第十二讲 可视化和理解神经网络

2019年5月24日　　10:07

1.DeepDream and Style Transfer

1.1DeepDream

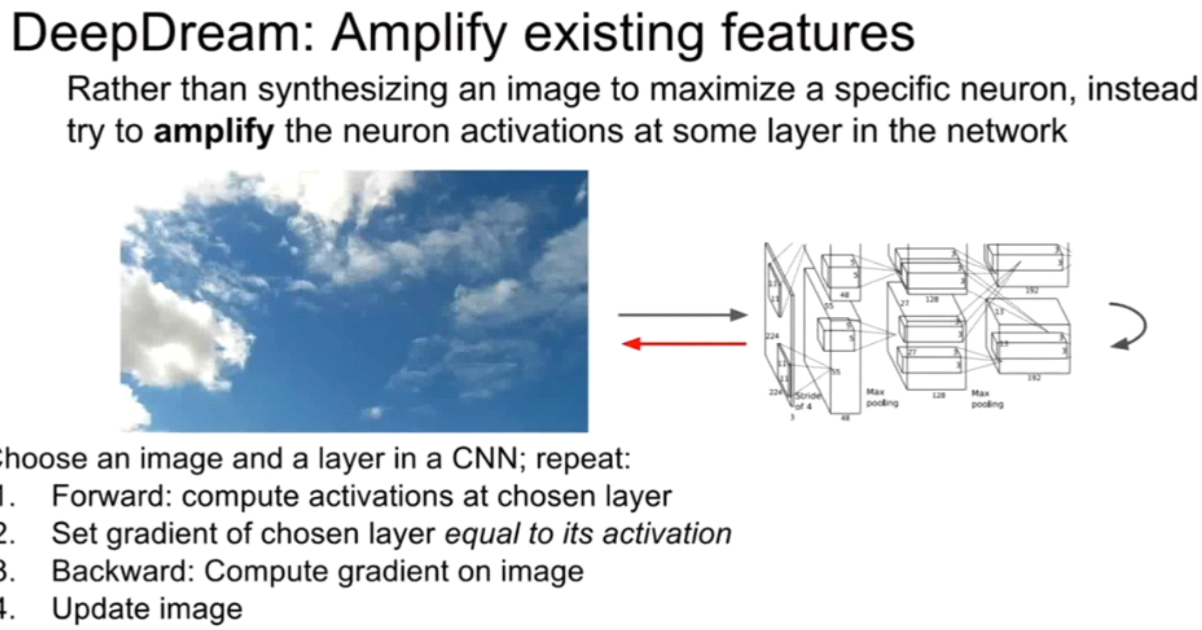
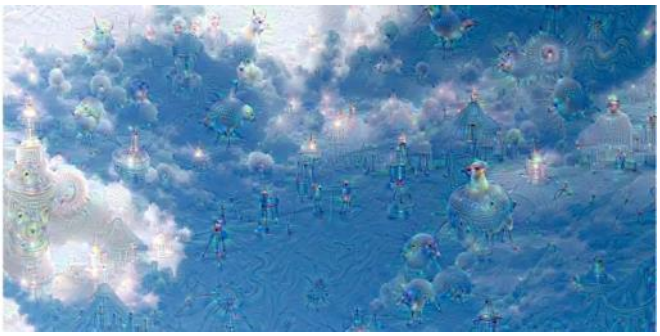


图12.1.1 DeepDream

将网络中一些层的梯度设置为它的激活函数所得到得值，反向传播，更新图片，这样试图从网络中发现网络所提取得图像特征是什么。

经过DeepDream的一些图片：

	
	从图中可以看到其实图中所融合的特征展示了训练集所提取的一些图像，如第一张图，原始数据集中有两百多张狗的图片，所以网络所提取的特征与新图融合时里面出现了很多狗的图片。

1.2Feature Inversion

Feature Inversion

Given a CNN feature vector for an image, find a new image that:

- Matches the given feature vector
- “looks natural” (image prior regularization)

$$\mathbf{x}^* = \underset{\mathbf{x}\in\mathbb{R}^{H\times W\times C}}{\operatorname{argmin}} \ell(\Phi(\mathbf{x}), \Phi_0) + \lambda\mathcal{R}(\mathbf{x})$$

Given feature vector

Features of new image

$$\ell(\Phi(\mathbf{x}), \Phi_0) = \|\Phi(\mathbf{x}) - \Phi_0\|^2$$

$$\mathcal{R}_{V^\beta}(\mathbf{x}) = \sum_{i,j}\left((x_{i,j+1} - x_{ij})^2 + (x_{i+1,j} - x_{ij})^2\right)^{\frac{\beta}{2}}$$

Total Variation regularizer
(encourages spatial smoothness)

Feature Inversion

Reconstructing from different layers of VGG-16

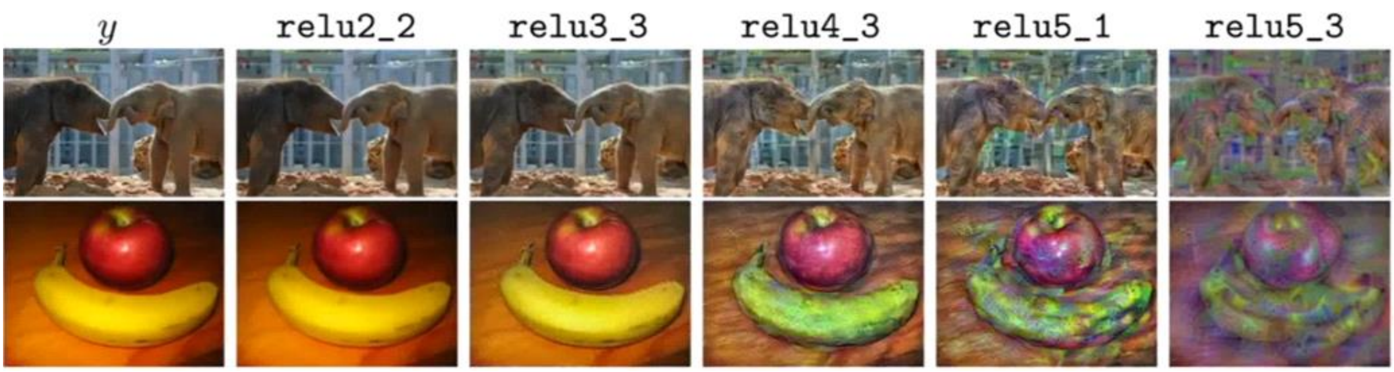
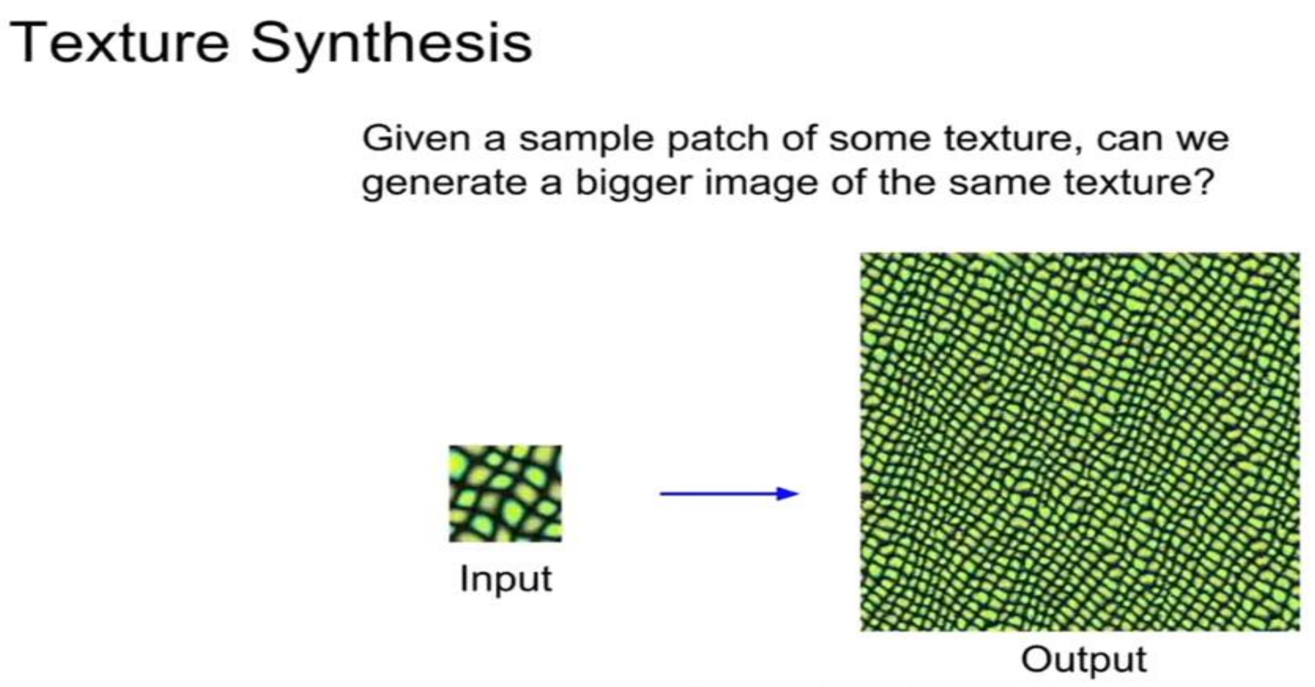
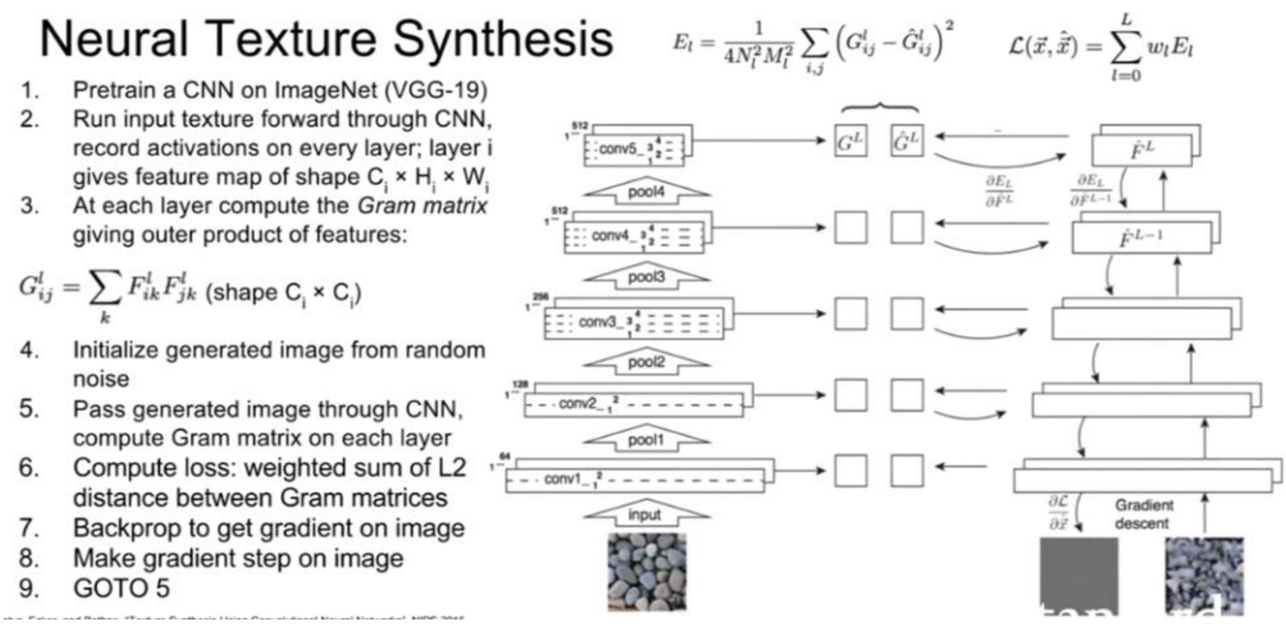


图12.1.2 从VGG16不同层重构的图像

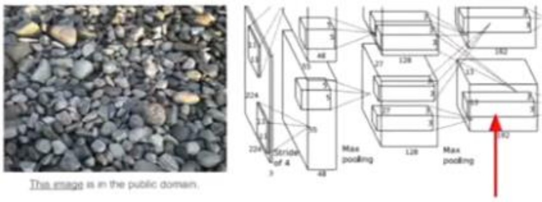
1.3Texture Synthesis

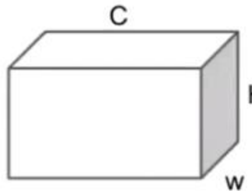


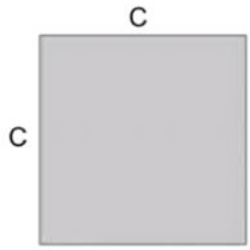
纹理合成常见的一种方法是最近邻截取，但是效果并不好，有人提出了另外一种纹理合成的方法如下 格拉姆矩阵：



Neural Texture Synthesis: Gram Matrix







Each layer of CNN gives C x H x W tensor of features; H x W grid of C-dimensional vectors

Outer product of two C-dimensional vectors gives C x C matrix measuring co-occurrence

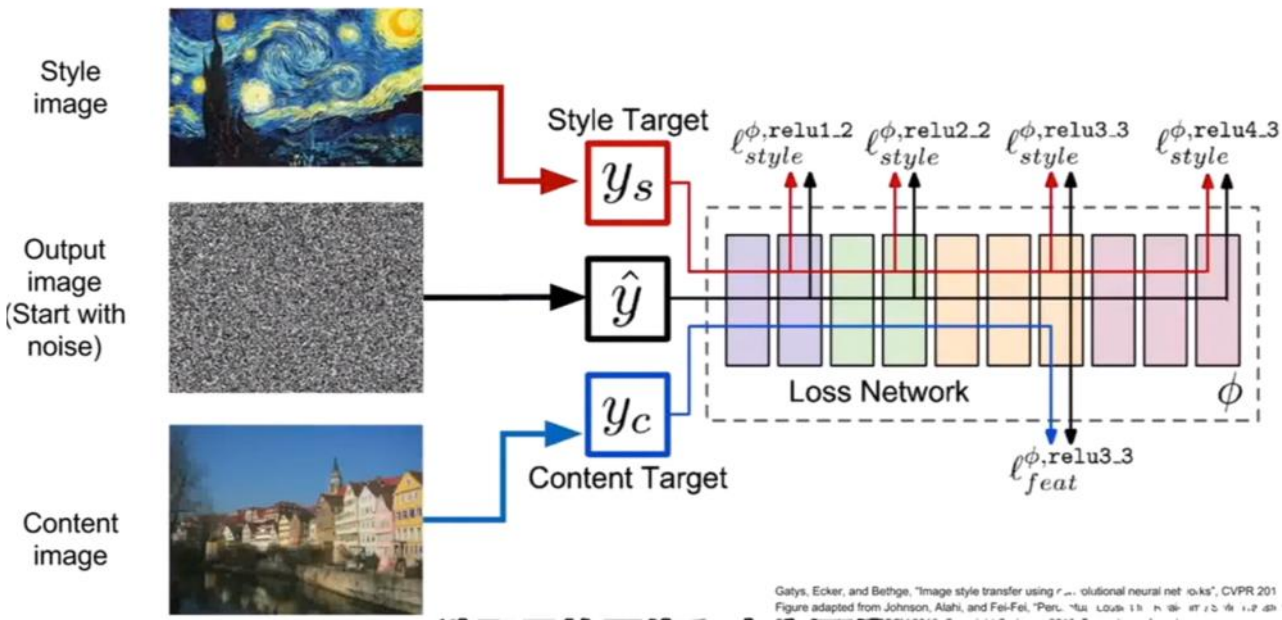
Average over all HW pairs of vectors, giving **Gram matrix** of shape C x C

Efficient to compute; reshape features from

C x H x W to =C x HW

then compute $G = FF^T$

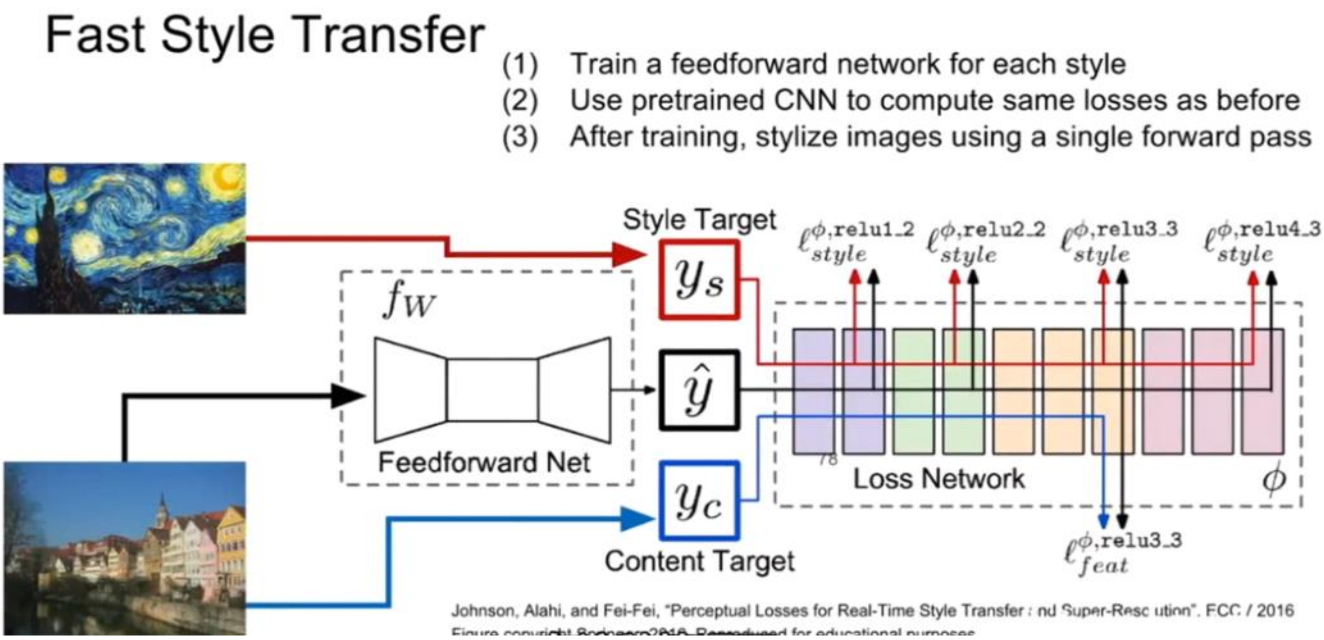
1.4 Style Transfer



Neural Style Transfer

Resizing style image before running style transfer algorithm can transfer different types of features

Larger style image ⟷ Smaller style image



2卷积神经网络理解

1.what is going on inside convnets?

t-sne与pca