
아티스트를 위한 머신러닝 & 딥러닝

텐서플로를 활용한 딥러닝 #5

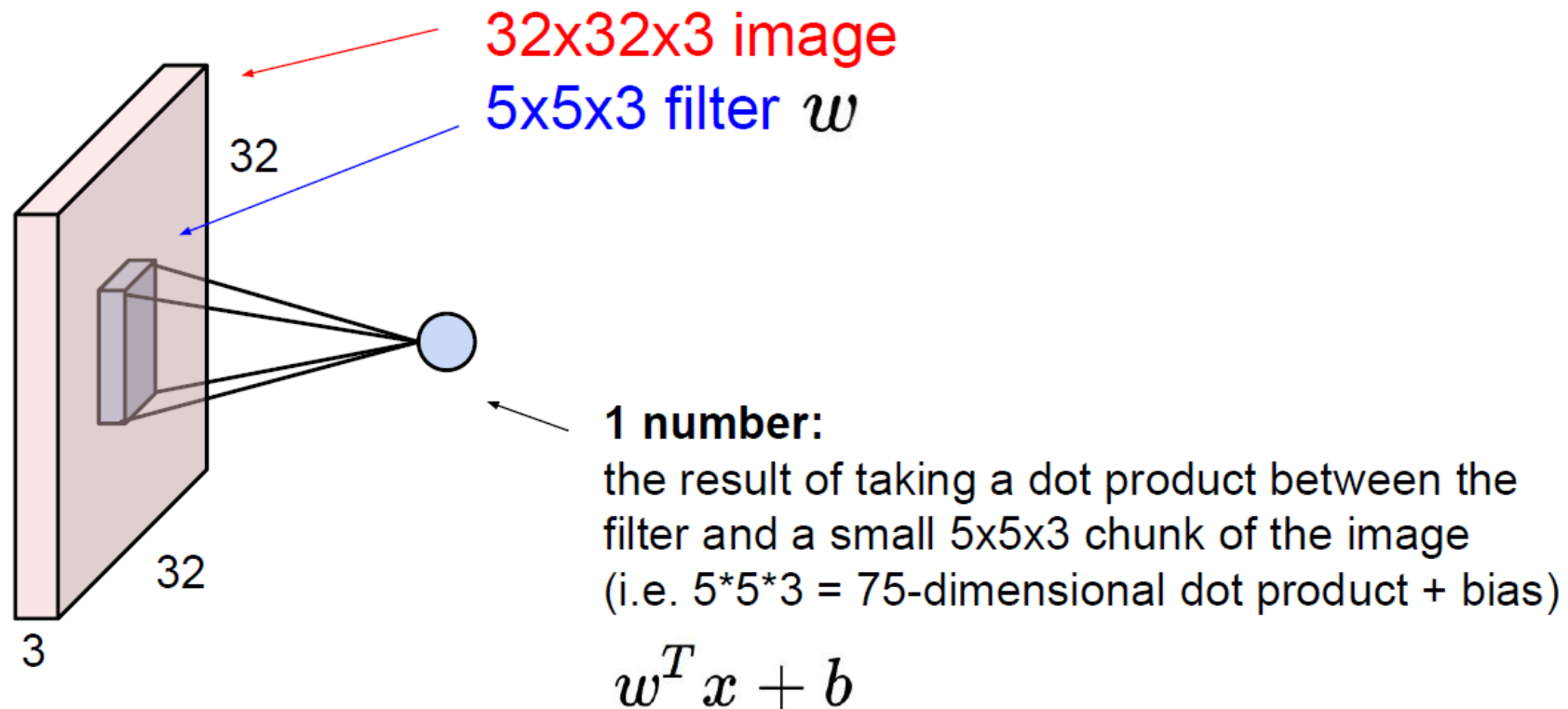
서울대학교 & V.DO / 김대식

Recap

컨볼루션 비디오

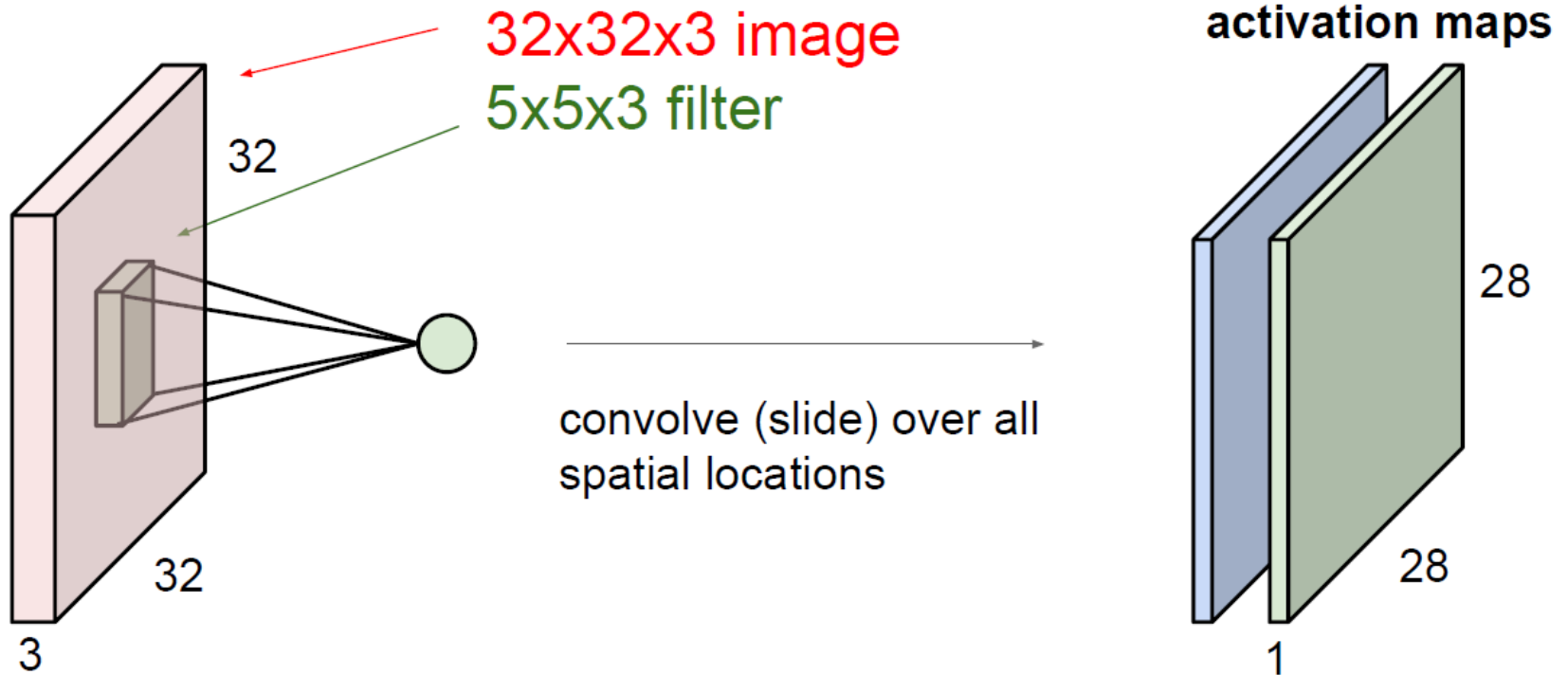
https://www.youtube.com/watch?v=KiftWz544_8

Convolution Layer

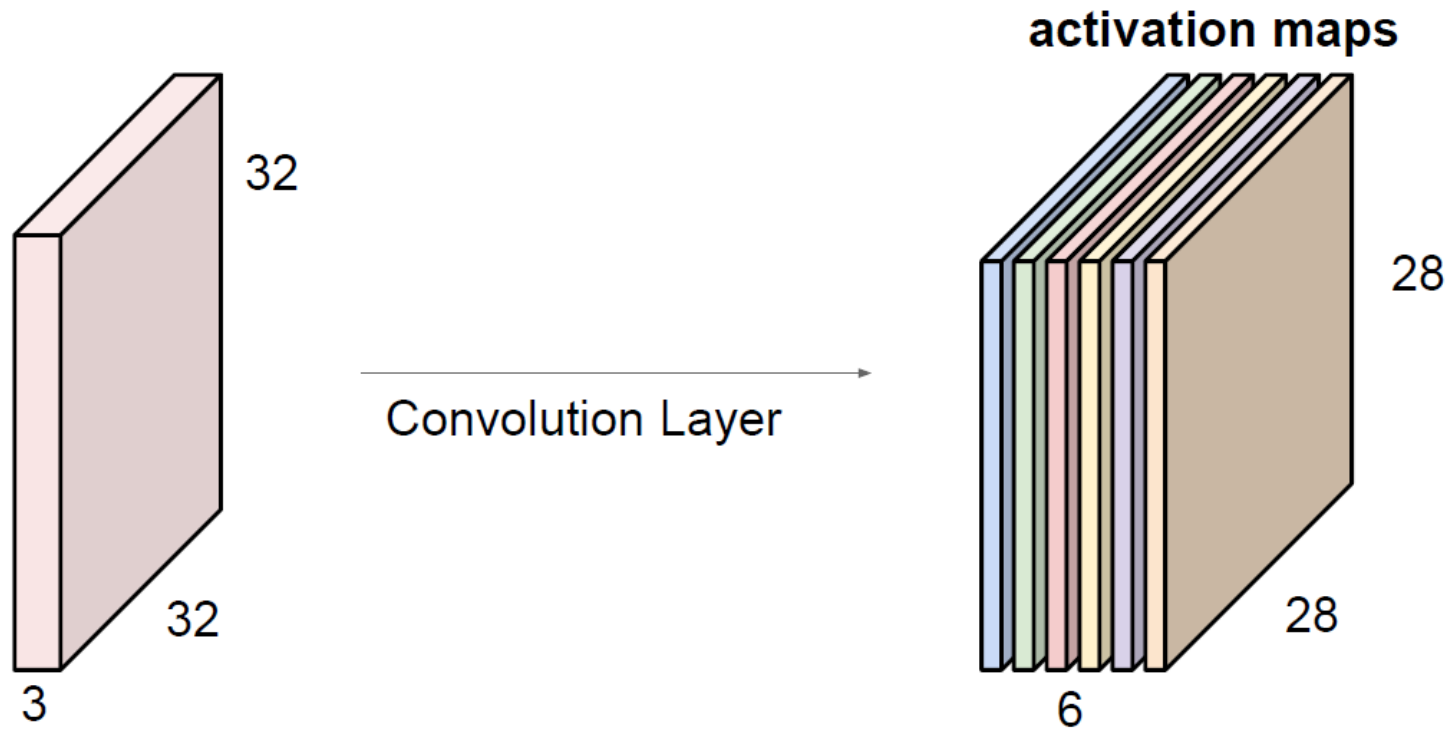


Convolution Layer

consider a second, **green** filter

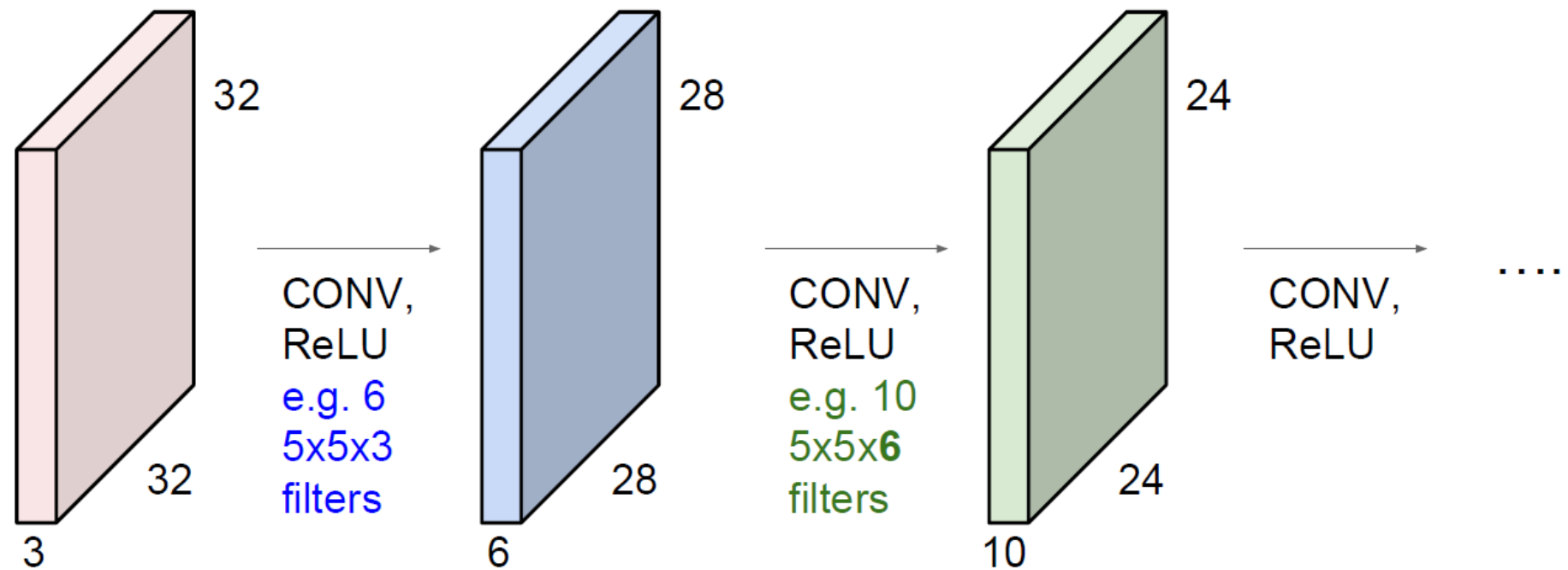


For example, if we had 6 5x5 filters, we'll get 6 separate activation maps:



We stack these up to get a “new image” of size 28x28x6!

Preview: ConvNet is a sequence of Convolutional Layers, interspersed with activation functions

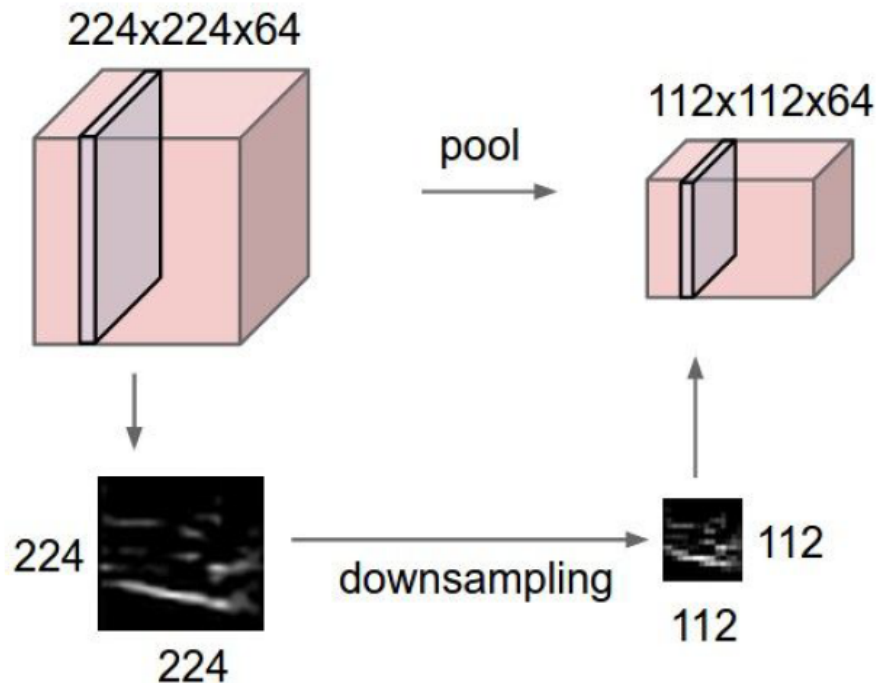


풀링 비디오

<https://www.youtube.com/watch?v=mW3KyFZDNIQ>

Pooling layer

- makes the representations smaller and more manageable
- operates over each activation map independently:



MAX POOLING

Single depth slice

x ↑

1	1	2	4
5	6	7	8
3	2	1	0
1	2	3	4

→ y

max pool with 2x2 filters
and stride 2



6	8
3	4

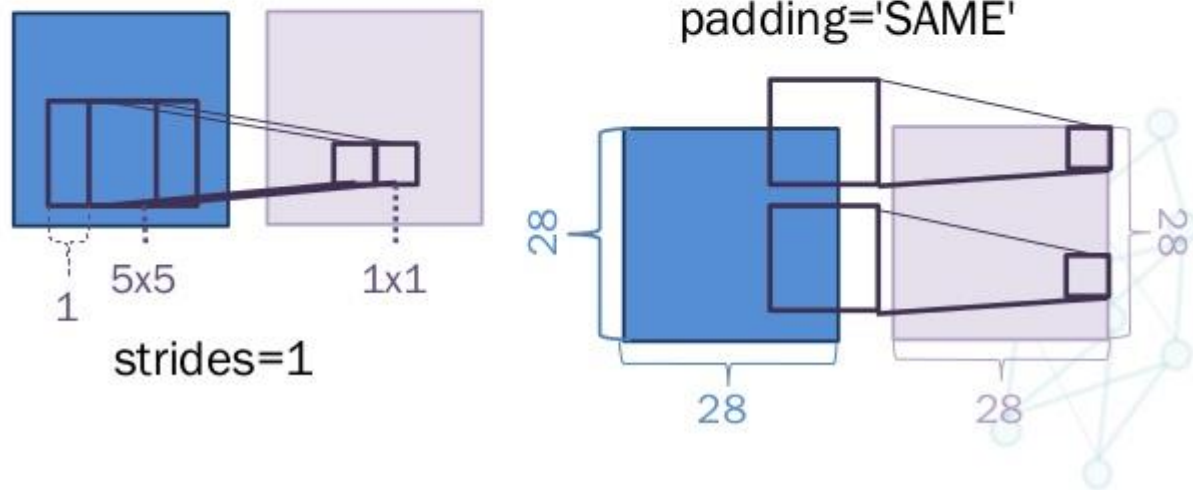
텐서플로 실습

컨볼루션 in 텐서플로

Convolutional Layer

```
tf.nn.conv2d(x, W, strides=[1, 1, 1, 1], padding='SAME')+b
```

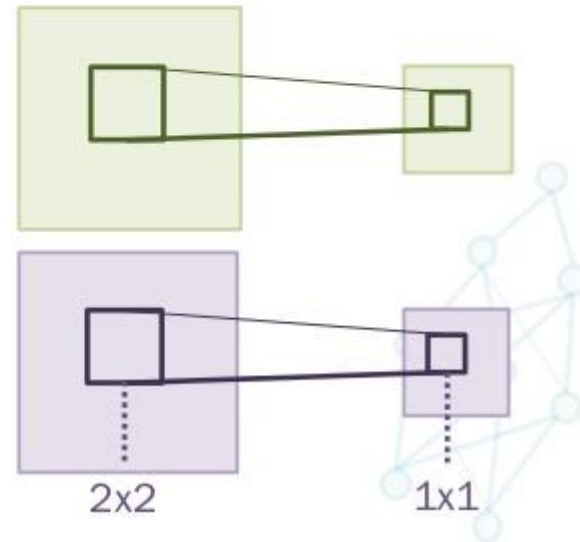
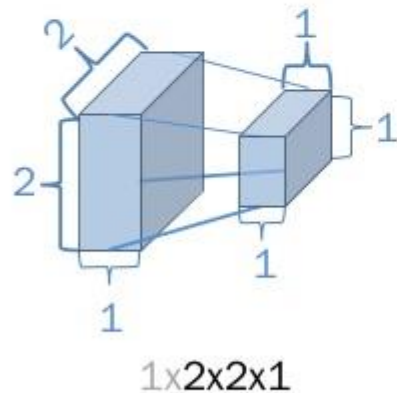
[batch, in_height, in_width, in_channels]



맥스풀링 in 텐서플로

Pooling Layer

```
tf.nn.max_pool(x, ksize=[1, 2, 2, 1],  
               strides=[1, 2, 2, 1], padding='SAME')
```



컨볼루션 in 텐서플로

```
def createNetwork():
    # network weights
    W_conv1 = weight_variable([3, 3, 4, 32])
    b_conv1 = bias_variable([32])

    W_conv2 = weight_variable([3, 3, 32, 64])
    b_conv2 = bias_variable([64])

    W_conv3 = weight_variable([3, 3, 64, 64])
    b_conv3 = bias_variable([64])

    #
    W_fc1 = weight_variable([6400, 512])
    b_fc1 = bias_variable([512])

    W_fc2 = weight_variable([512, ACTIONS])
    b_fc2 = bias_variable([ACTIONS])

    # input layer
    s = tf.placeholder("float", [None, 80, 80, 4])

    # hidden layers
    h_conv1 = tf.nn.relu(conv2d(s, W_conv1, 1) + b_conv1)
    h_pool1 = max_pool_2x2(h_conv1)

    h_conv2 = tf.nn.relu(conv2d(h_pool1, W_conv2, 1) + b_conv2)
    h_pool2 = max_pool_2x2(h_conv2)

    h_conv3 = tf.nn.relu(conv2d(h_pool2, W_conv3, 1) + b_conv3)
    h_pool3 = max_pool_2x2(h_conv3)

    #
    #h_pool3_flat = tf.reshape(h_pool3, [-1, 256])
    h_conv3_flat = tf.reshape(h_pool3, [-1, 6400])

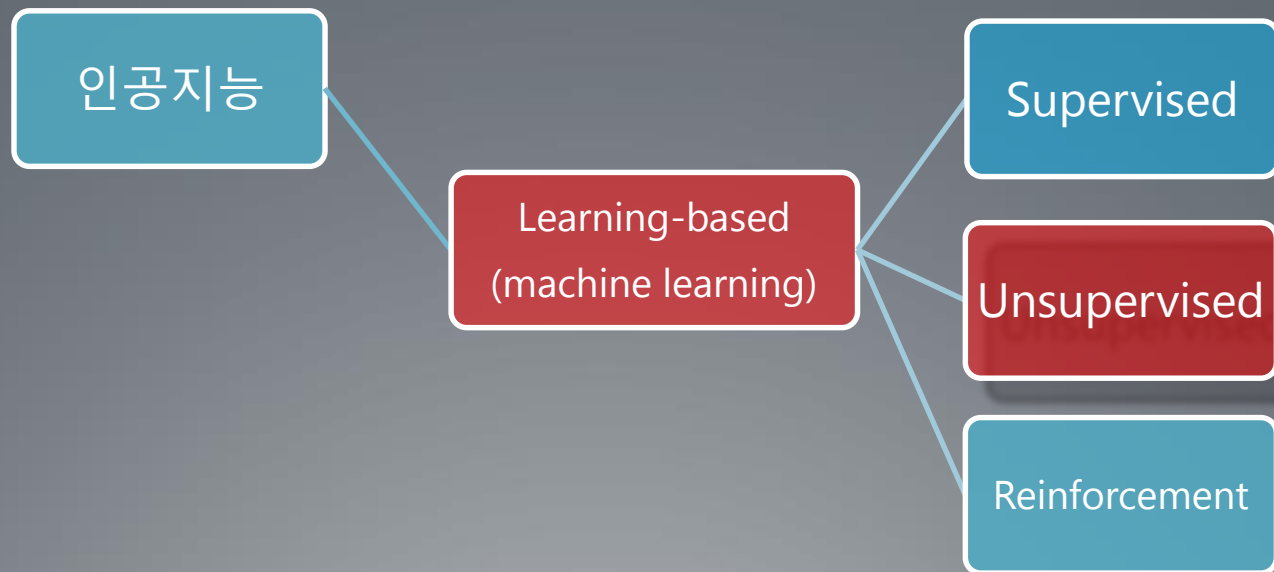
    h_fc1 = tf.nn.relu(tf.matmul(h_conv3_flat, W_fc1) + b_fc1)
```

프리 트레인 모델 (Pre-trained model) 사용하기

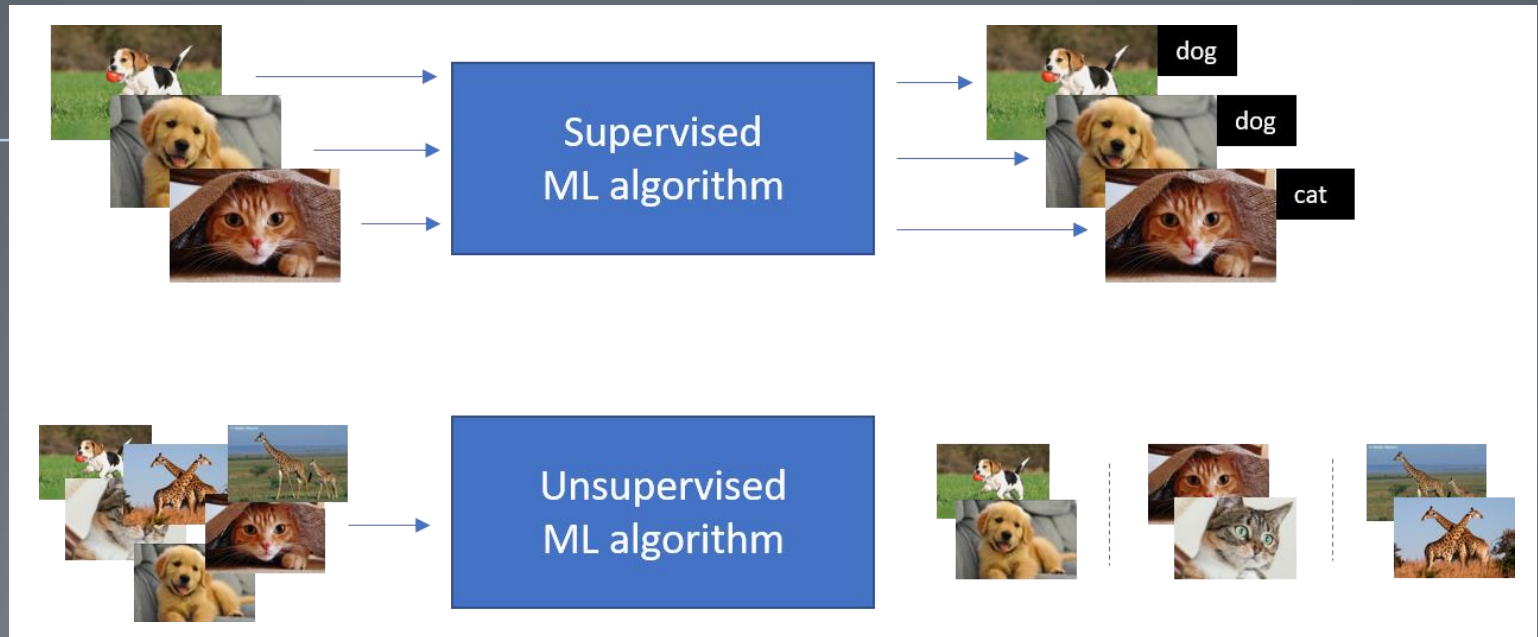
트랜스퍼 러닝 Transfer Learning

<https://github.com/tensorflow/models/tree/master/research/slim>

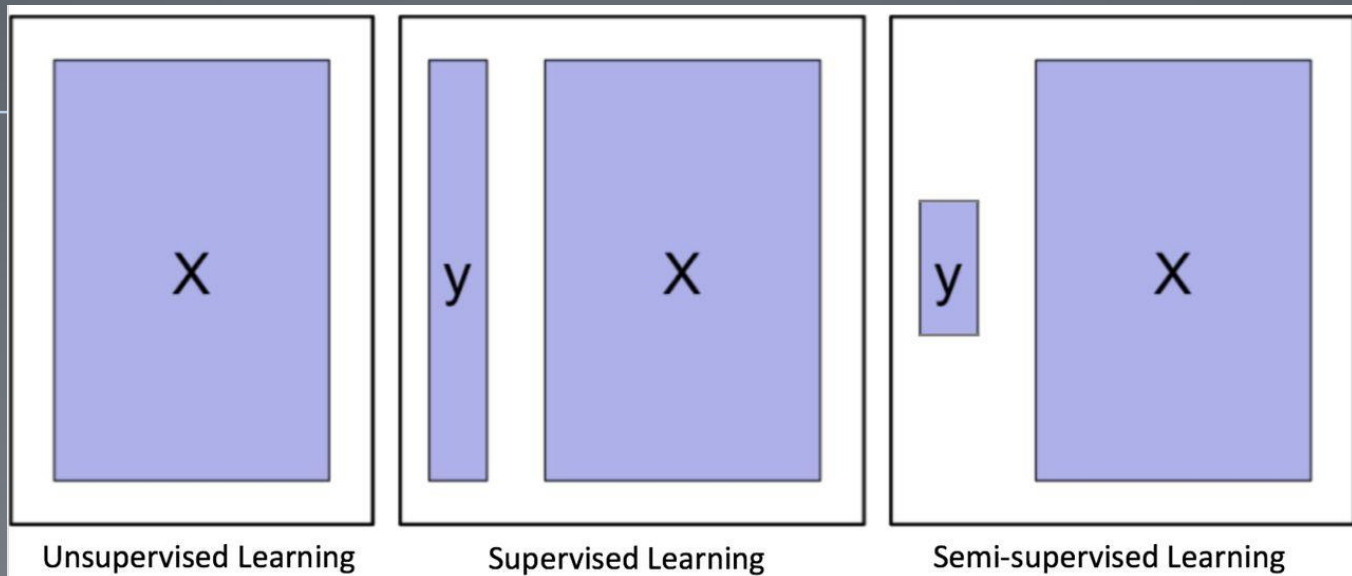
우린 Learning 배웁니다



지도학습 vs 비지도학습



지도학습 vs 비지도학습



Generative Adversarial network(GAN)

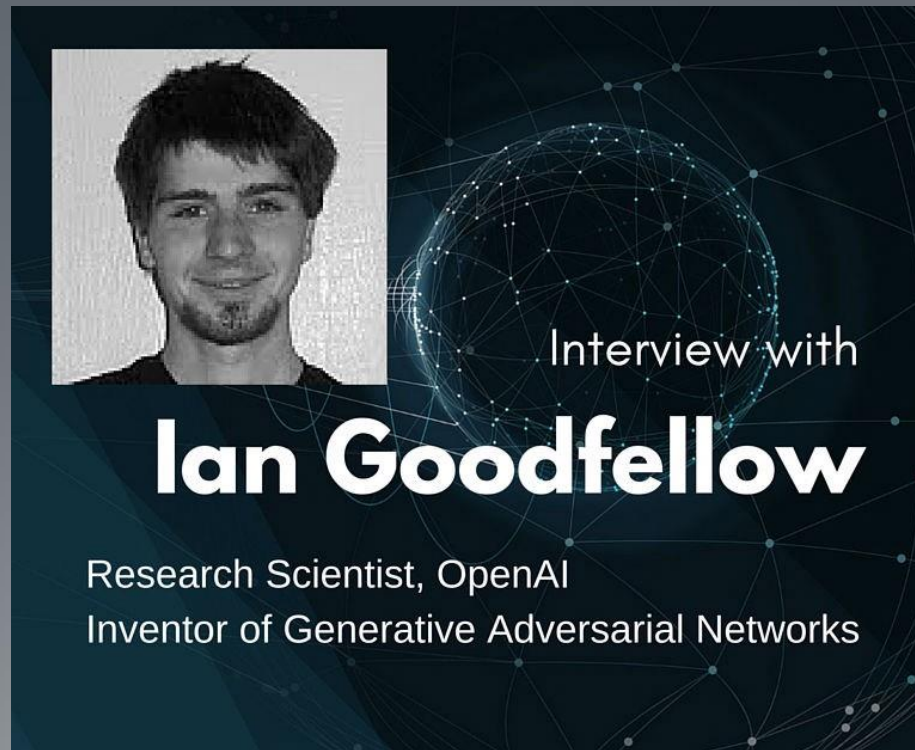
Noise $\sim N(0,1)$



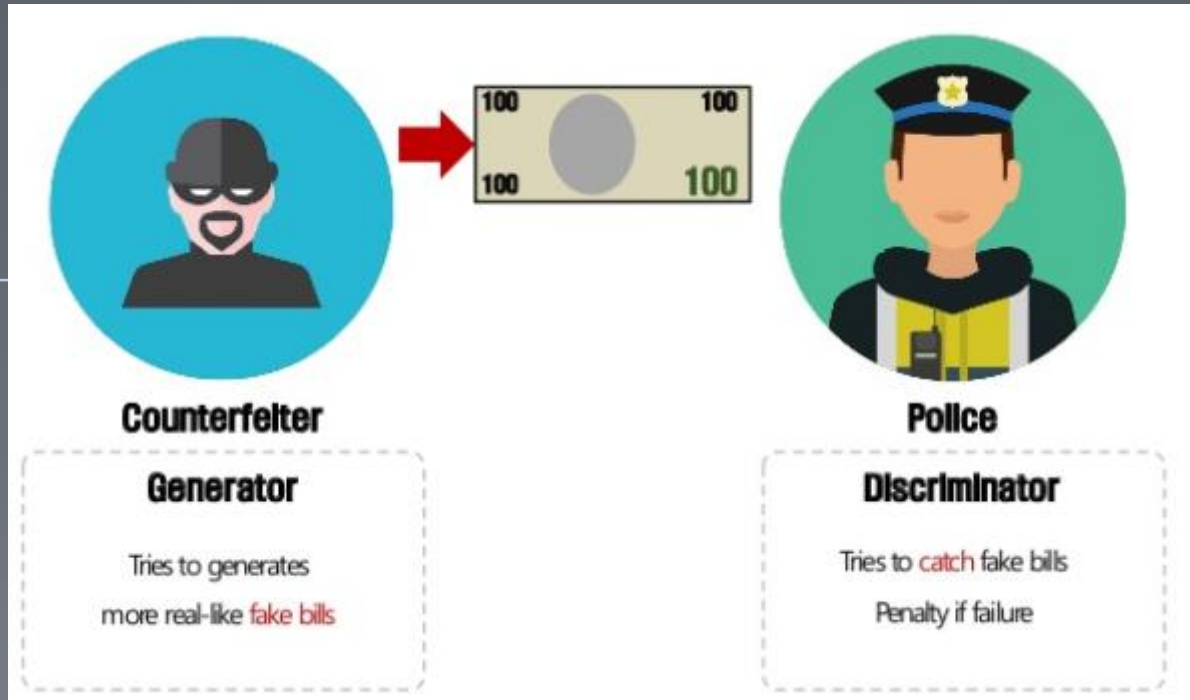
Generative
Model



Generative Adversarial network(GAN)



위조지폐범 vs 경찰



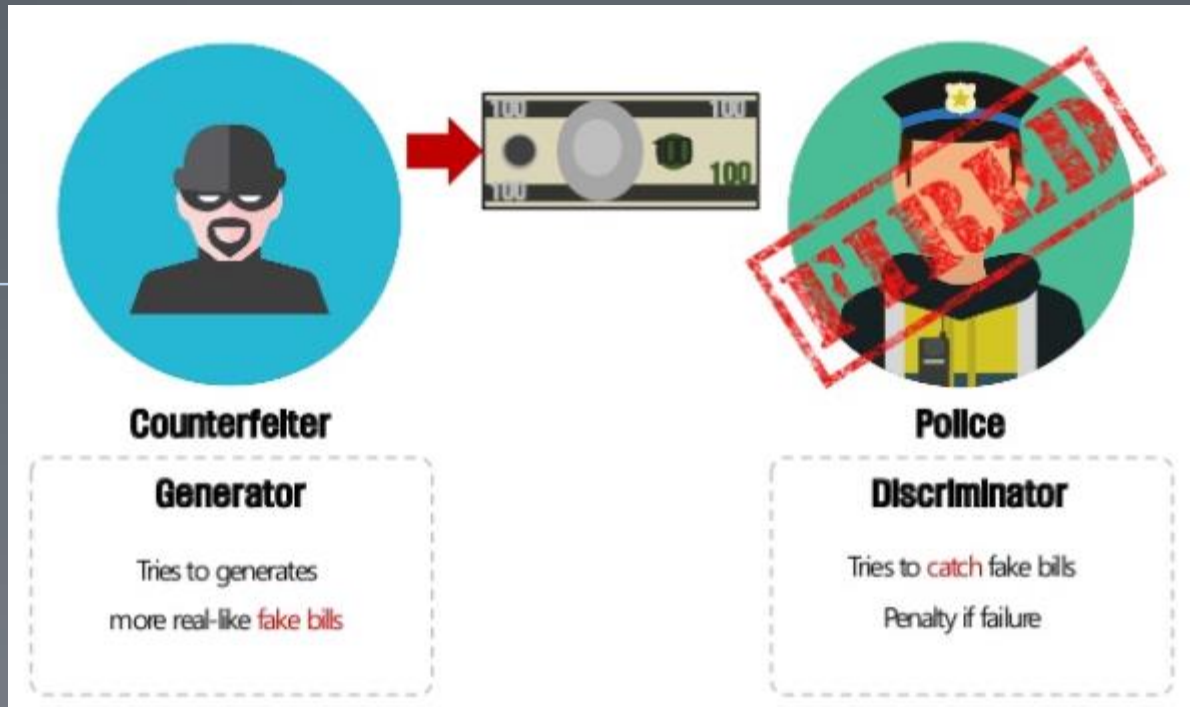
위조지폐범 vs 경찰



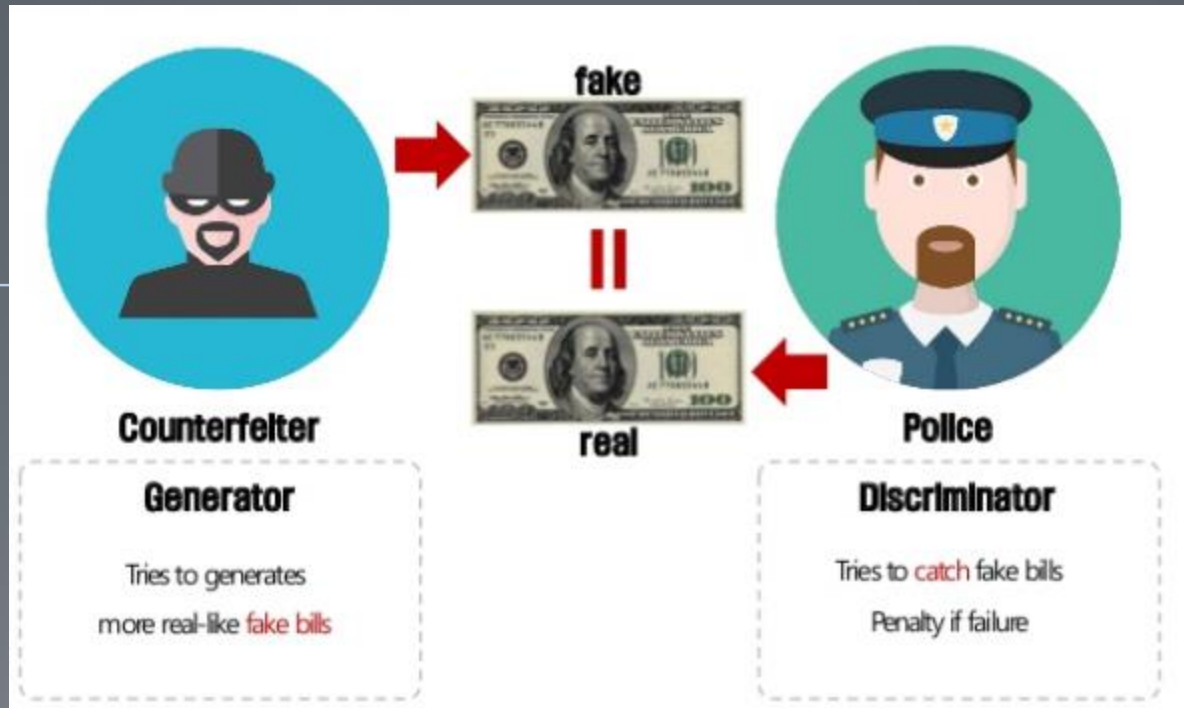
위조지폐범 vs 경찰



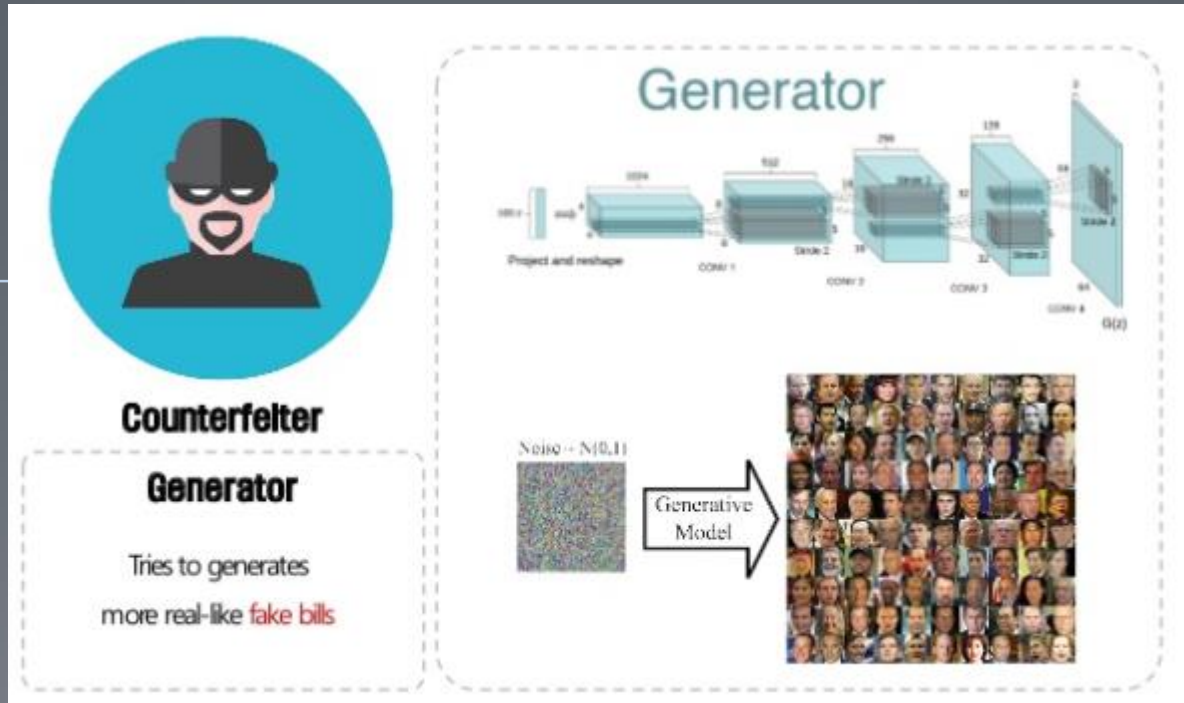
위조지폐범 vs 경찰



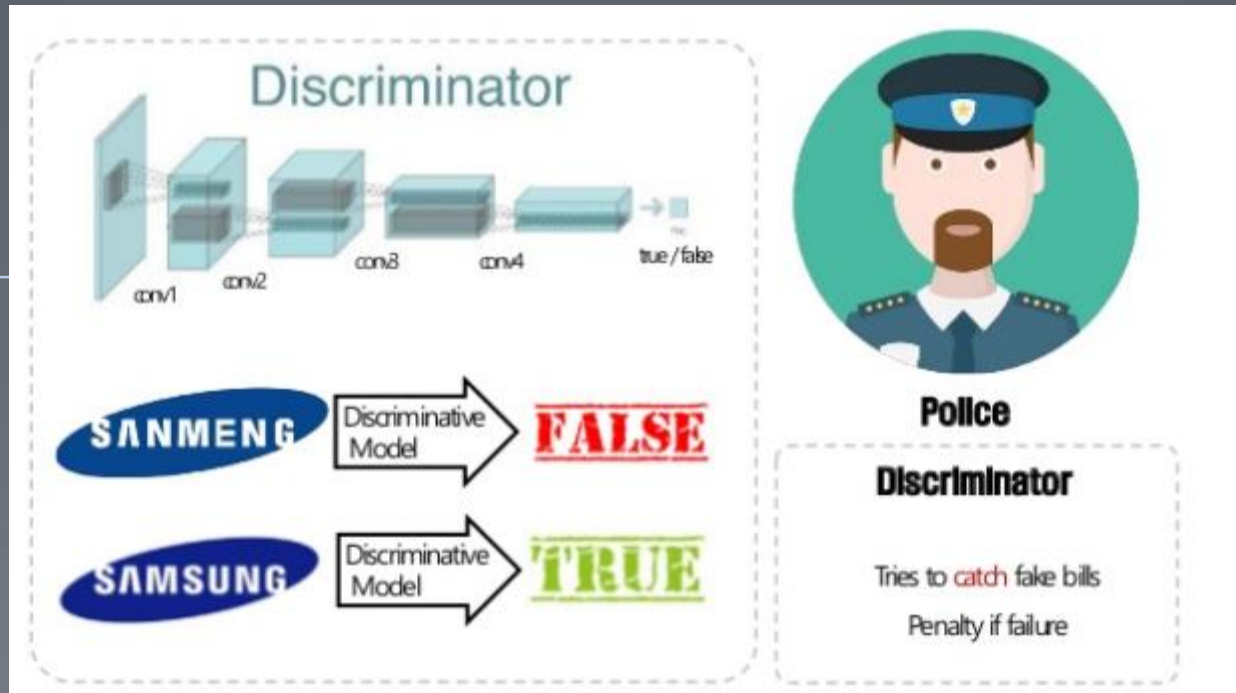
위조지폐범 vs 경찰



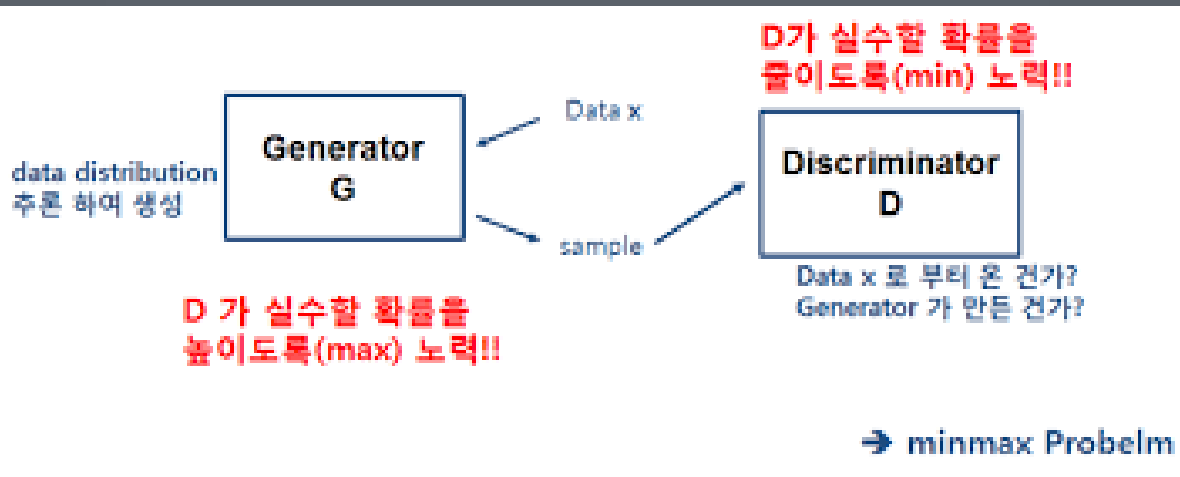
위조지폐범 vs 경찰



위조지폐범 vs 경찰



GAN 학습법



Generative Adversarial Networks - GAN

- Mathematical notation

$$\min_G \max_D V(D, G) = \mathbb{E}_{x \sim p_{\text{data}}(x)} [\log D(x)] + \mathbb{E}_{z \sim p_z(z)} [\log(1 - D(G(z)))]$$

Annotations for the equation:

- min**: Minimize G
- max**: Maximize D
- Value of**: Points to $V(D, G)$
- Expectation**: Points to \mathbb{E}
- prob. of D(real)**: Points to $\log D(x)$
- prob. of D(fake)**: Points to $\log(1 - D(G(z)))$
- x is sampled from real data**: Points to $x \sim p_{\text{data}}(x)$
- z is sampled from $N(0, 1)$** : Points to $z \sim p_z(z)$
- fake**: Points to $D(G(z))$

GAN 실습

GAN 응용 사례

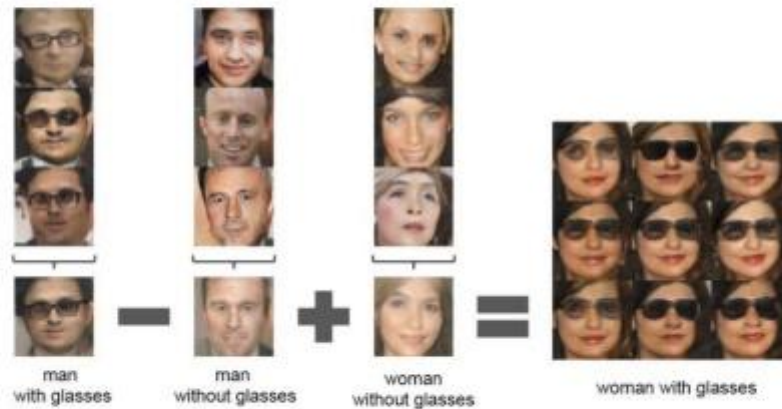


<https://deephunt.in/the-gan-zoo-79597dc8c347>

GAN 응용 사례

DCGAN – Vector Arithmetic

Deep Convolutional GAN – Alec Radford et al. (2016)



Source: Radford, Alec, Luke Metz, and Soumith Chintala. "Unsupervised representation learning with deep convolutional generative adversarial networks." arXiv preprint arXiv:1511.06434 (2015).

GAN 응용 사례

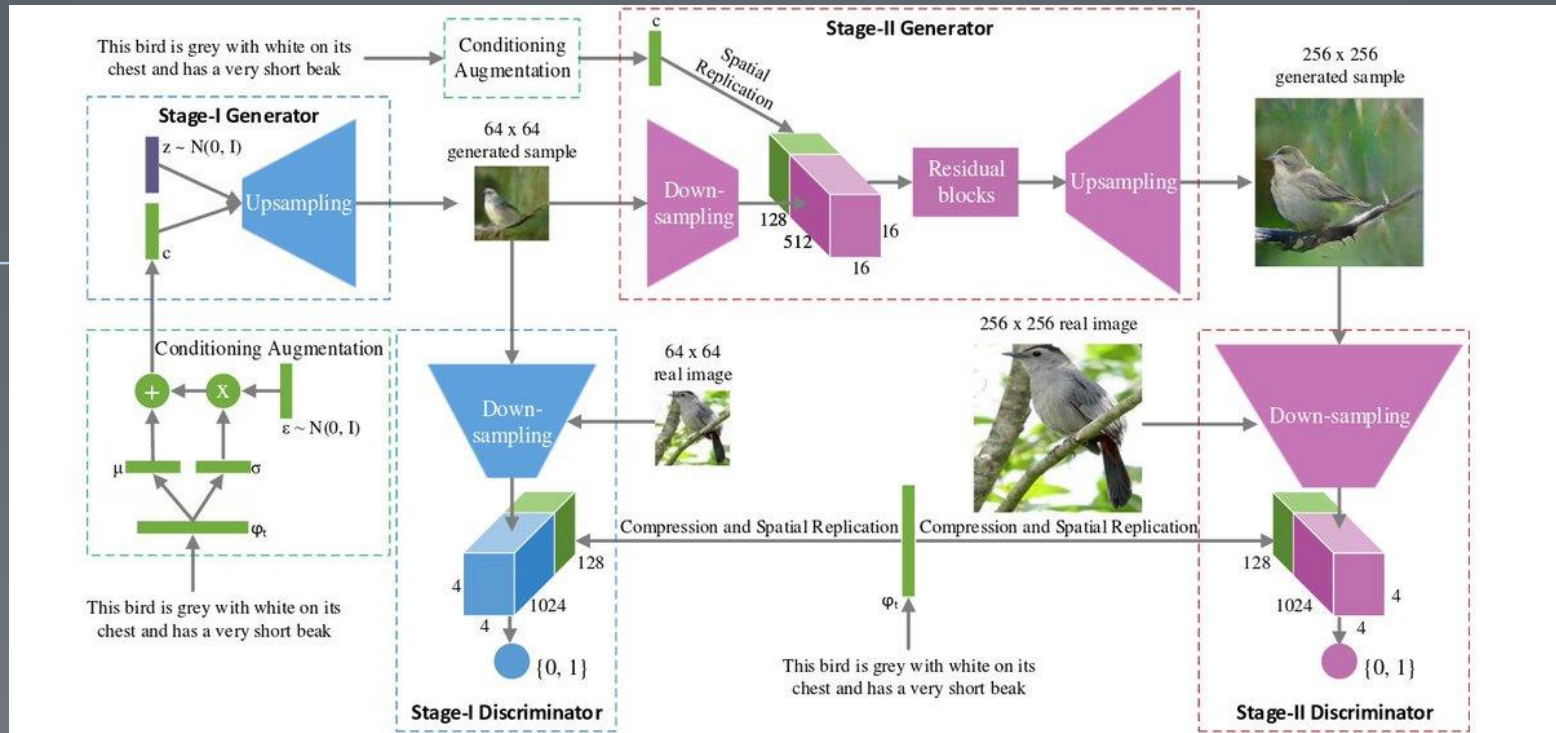
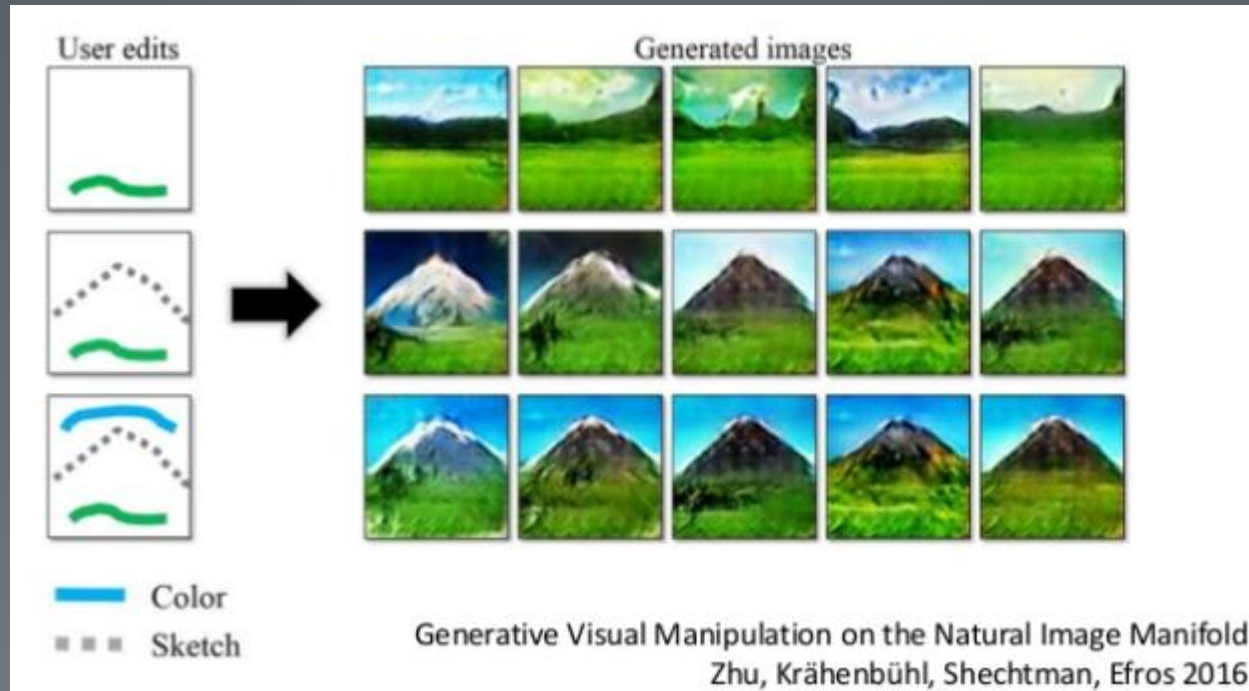


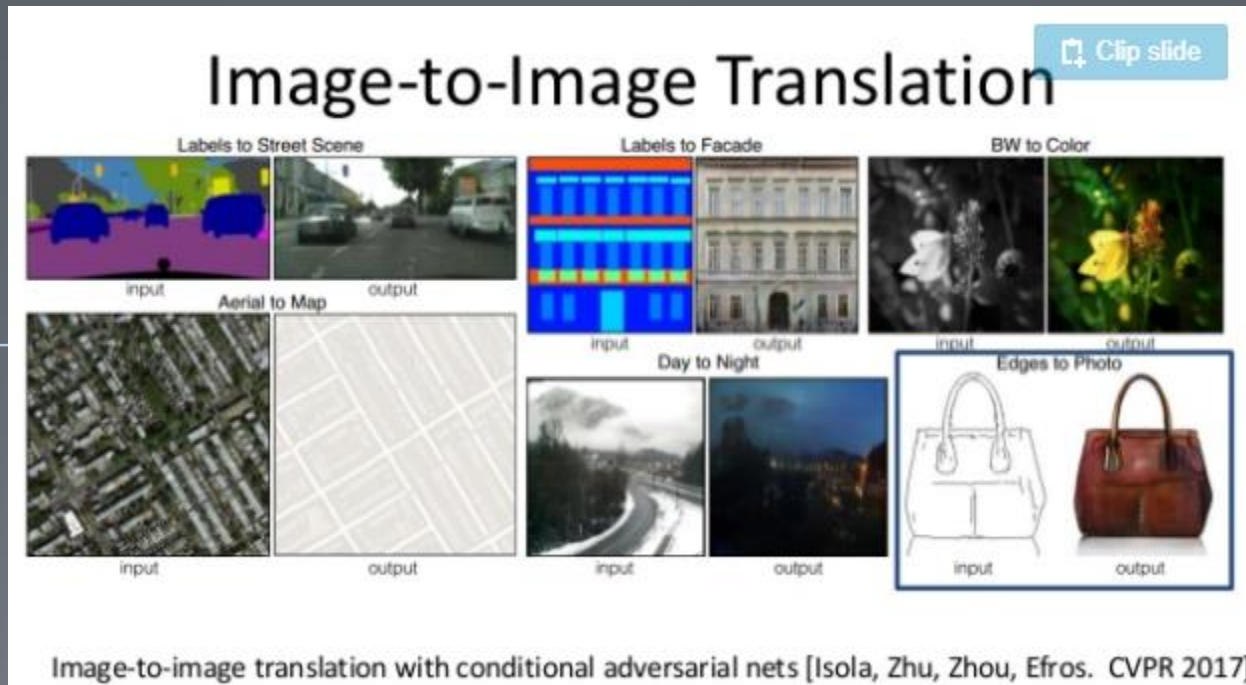
Figure 2. The architecture of the proposed StackGAN. The Stage-I generator draws a low resolution image by sketching rough shape and basic colors of the object from the given text and painting the background from a random noise vector. The Stage-II generator generates a high resolution image with photo-realistic details by conditioning on both the Stage-I result and the text again.

GAN 응용 사례



<https://www.youtube.com/watch?v=9c4z6YsBGQ0>

GAN 응용 사례

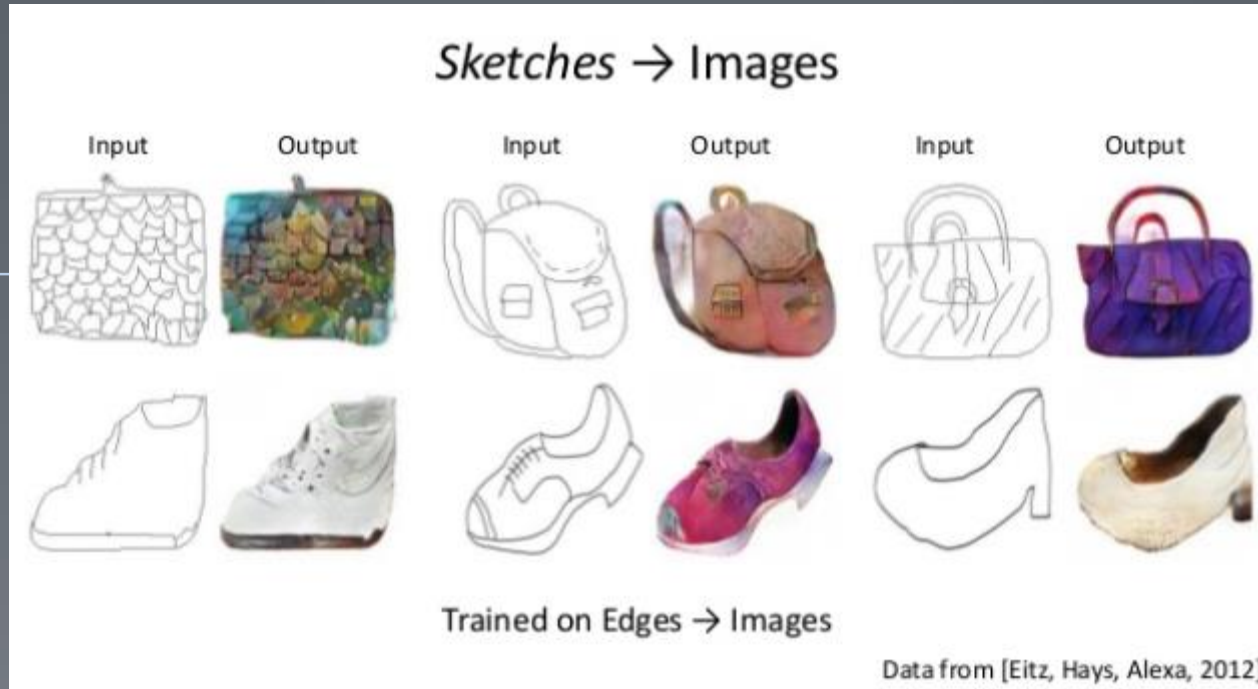


<https://www.youtube.com/watch?v=9c4z6YsBGQ0>

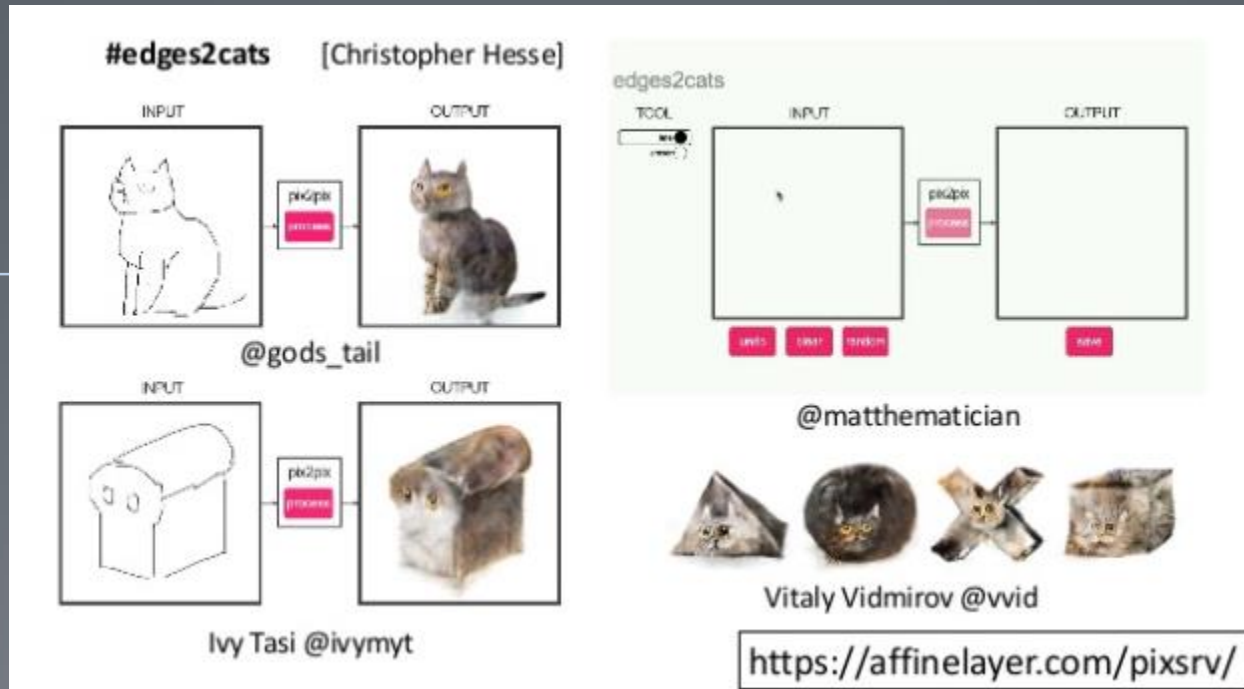
GAN 응용 사례



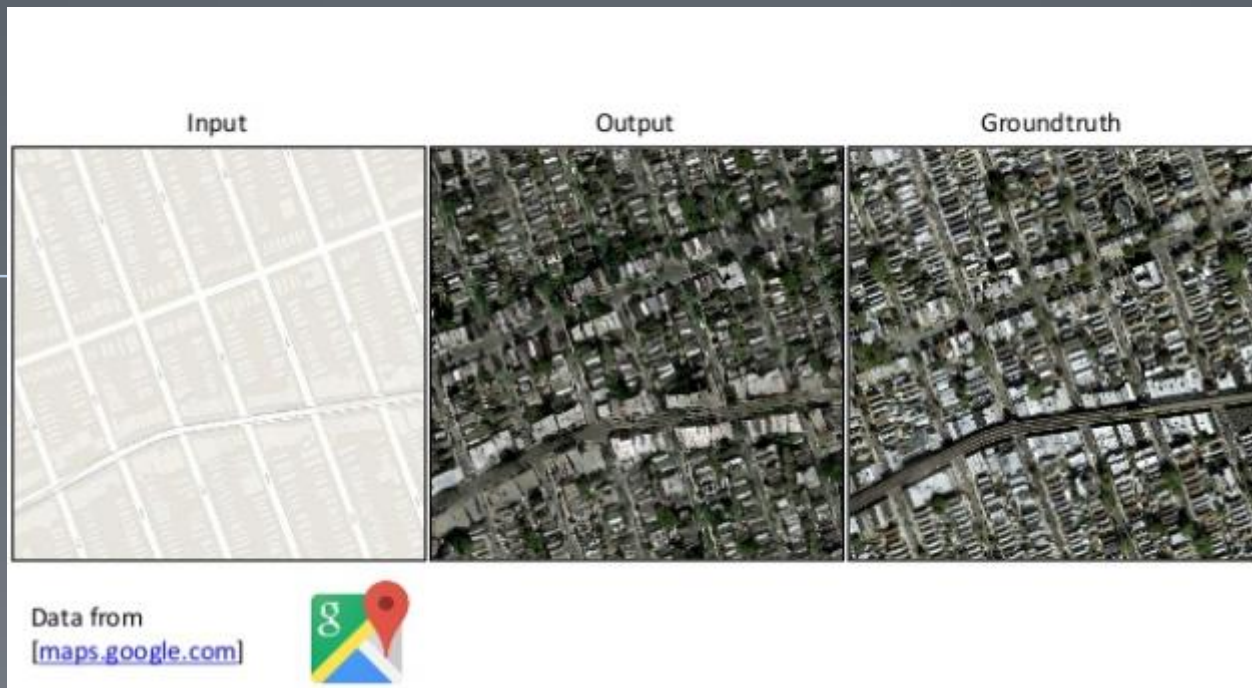
GAN 응용 사례



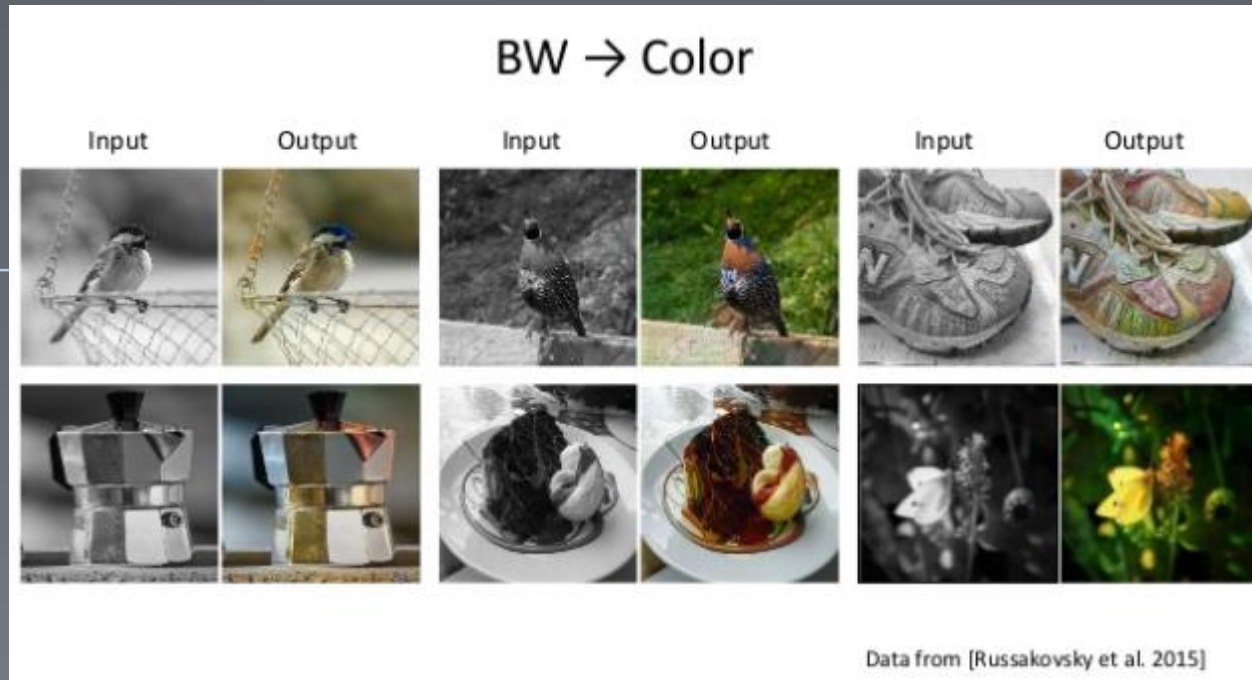
GAN 응용 사례



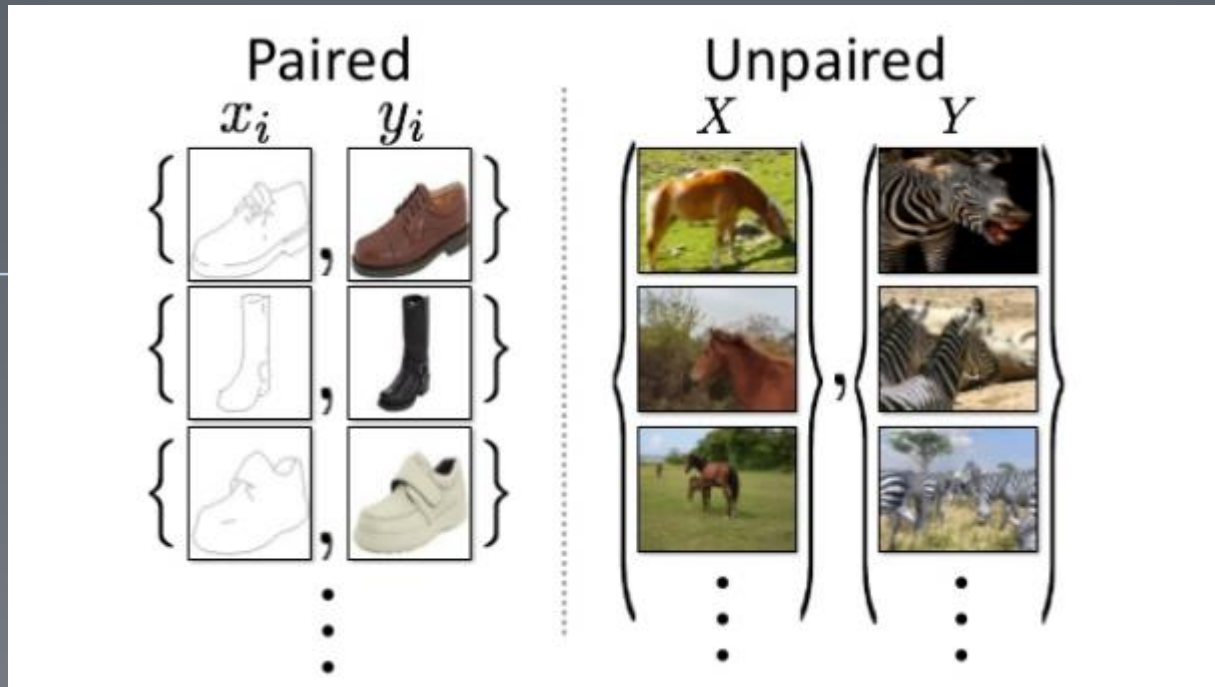
GAN 응용 사례



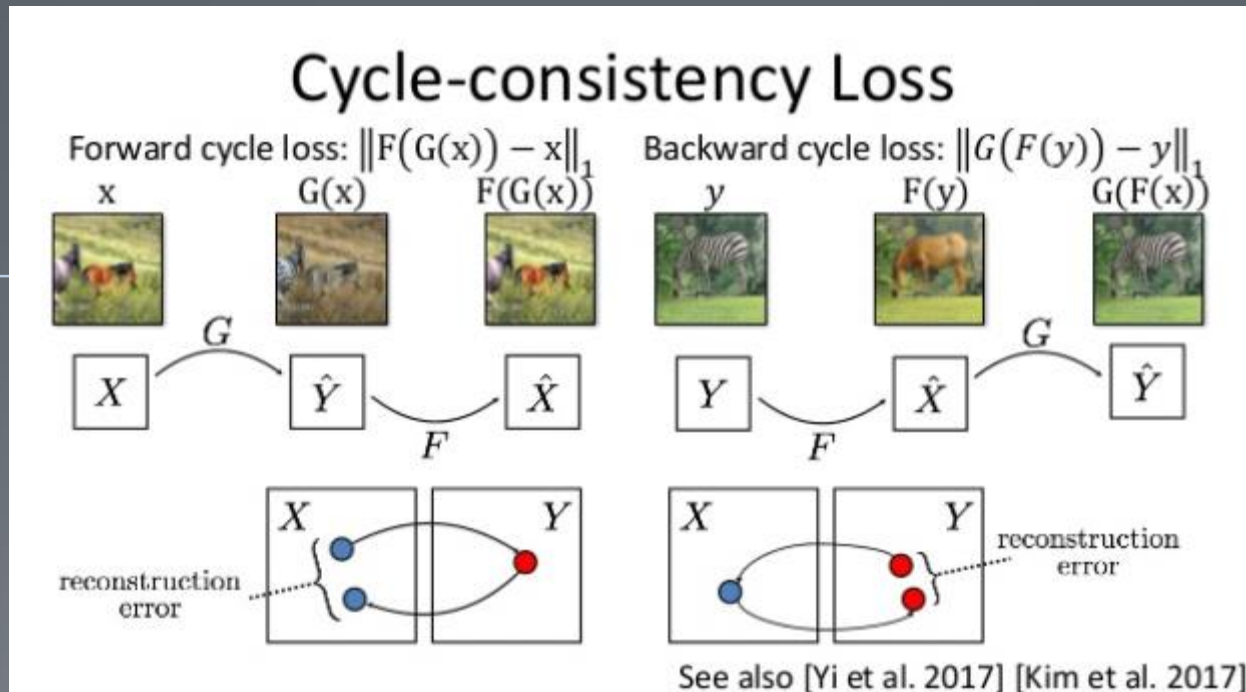
GAN 응용 사례



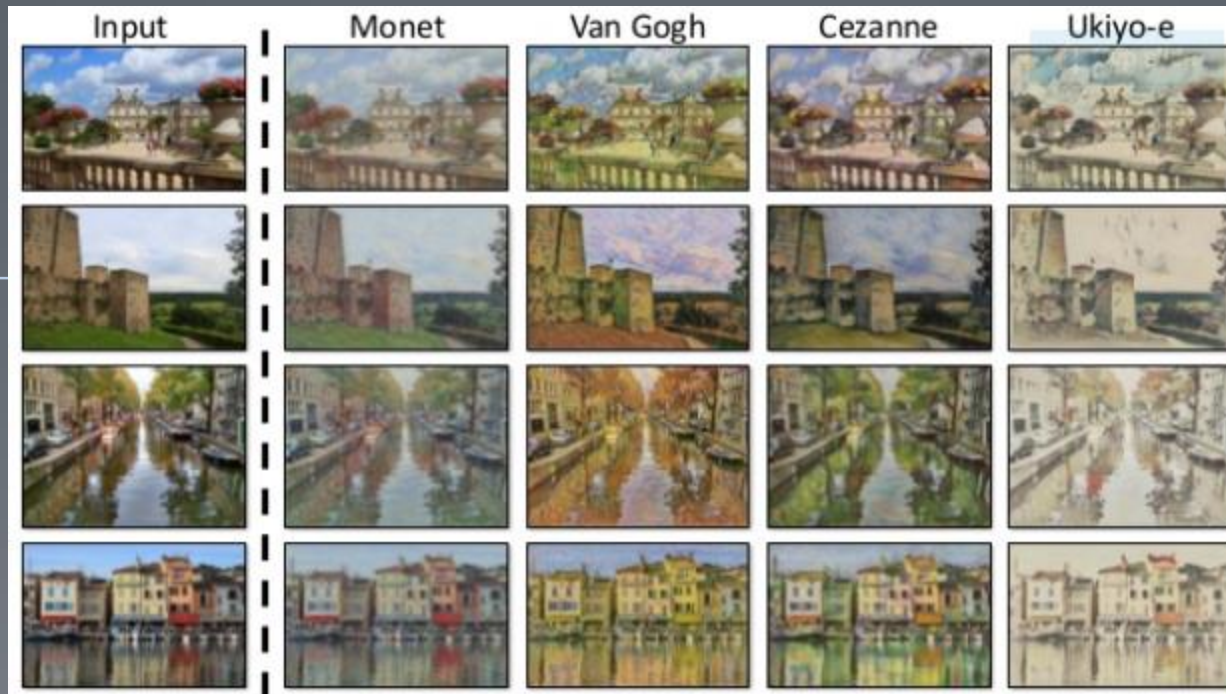
GAN 응용 사례



GAN 응용 사례



GAN 응용 사례



GAN 응용 사례

Monet's paintings → photos



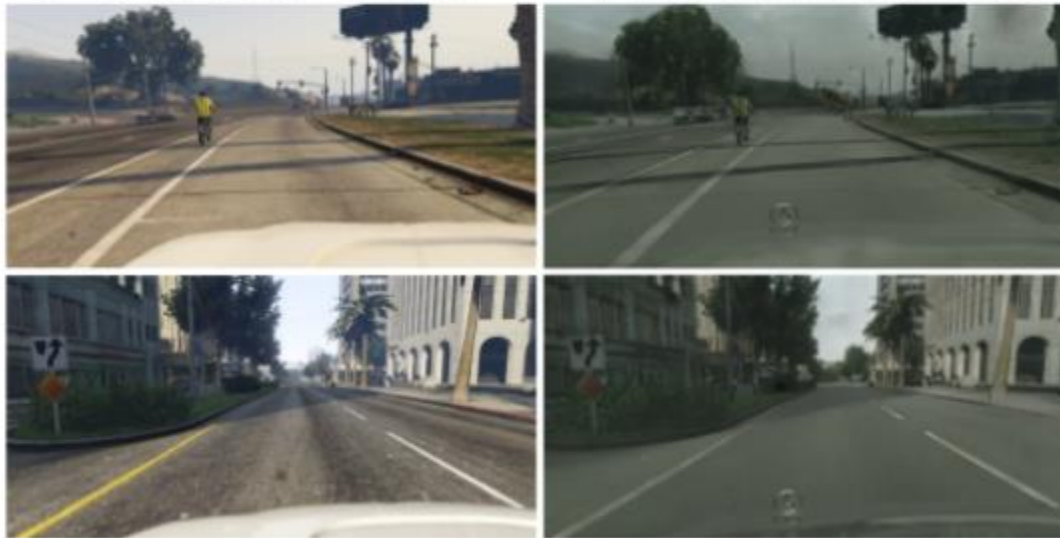
GAN 응용 사례

Summer ↔ Winter



GAN 응용 사례

CG2Real: GTA5 → real streetview



GTA5 CG Input

Output
Inspired by [Johnson et al. 2011]

GAN 응용 사례

Real2CG: real streetview → GTA



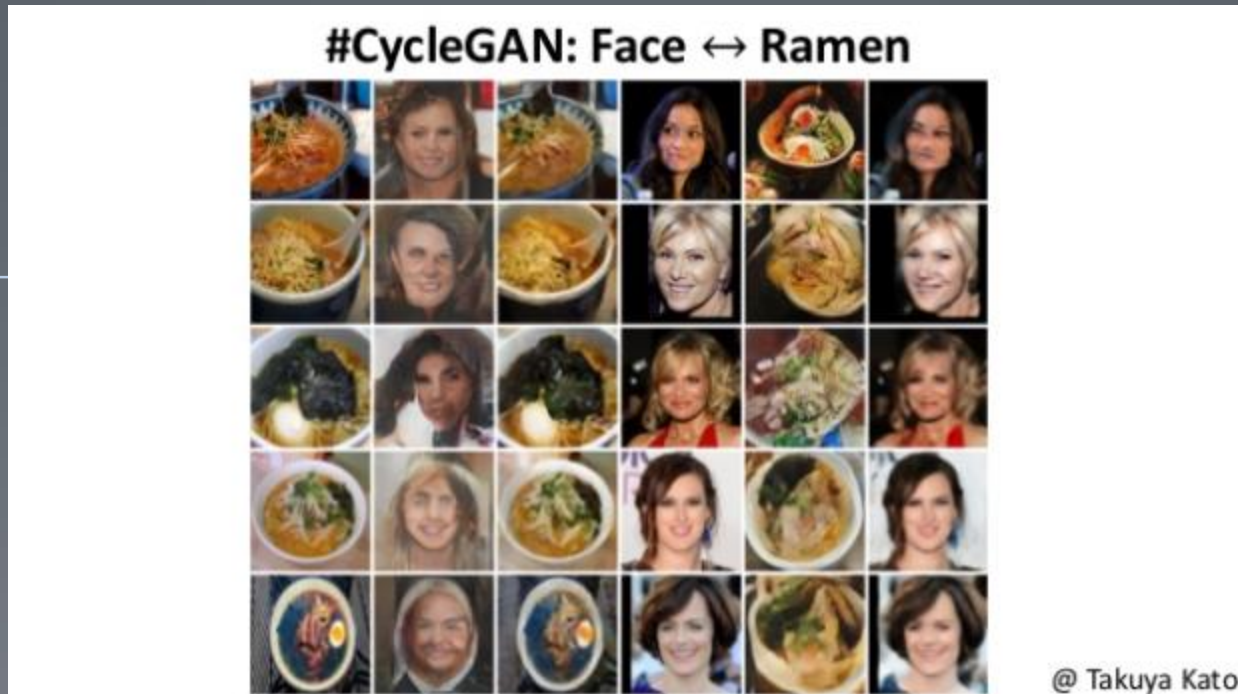
Cityscape Input

Output

GAN 응용 사례

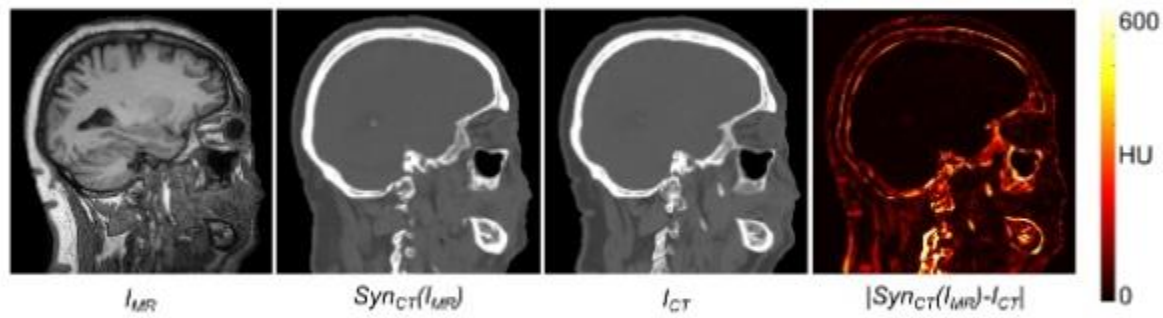


GAN 응용 사례



GAN 응용 사례

MR \leftrightarrow CT



GAN 응용 사례

<https://youtu.be/36lE9tV9vm0>

<https://www.youtube.com/watch?v=PUkQbGaL4Fg>

감사합니다