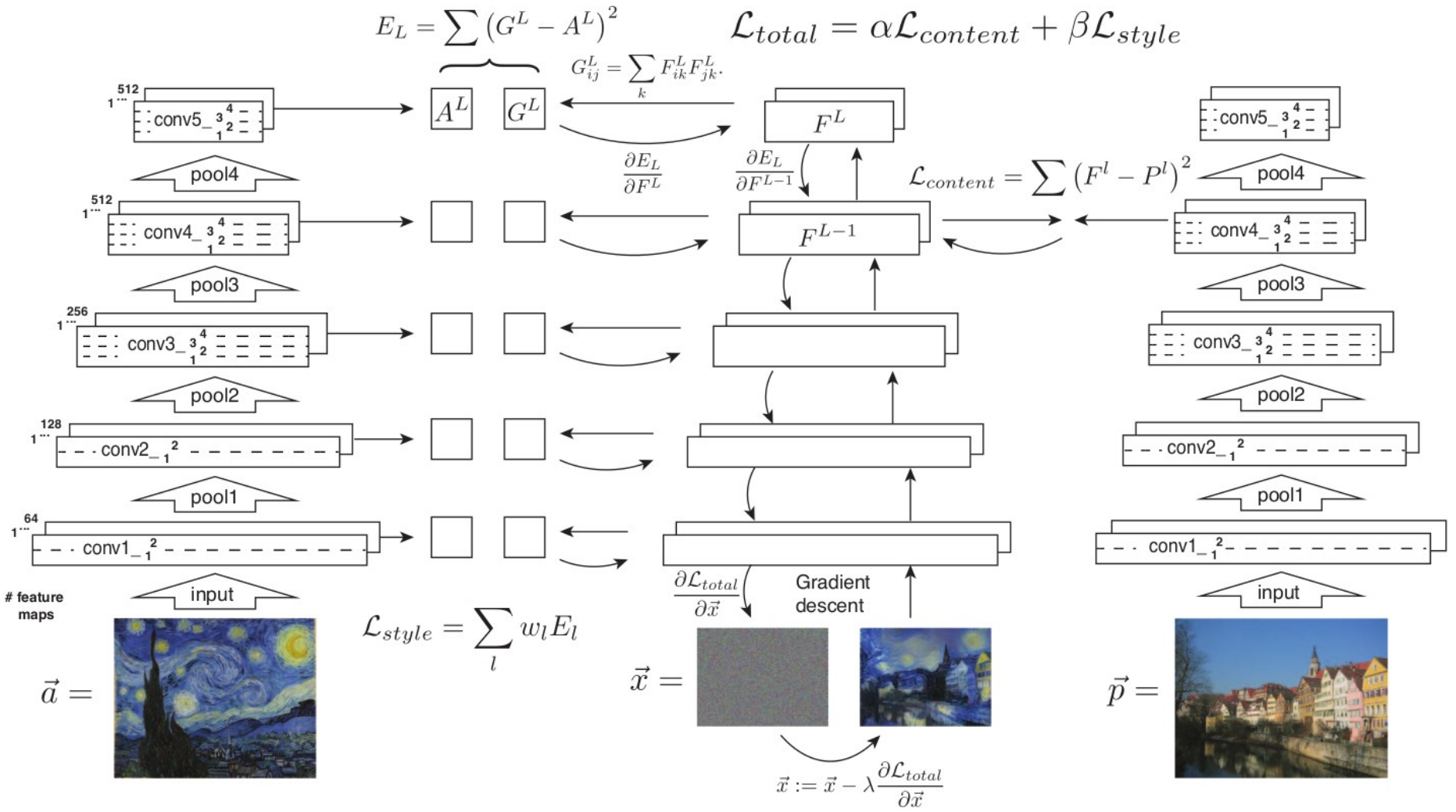


Image Style Transfer Using Convolutional Neural Networks, Leon A. Gatys, e.alii

Style transfer algorithm



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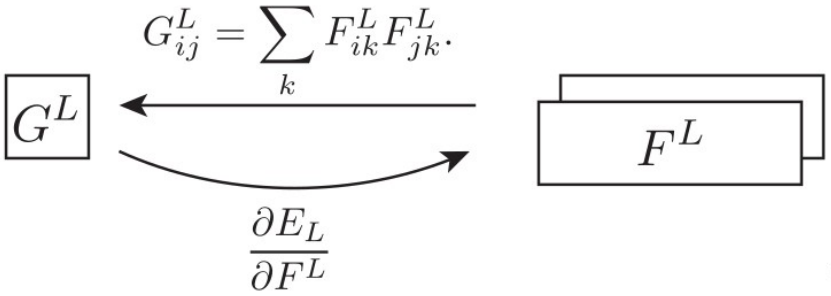
Gram Matrix

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.



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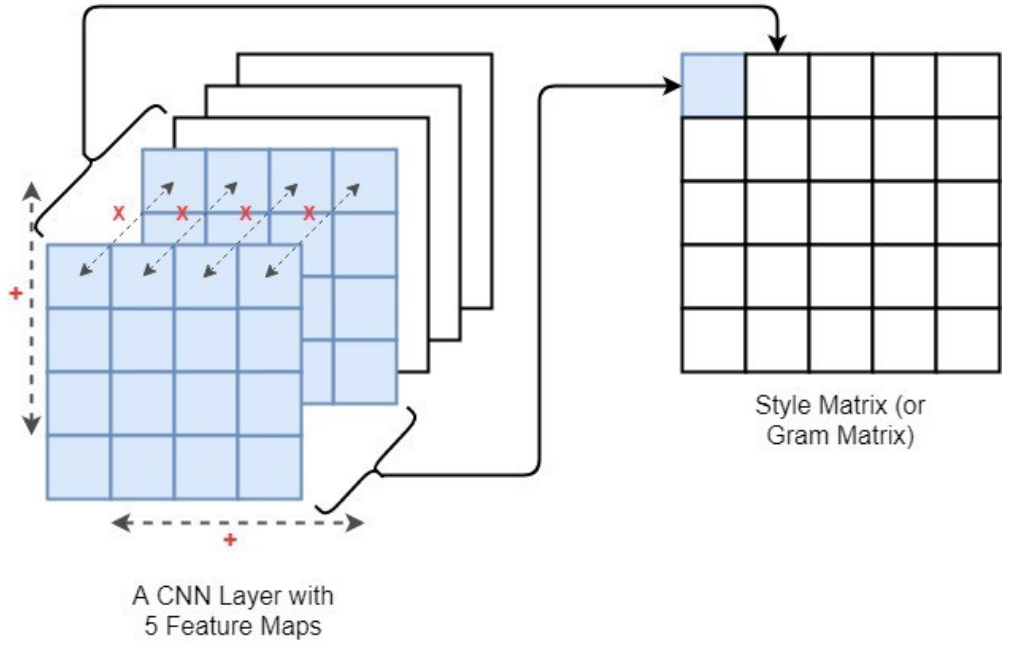


How the Style Matrix is Computed for a CNN Layer with 5 Feature Maps

Definition of a Loss function

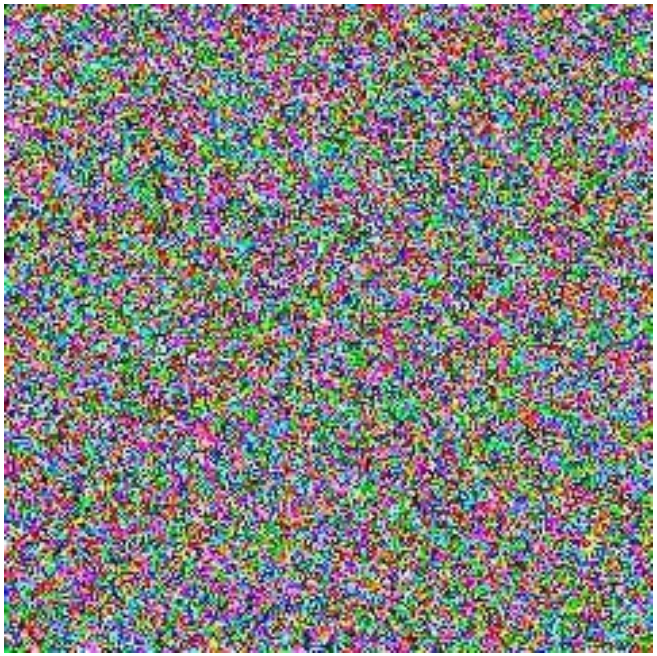
$$\mathcal{L}_{total} = \alpha \mathcal{L}_{content} + \beta \mathcal{L}_{style}$$

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

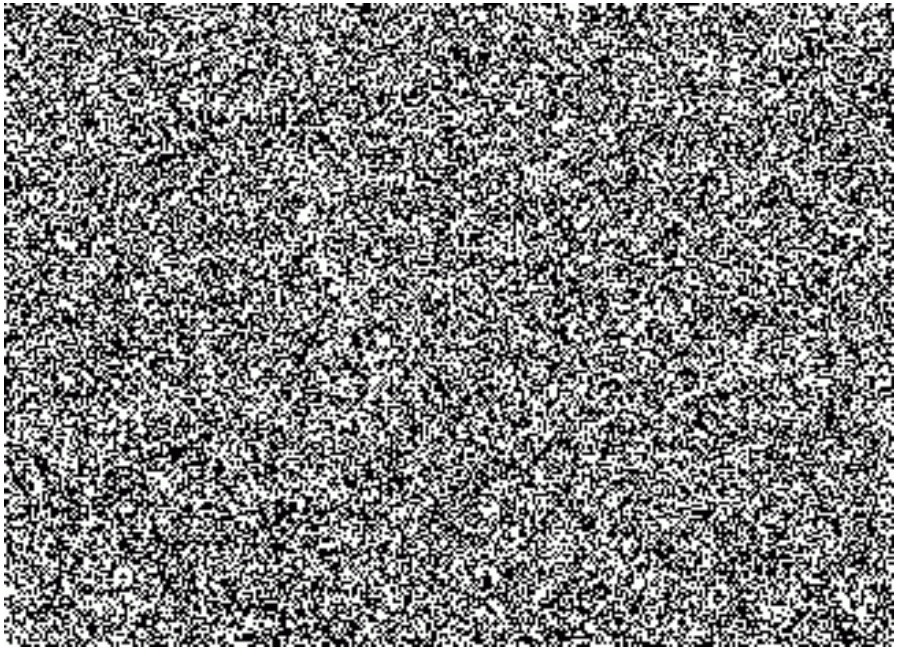
$$\mathcal{L}_{style} = \sum_l w_l E_l$$

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

Image reconstruction from white noise of random color image

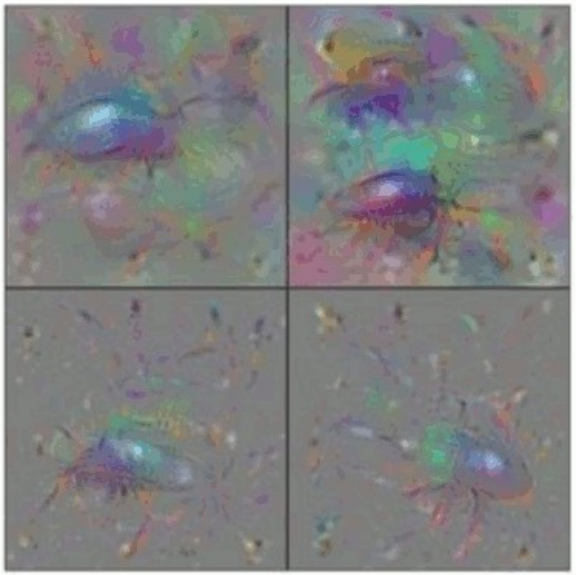


www.yosinski.com

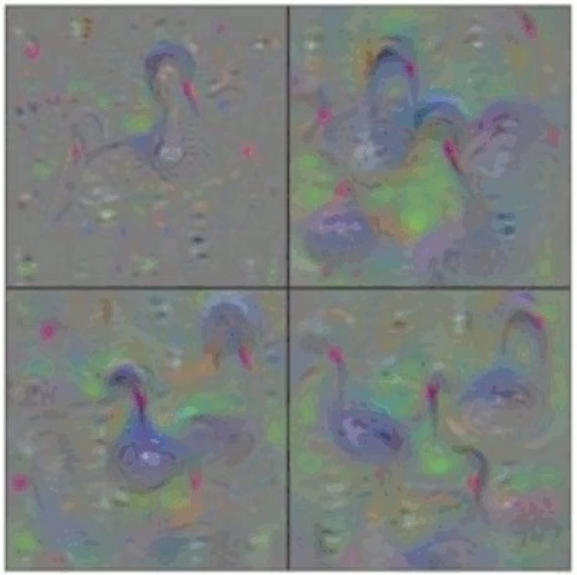


www.iceyboard.no-ip.org

Image reconstruction of deep layers



Ground Beetle



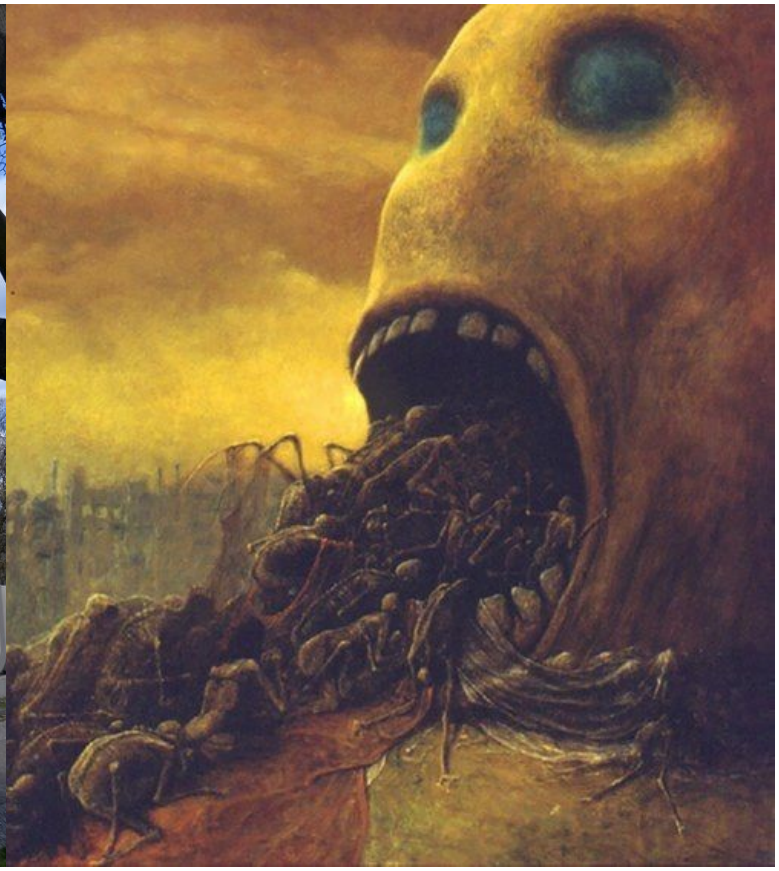
Black Swan

Tricycle

www.yosinski.com

Thank you for your attention

www.berliner-woche.de



www.i.pinimg.com

The new Beuth

www.deepart-io