



**Paint your video in style**

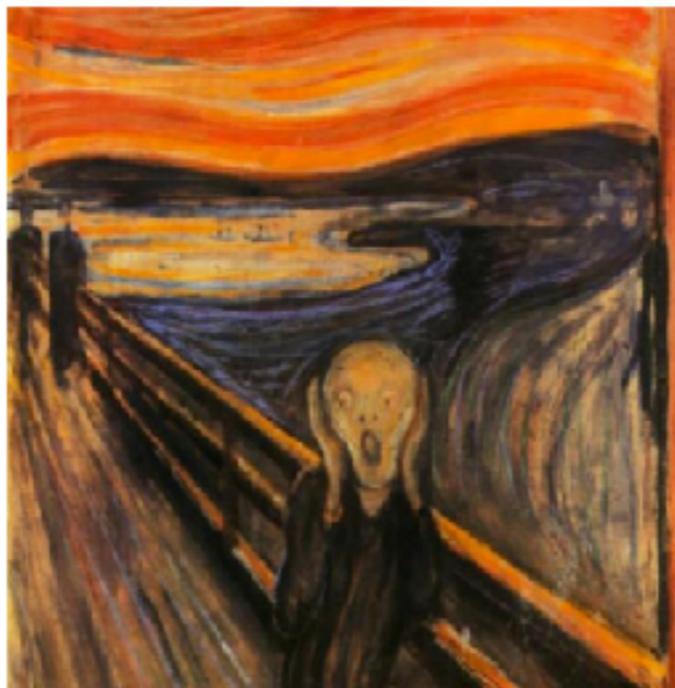
Yao Wu  
Dec 13, 2016

# Style Transfer for static images

Content



Style



Your Art



# Style Transfer for static images

Content



Style

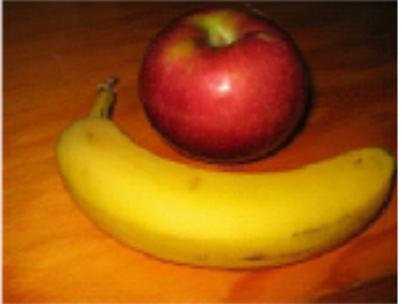


Your Art



# Style Transfer for static images

## Feature Extraction



Content Image

Layer 1

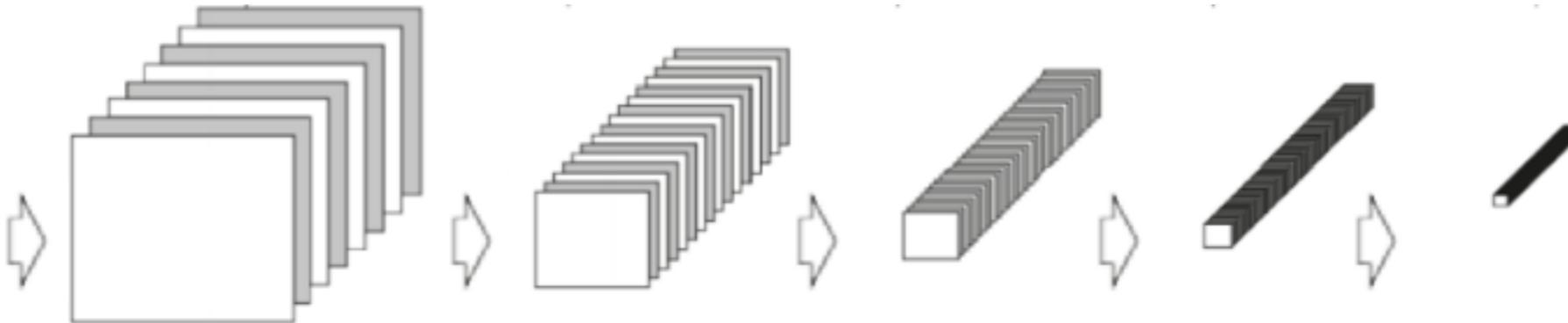
Layer 2

Layer 3

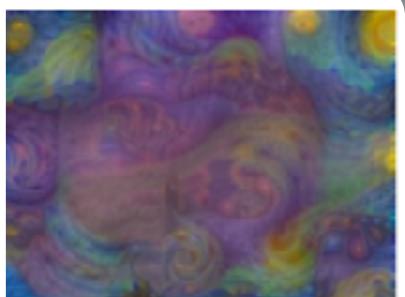
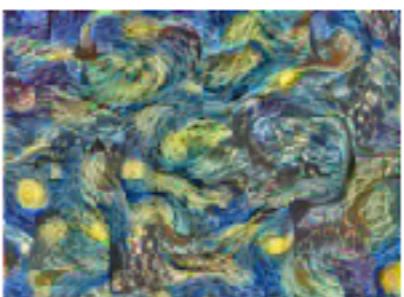
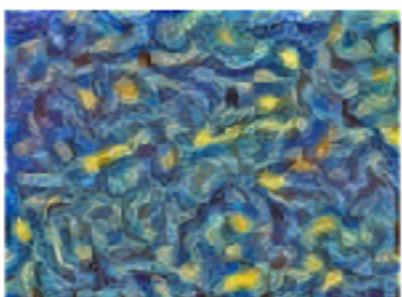
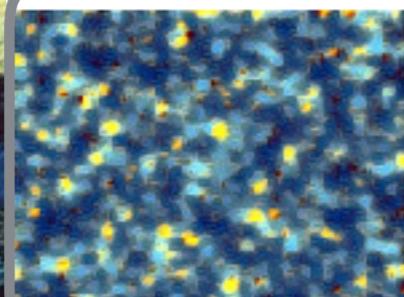
Layer 4

Layer 5

Input Image



Convolutional Neural Network



Style Image

# Style Transfer for static images

## Optimization

Minimize loss function to produce transferred image.

$$\mathcal{L} = \text{Content Loss} + \text{Style Loss}$$

*A Neural Algorithm of Artistic Style (Gatys 2015)*

### Fine-tune VGG 16

Fine-tuned the last convolutional layer with 20k images to distinguish paintings from pictures at 88%.

### Feature Extraction

Content features from 4th and 5th layers.  
Style features from all layers.

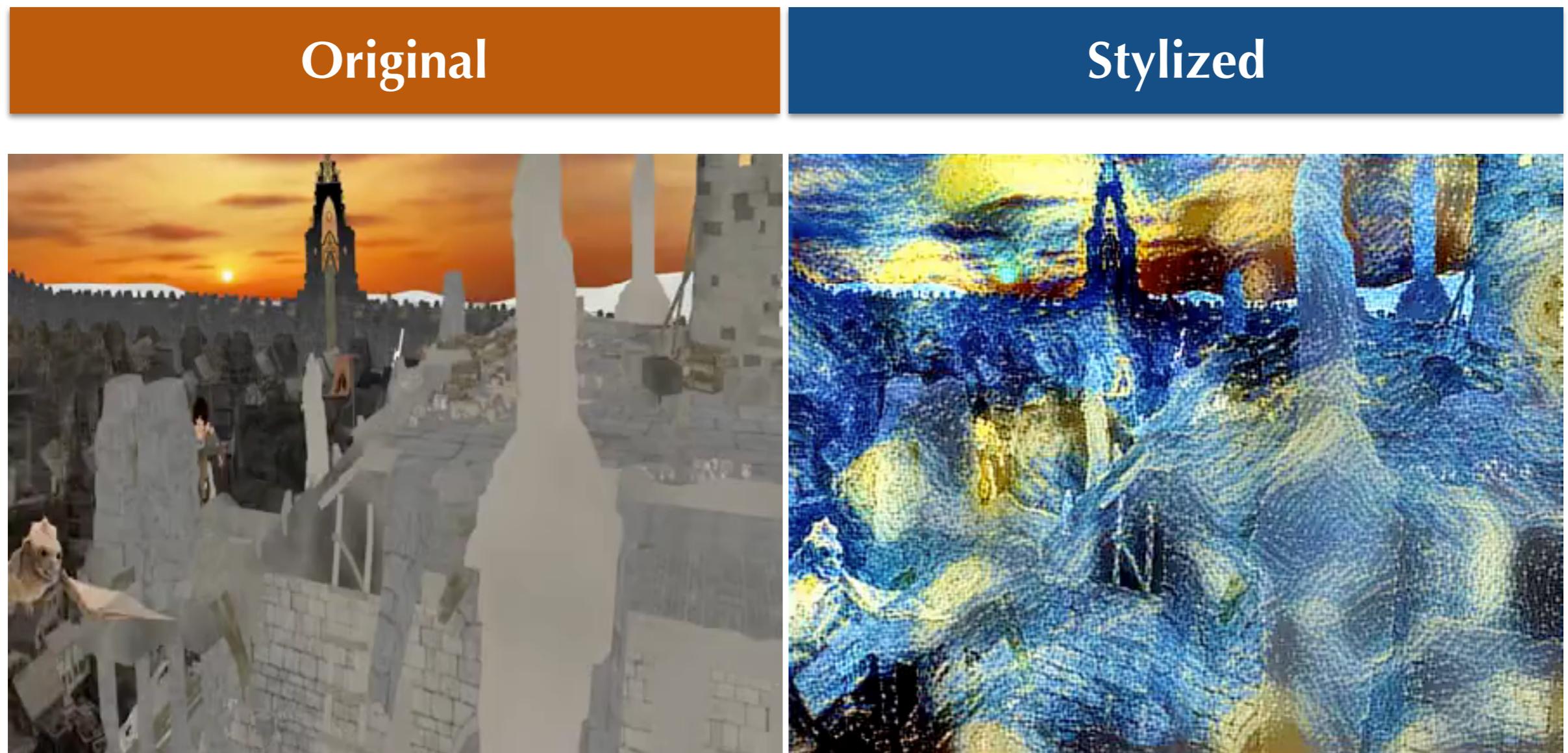
### Optimization

Style Transfer  
=

Loss Minimization

# Style Transfer for videos

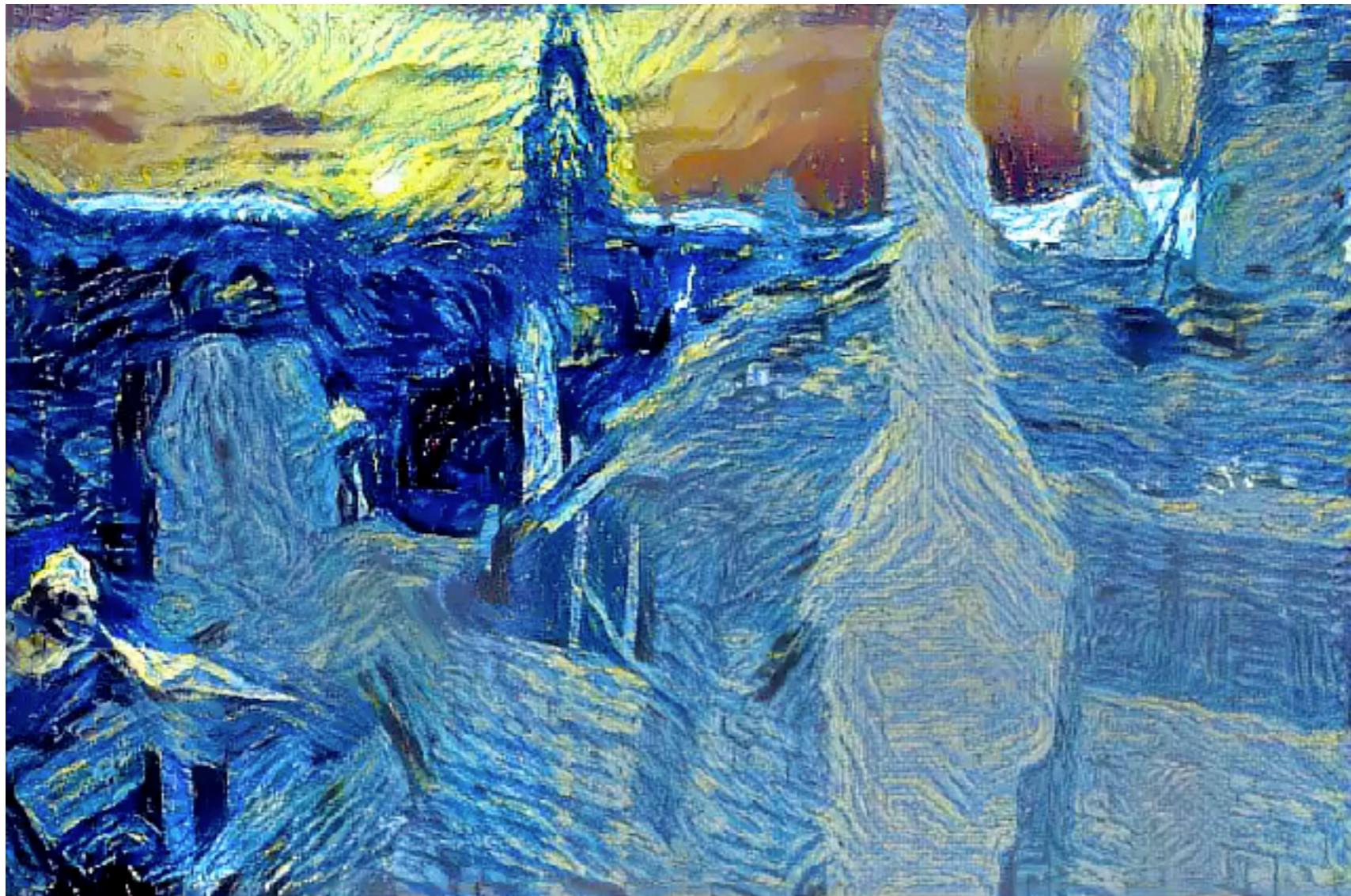
## Without Temporal Constraints



# Style Transfer for videos With Temporal Constraints

$$\mathcal{L} = \text{Content Loss} + \text{Style Loss} + \text{Temporal Loss}$$

*Artistic style transfer for videos (Ruder 2016)*



Initialize from the last frame.

Identify moving objects to initialize them at the correct position.

Penalize temporal loss between adjacent frames.

# Tools and Frameworks

## Deep Learning



theano



## Web Scraping



## Video Processing



# Style Transfer for videos



# Style Transfer for videos



Muse by Picasso

Scream by Munch

# The future

## Google

Google Brain has pre-trained a style transfer network that substantially cuts down the running time.

*A learned representation for Artistic style (Dumoulin 2017)*

## Facebook

Facebook is testing a video style transfer mobile app caffe2go in a few countries and it will soon be deployed in a wide range of countries.

## For all of us

Real-time style transfer on streaming data seems to be a not-so-distant possibility.

# Thank you!

## Contact



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