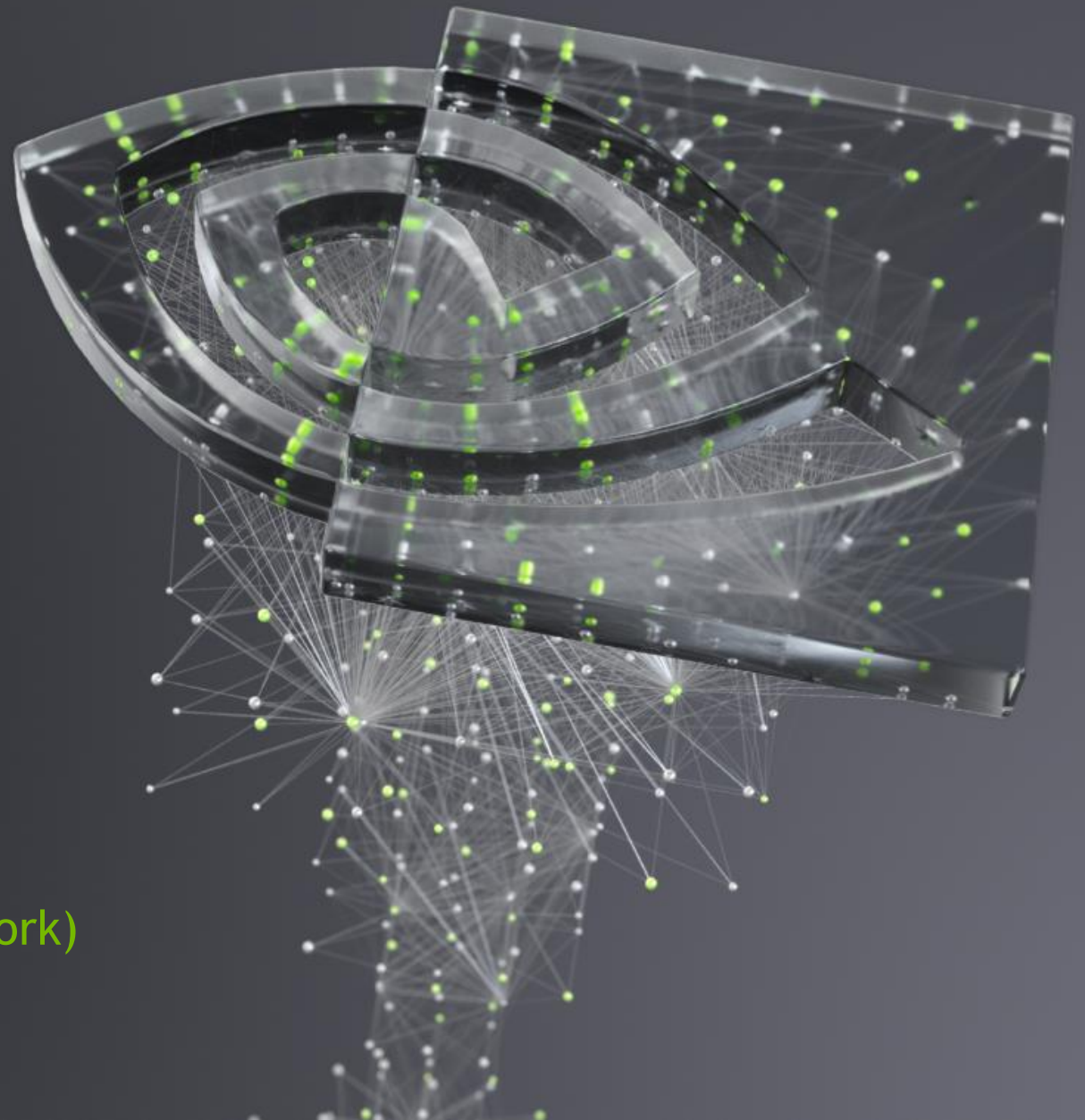

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# 딥러닝의 기초

## 3부: CNN(Convolutional Neural Network)

# 목차

# 목차 – 3부

- 커널과 합성곱
- 커널과 뉴럴 네트워크
- 모델의 다른 레이어

# HANDS-ON 요약

밀집(Fully-connected) 뉴럴 네트워크 모델 학습

트레이닝 정확도가 높음

검증 정확도가 낮음

과적합의 증거

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# 커널과 합성곱
# KERNELS AND CONVOLUTION

# 커널과 합성곱 (KERNELS AND CONVOLUTION)

이미지 원본

흐리게 하기

선명하게 하기

밝게 하기

어둡게 하기

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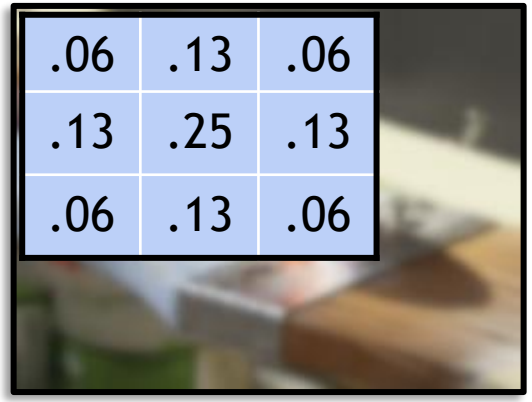
# 커널과 합성곱 (KERNELS AND CONVOLUTION)

이미지 원본

흐리게 하기

| | | |
|---|---|---|
| .06 | .13 | .06 |
| .13 | .25 | .13 |
| .06 | .13 | .06 |



선명하게 하기

| | | |
|---|---|---|
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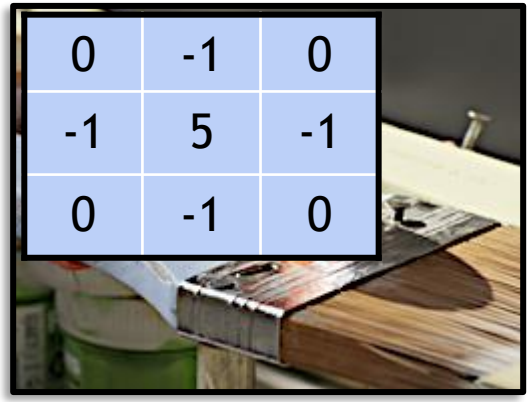
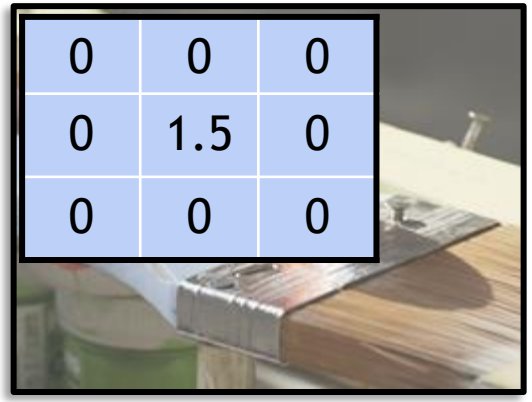
| -1 | 5 | -1 |
| 0 | -1 | 0 |



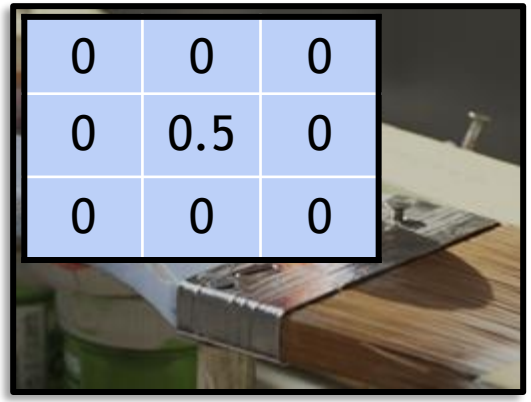
밝게 하기

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1.5 | 0 |
| 0 | 0 | 0 |



어둡게 하기

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 0.5 | 0 |
| 0 | 0 | 0 |



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# 커널과 합성곱 (KERNELS AND CONVOLUTION)

흐리게 하기 커널

| | | |
|---|---|---|
| .06 | .13 | .06 |
| .13 | .25 | .13 |
| .06 | .13 | .06 |

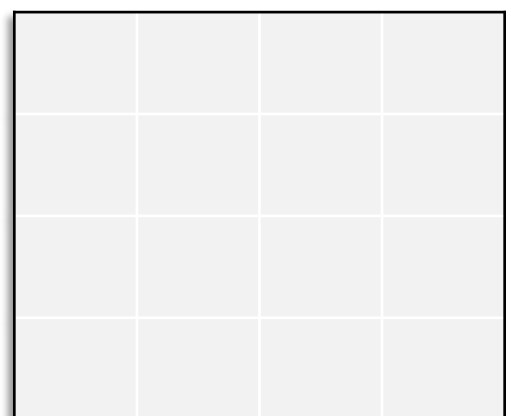
*

이미지 원본

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 |

=

합성곱이 수행된 이미지



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# 커널과 합성곱 (KERNELS AND CONVOLUTION)


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# 커널과 합성곱 (KERNELS AND CONVOLUTION)


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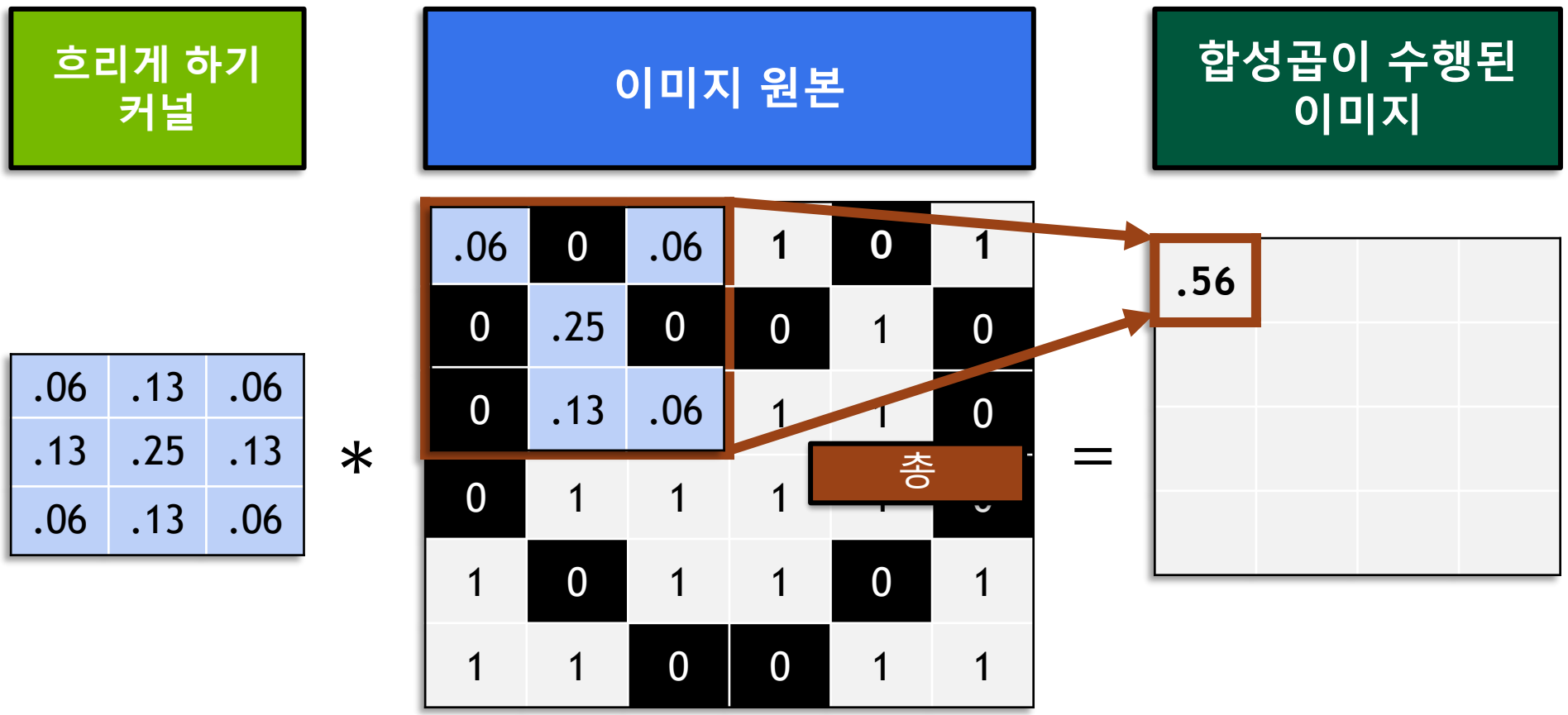
# 커널과 합성곱 (KERNELS AND CONVOLUTION)

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# 커널과 합성곱 (KERNELS AND CONVOLUTION)


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# 커널과 합성곱 (KERNELS AND CONVOLUTION)


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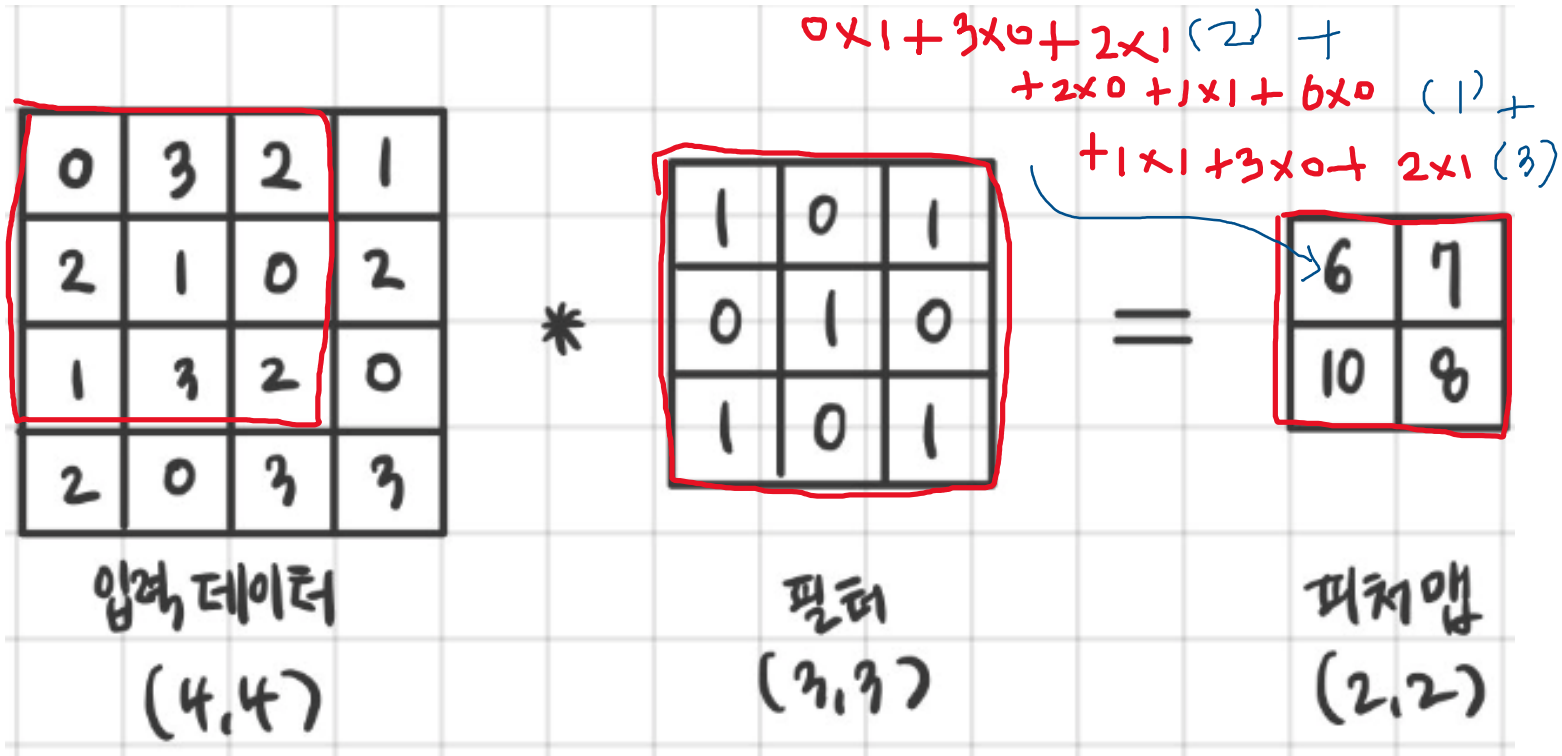
# 커널과 합성곱 (KERNELS AND CONVOLUTION)

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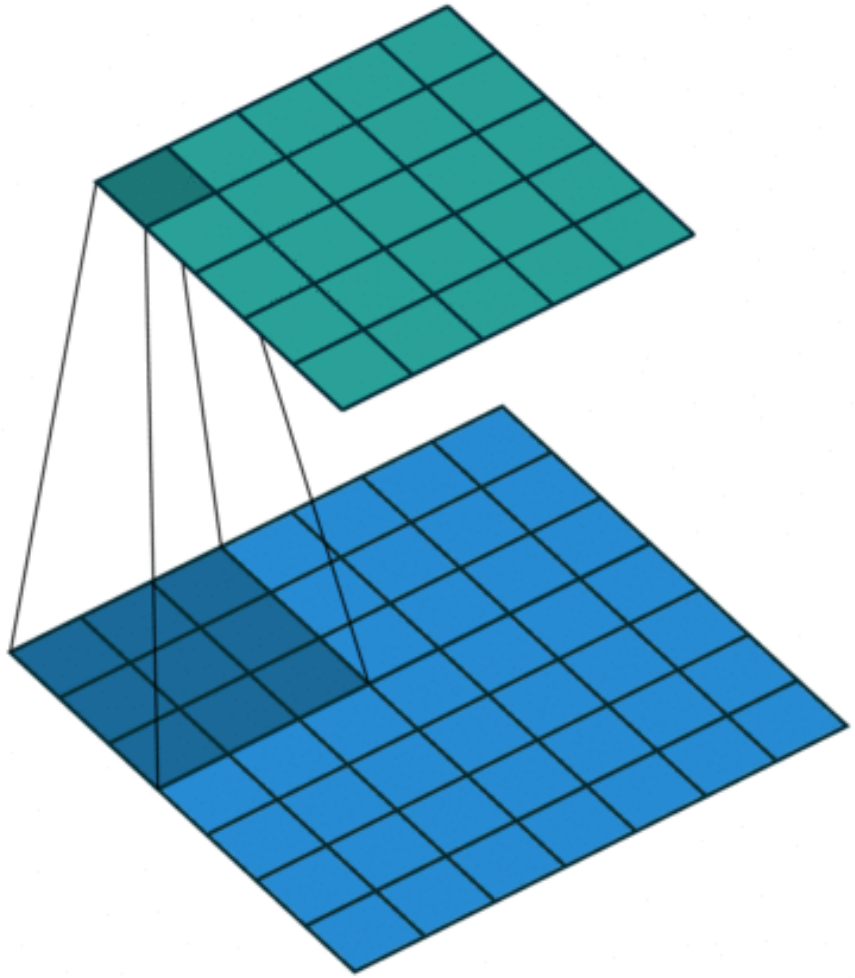
# 커널과 합성곱 (KERNELS AND CONVOLUTION)



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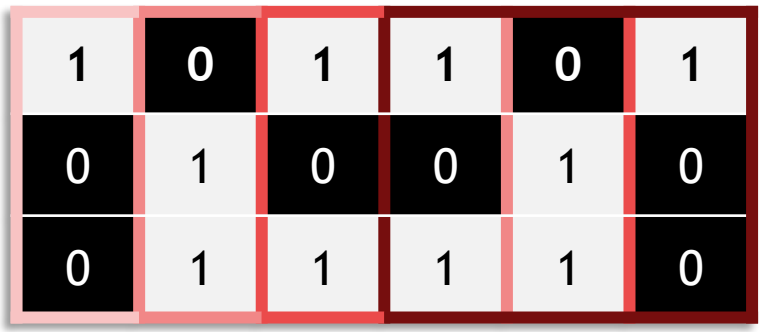
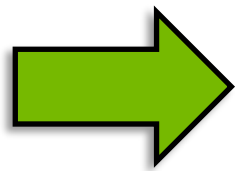
# 스트라이드 (STRIDE)

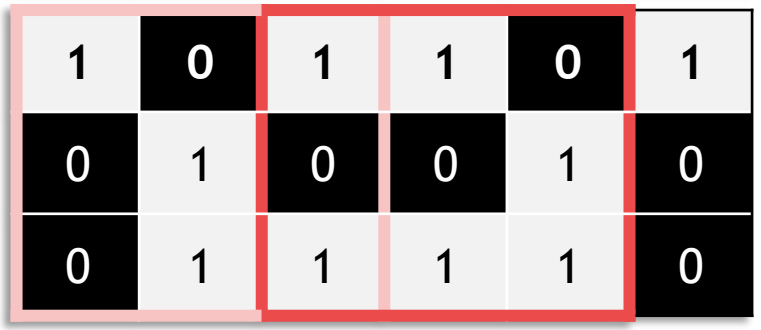
스트라이드 1

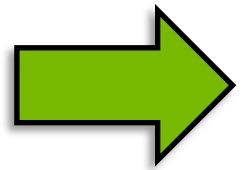


.56 .57 .57 .56

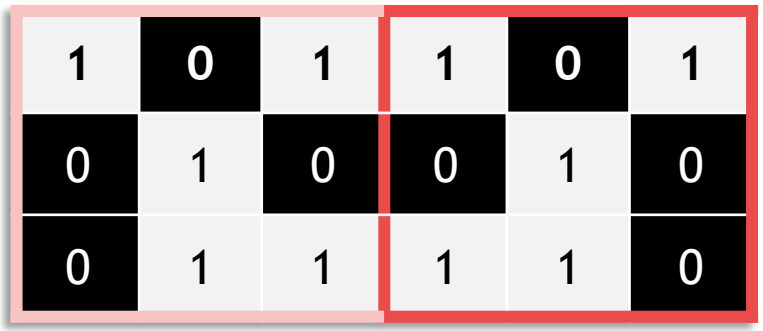
스트라이드 2

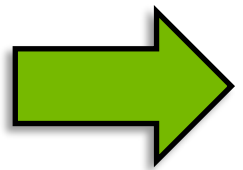


.56 .57

스트라이드 3



.56 .56

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# 패딩 (PADDING)

**이미지 원본**

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 |

**제로 패딩 (Zero Padding)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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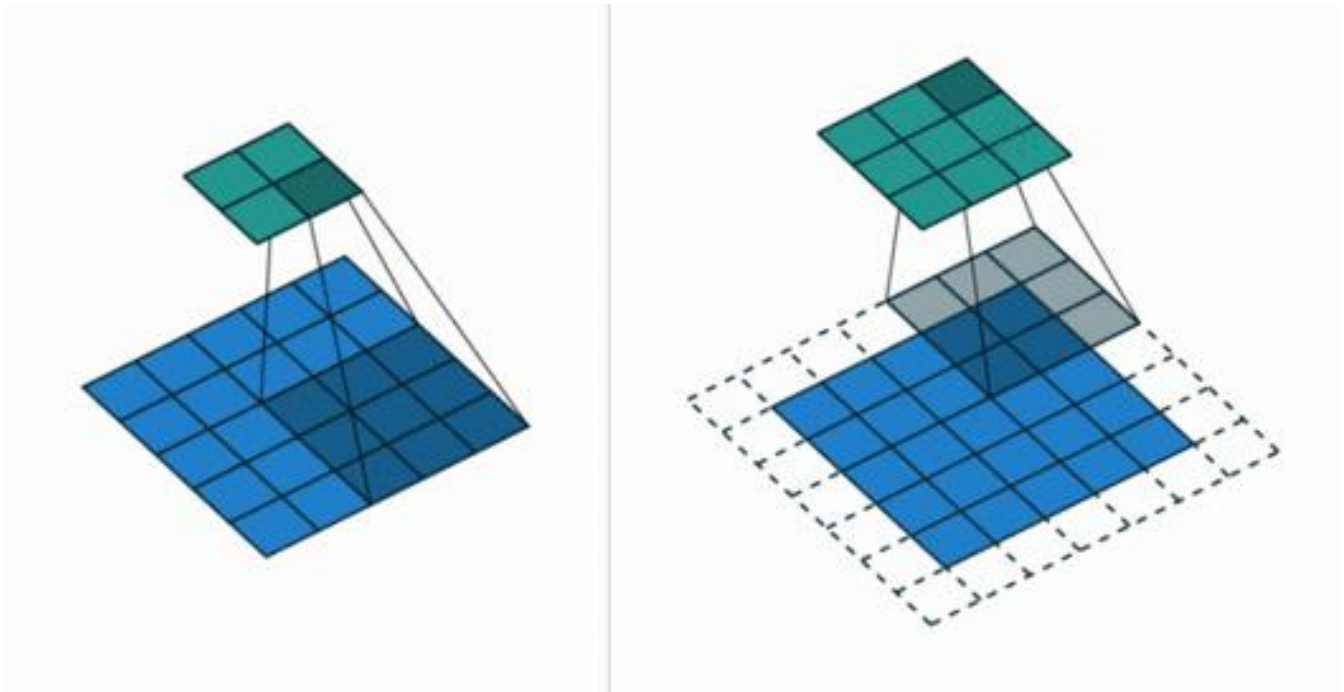
# 합성곱(CONV), 패딩(PADDING), 스트라이드(STRIDE)

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# 커널과 뉴럴 네트워크
# KERNELS AND NEURAL NETWORKS

# 커널과 뉴럴 네트워크

**커널**
**(Kernel)**

| | | |
|---|---|---|
| $W_1$ | $W_2$ | $W_3$ |
| $W_4$ | $W_5$ | $W_6$ |
| $W_7$ | $W_8$ | $W_9$ |

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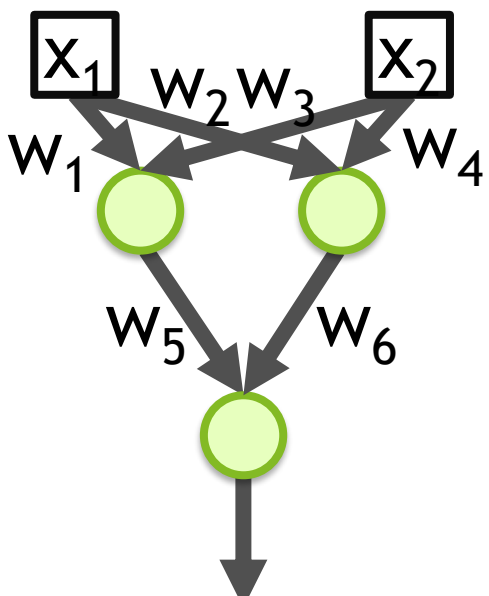
# 커널과 뉴럴 네트워크

**커널 (Kernel)**

| | | |
|---|---|---|
| $w_1$ | $w_2$ | $w_3$ |
| $w_4$ | $w_5$ | $w_6$ |
| $w_7$ | $w_8$ | $w_9$ |

**뉴런 (Neuron)**




CNN backpropagation :
https://www.jefkine.com/general/2016/09/05/backpropagation-in-convolutional-neural-networks/

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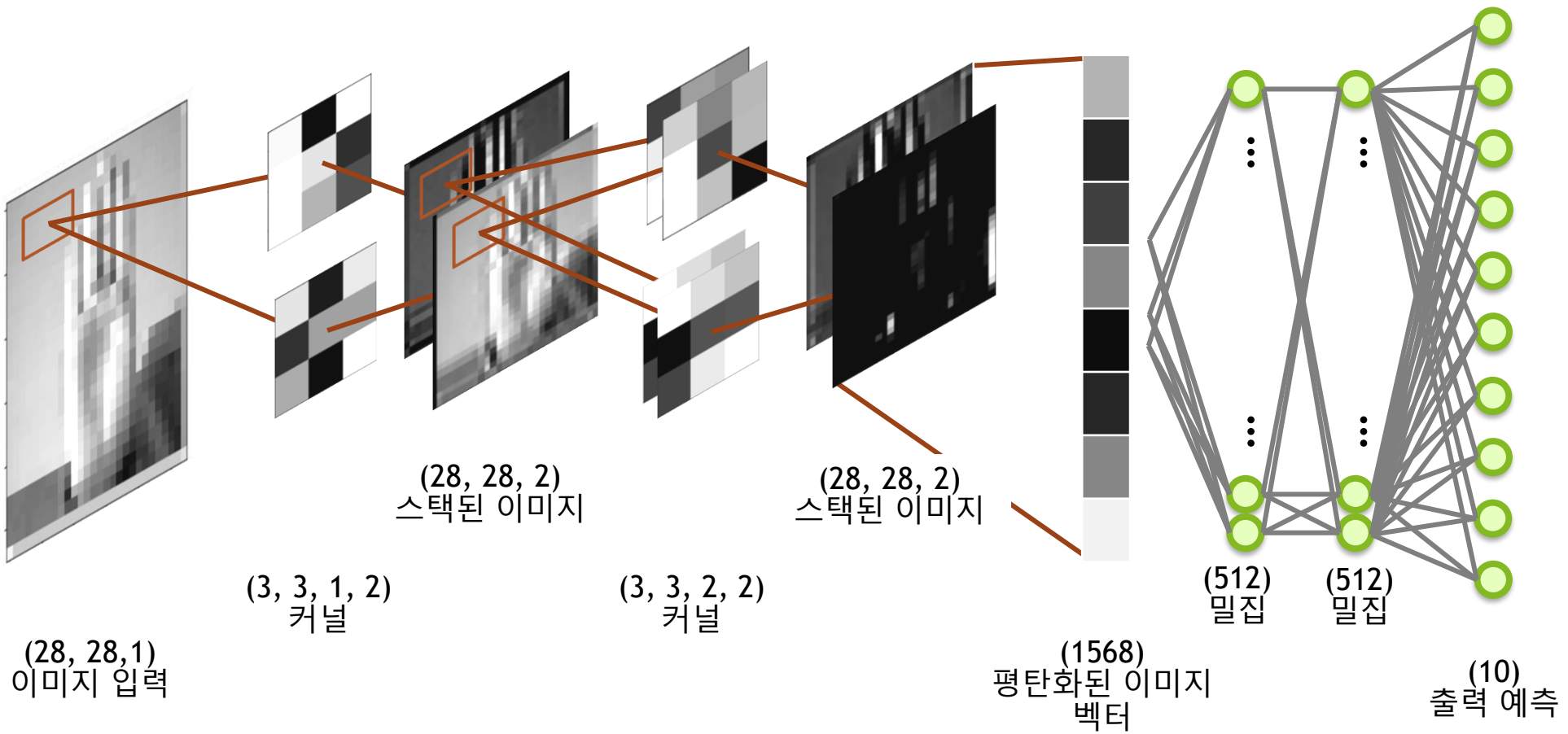
# 커널과 뉴럴 네트워크




Kenrel 시각화 :
https://stackoverflow.com/questions/43305891/how-to-correctly-get-layer-weights-from-conv2d-in-keras

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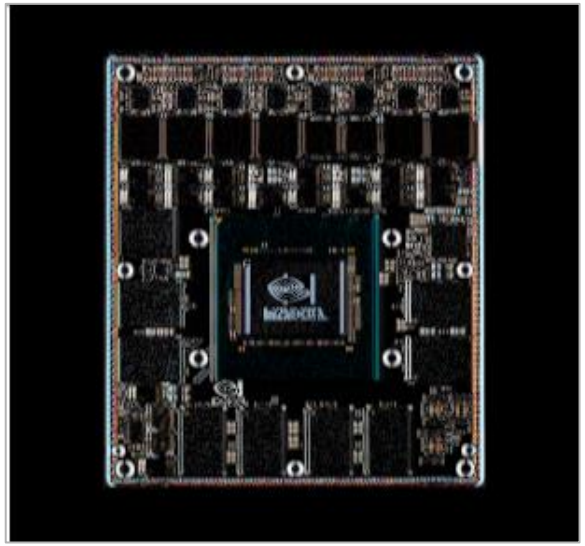
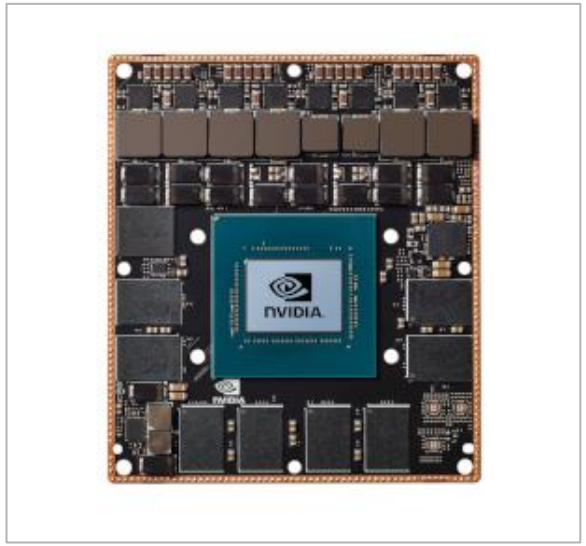
# 엣지(EDGE) 찾기

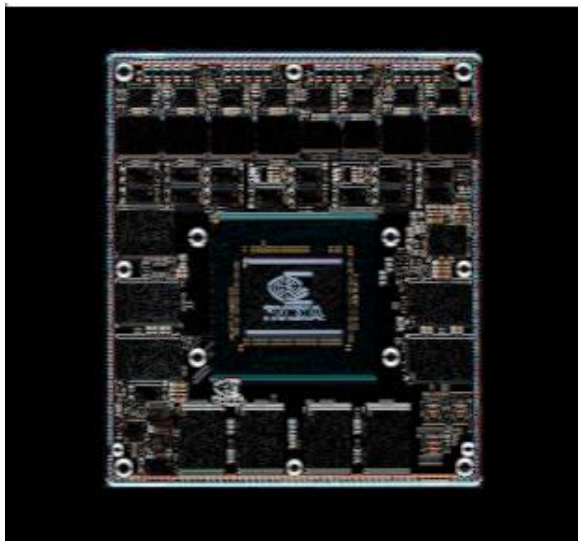
| 수직 엣지 | 이미지 원본 | 수평 엣지 |
|---|---|---|



| | | |
|---|---|---|
| 1 | 0 | -1 |
| 2 | 0 | -2 |
| 1 | 0 | -1 |



| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 0 |



| | | |
|---|---|---|
| 1 | 2 | 1 |
| 0 | 0 | 0 |
| -1 | -2 | -1 |

Image Kernel : https://setosa.io/ev/image-kernels/
Stanford cs 데모 사이트 : https://cs.stanford.edu/people/karpathy/convnetjs/demo/cifar10.html

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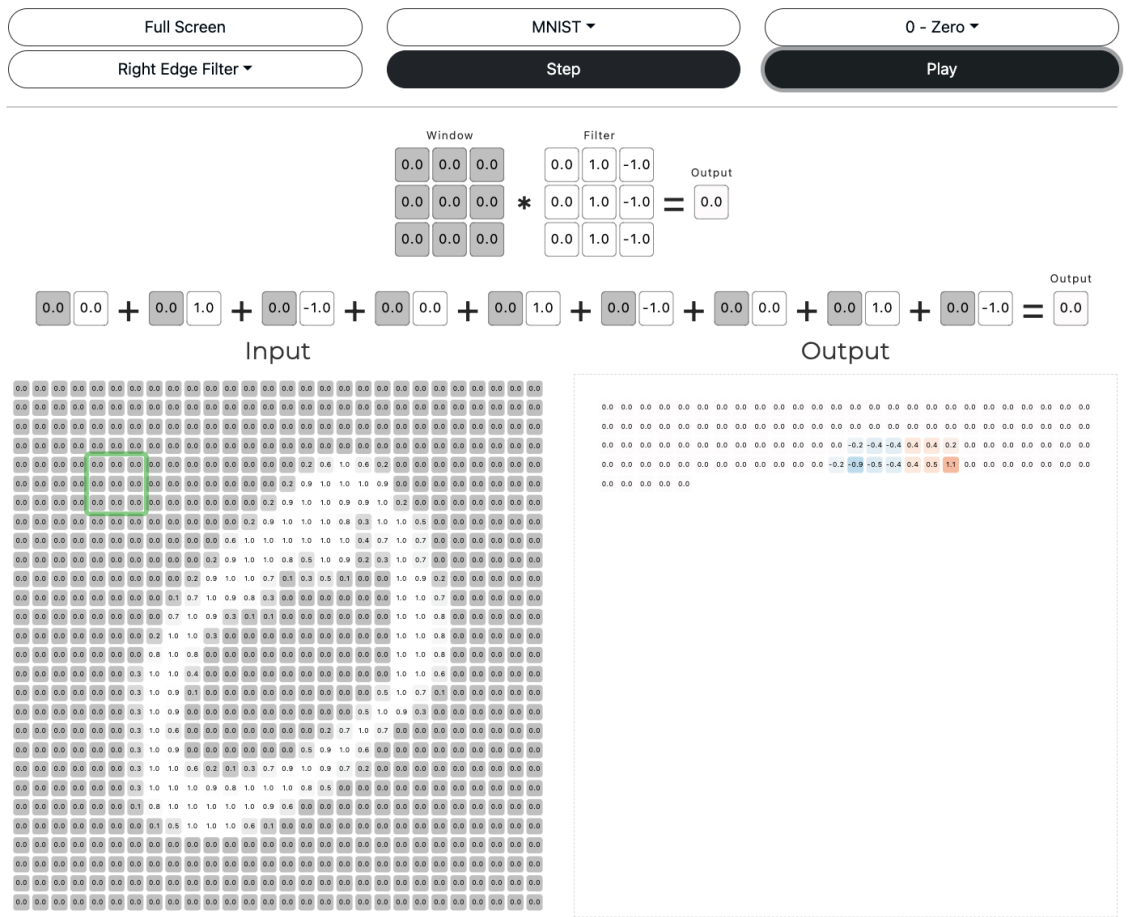
# 합성곱 연산(CONVOLUTION OPERATION)

- 데모 사이트 : https://deeplizard.com/resource/pavq7noze2

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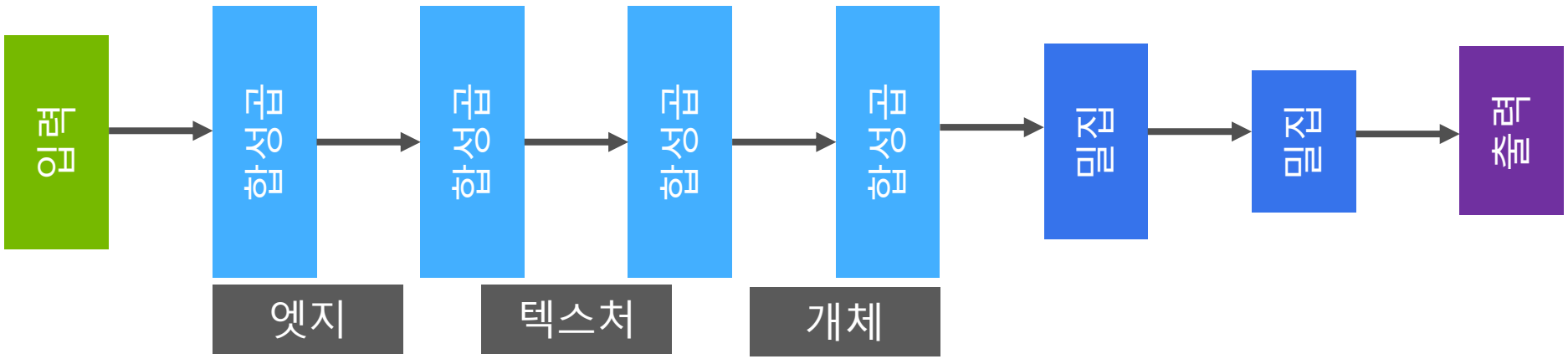
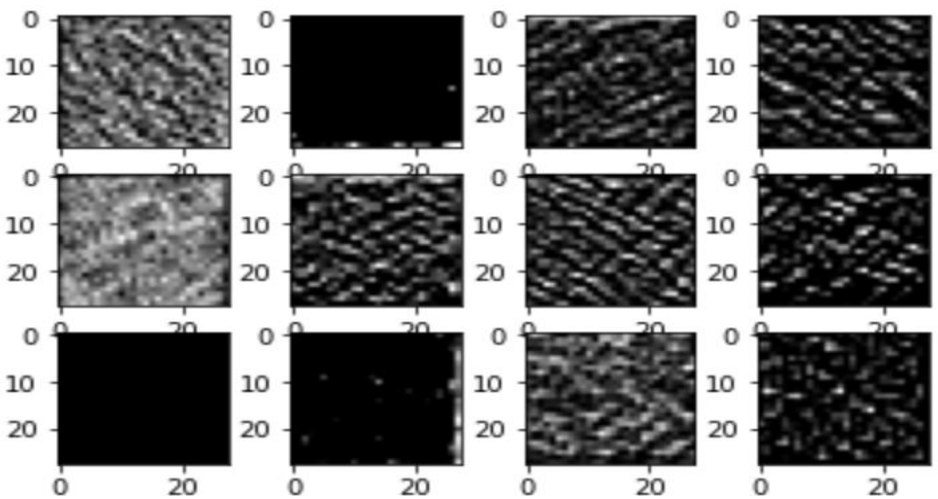
# 뉴럴 네트워크 인식
# (NEURAL NETWORK PERCEPTION)



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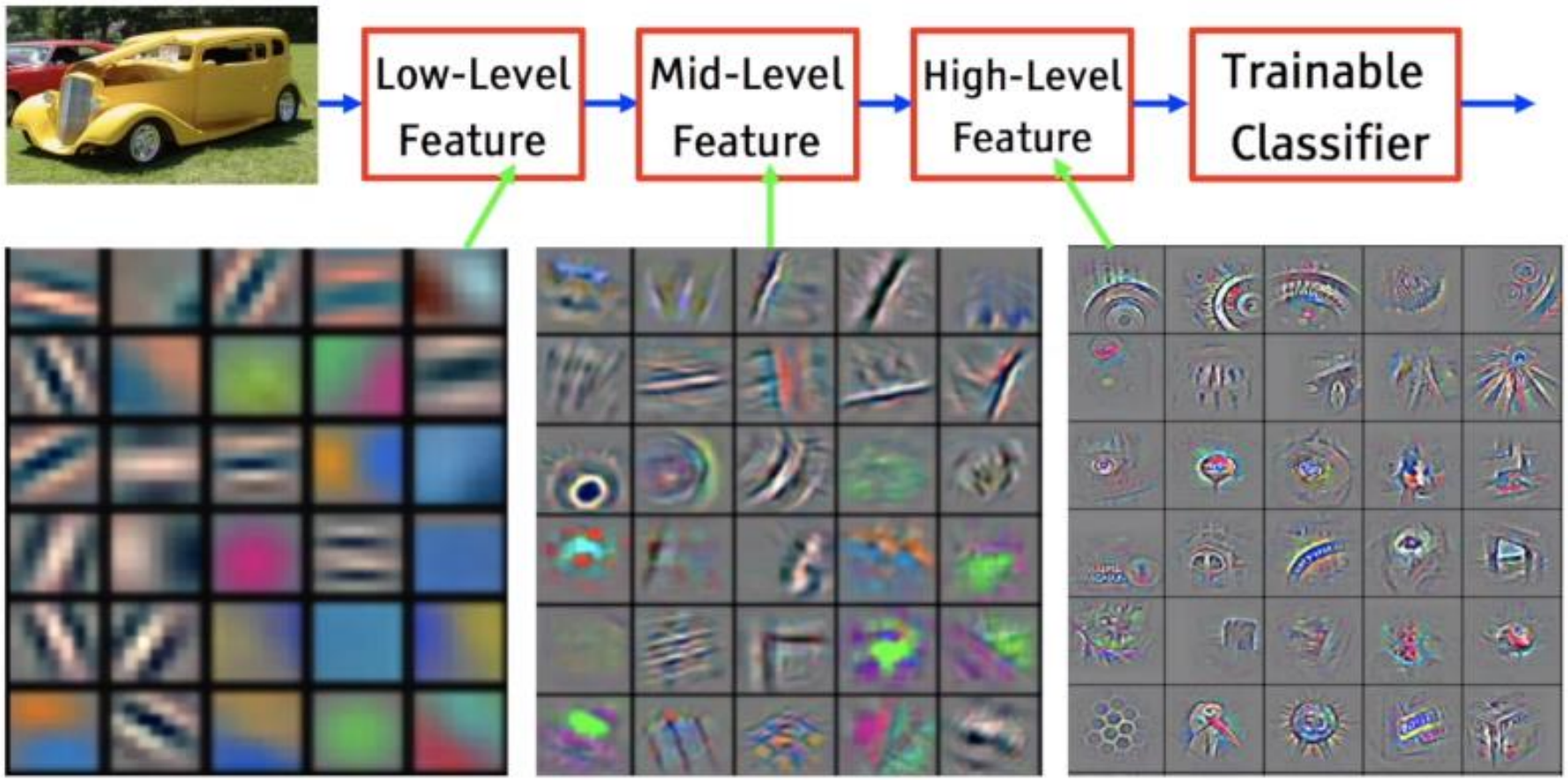
# FEATURE MAP

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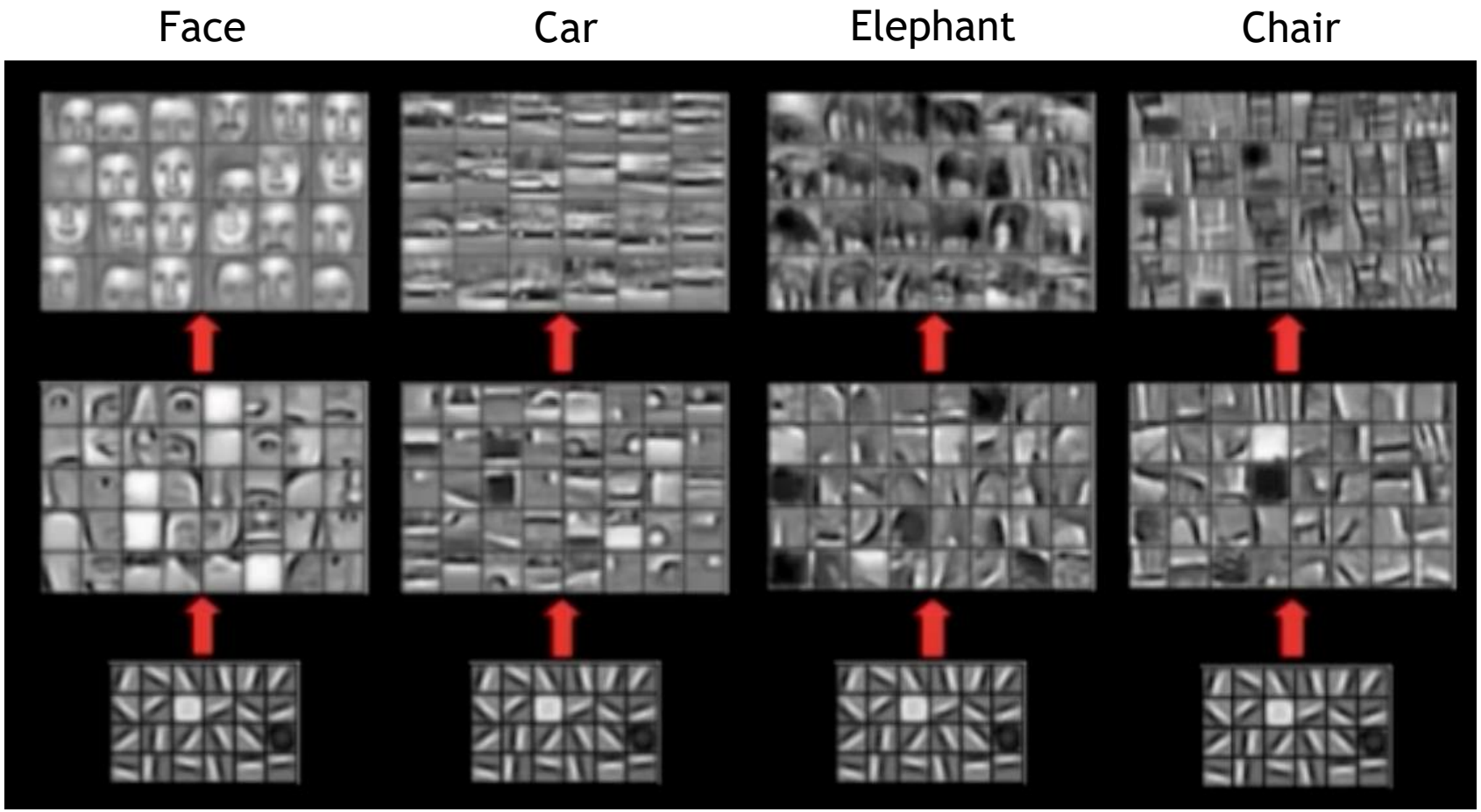
# FEATURE MAP

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# CNN 시각화(VISULATION)

## VGG16

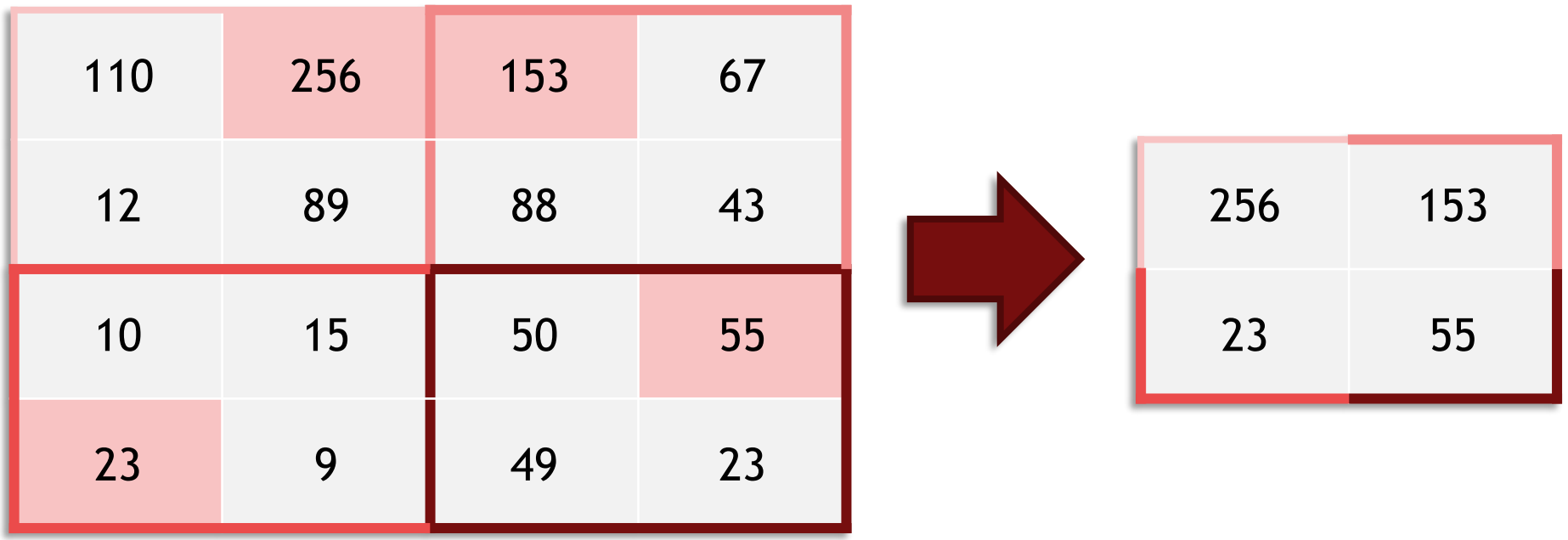
- 데이터 수집
- 모델 생성
- 모델 학습
- 이미지 분류 시각화
- https://www.youtube.com/watch?v=RNnKtNrsrmg

# 뉴럴 네트워크 인식
# (NEURAL NETWORK PERCEPTION)

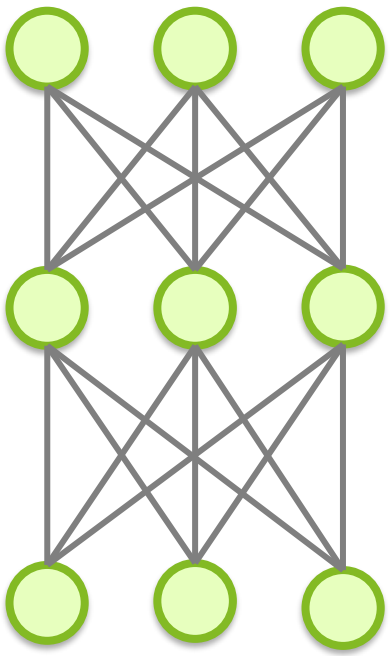
https://deepdreamgenerator.com/
https://towardsdatascience.com/how-to-visualize-convolutional-features-in-40-lines-of-code-70b7d87b0030

# 기타 레이어
# OTHER LAYERS IN THE MODEL

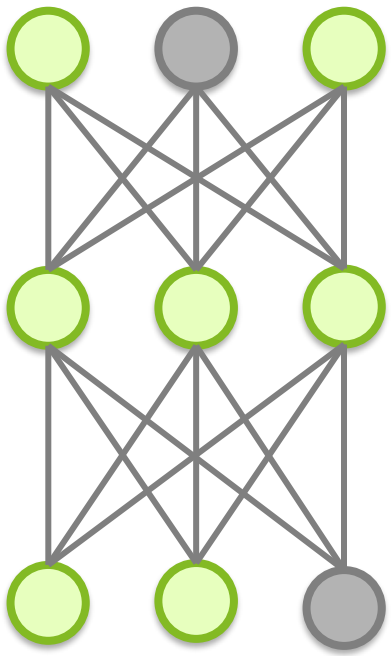
# MAX POOLING



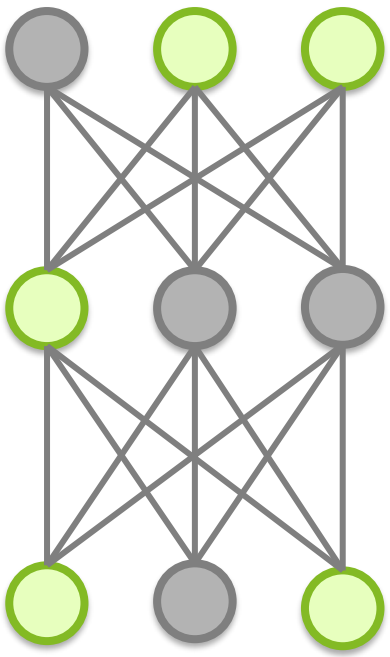
# 드롭아웃 (DROPOUT)



비율 = 0



비율 = .2



비율 = .4

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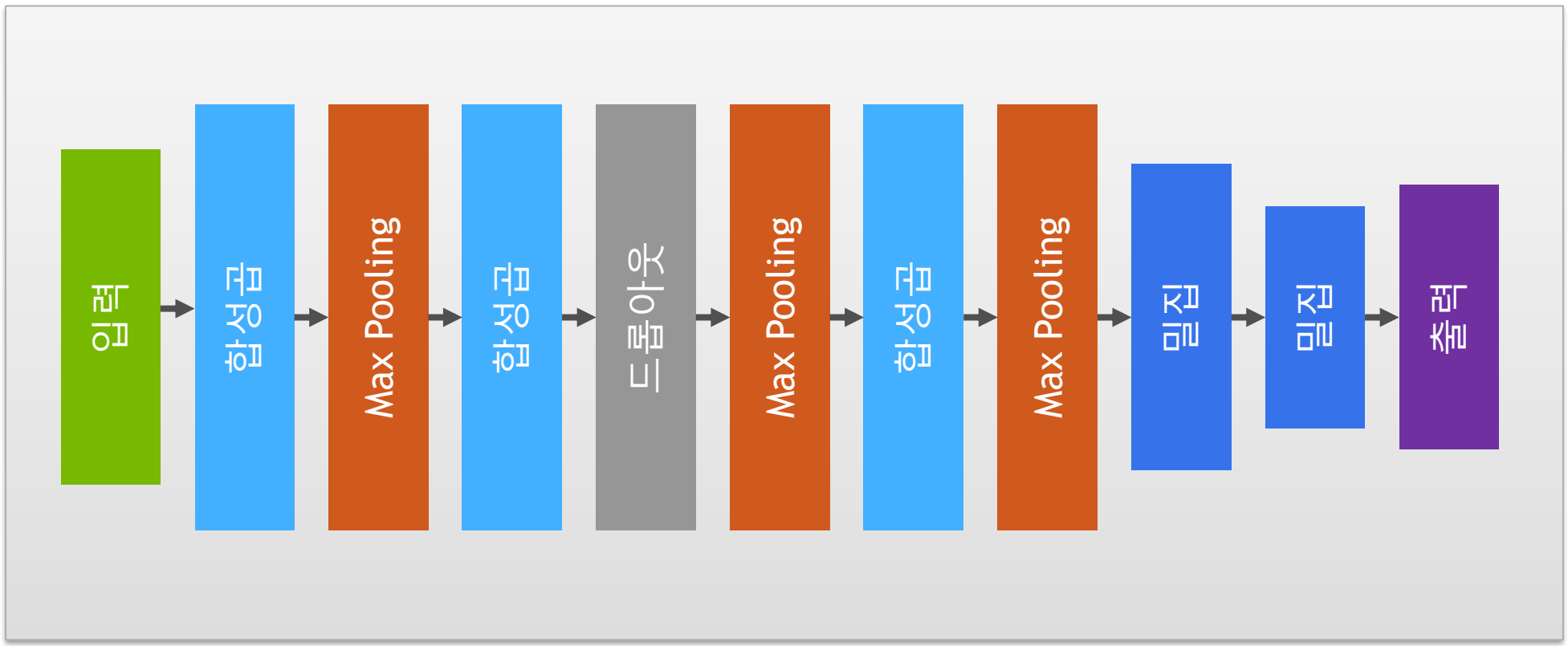
# 전체 아키텍처

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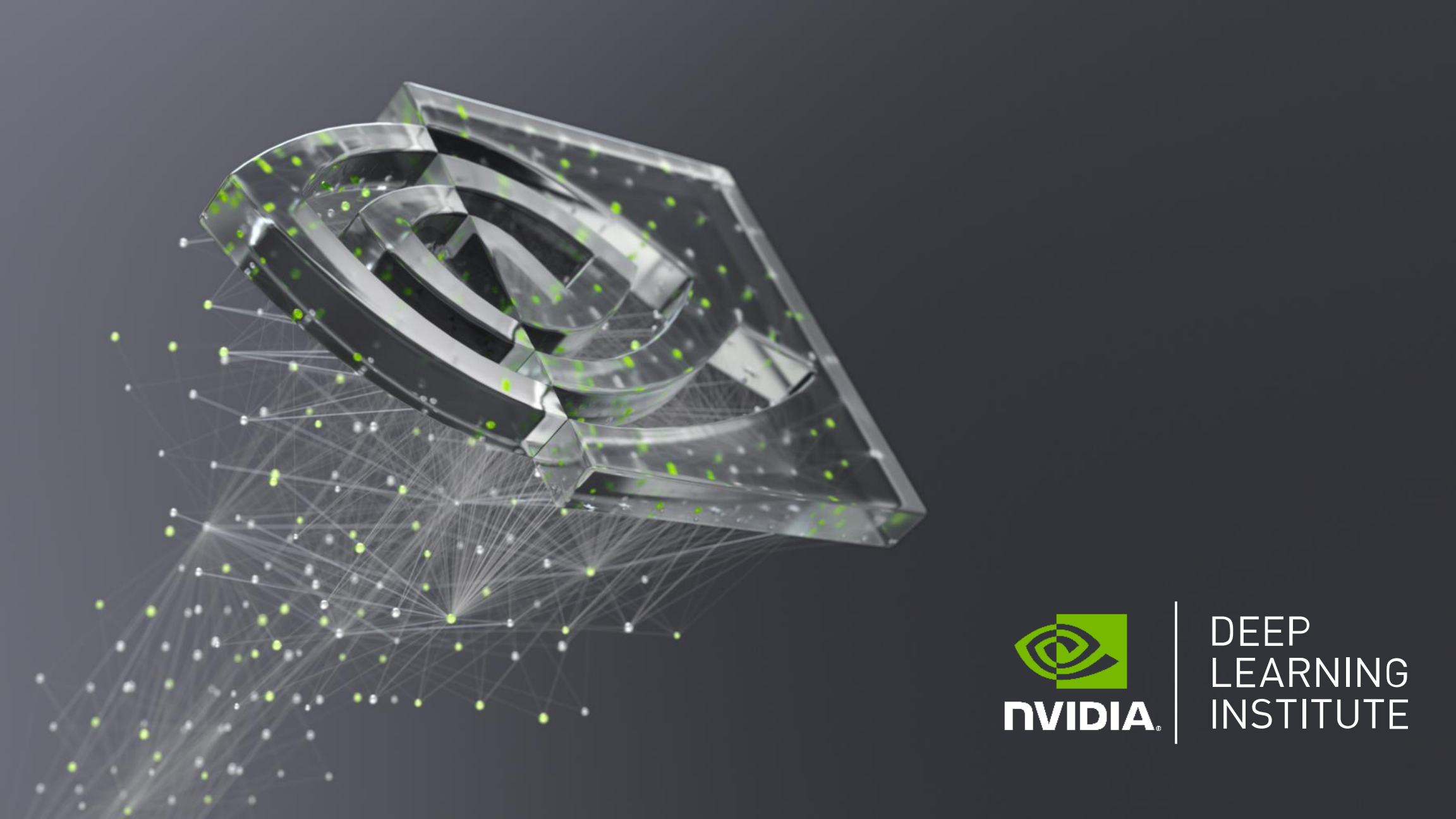
시작하겠습니다!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