Deep Learning 101

3주차

12기 이두형
12기 임효진

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Curriculum

1주차 : 딥러닝 소개 및 기초 (XOR문제, 퍼셉트론, 활성화 함수 등)

2주차 : Multi-layer Neural Network (Loss Function, Gradient Descending, Backpropagation, MNIST practice, Optimization)

3주차 : CNN 소개 및 기초 (Convolution, Padding, Stride, Pooling등 기초 개념 소개)

4주차 : CNN 실습 (세션 후 조별 과제 부여)

5주차 : RNN, LSTM, GRU

6주차 : seq2seq, 실습 (세션 후 조별 과제 부여)

7주차 : 조별 과제 발표

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Review

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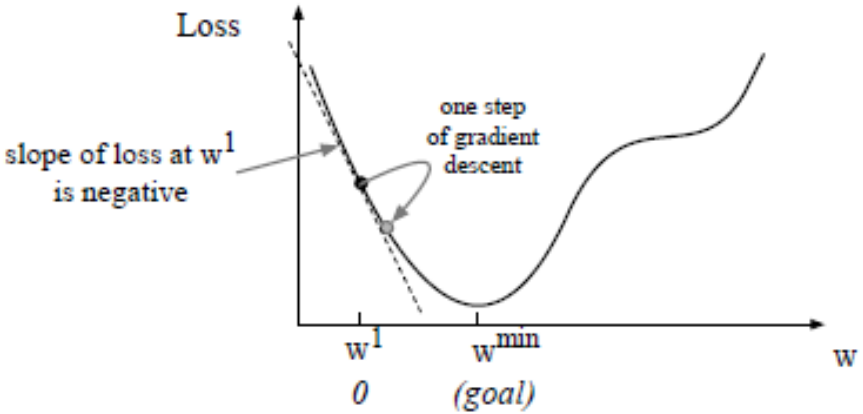
Review

- Gradient Descending



- Batch Gradient Descent
- Stochastic Gradient Descent
- Mini-Batch Gradient Descent

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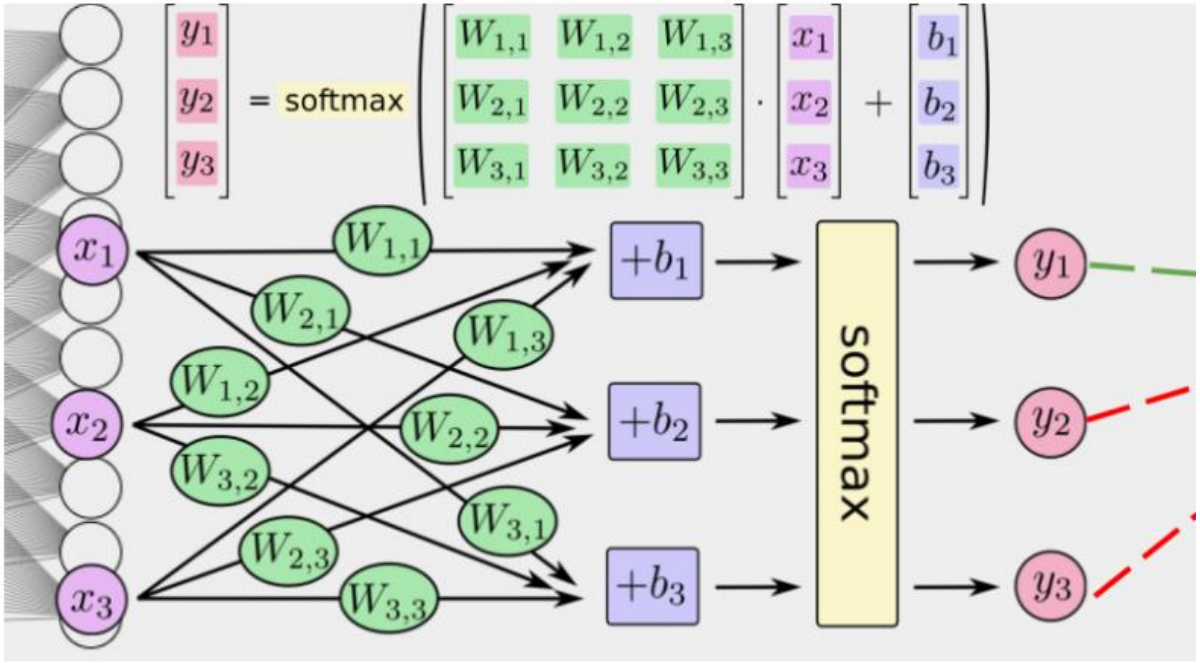
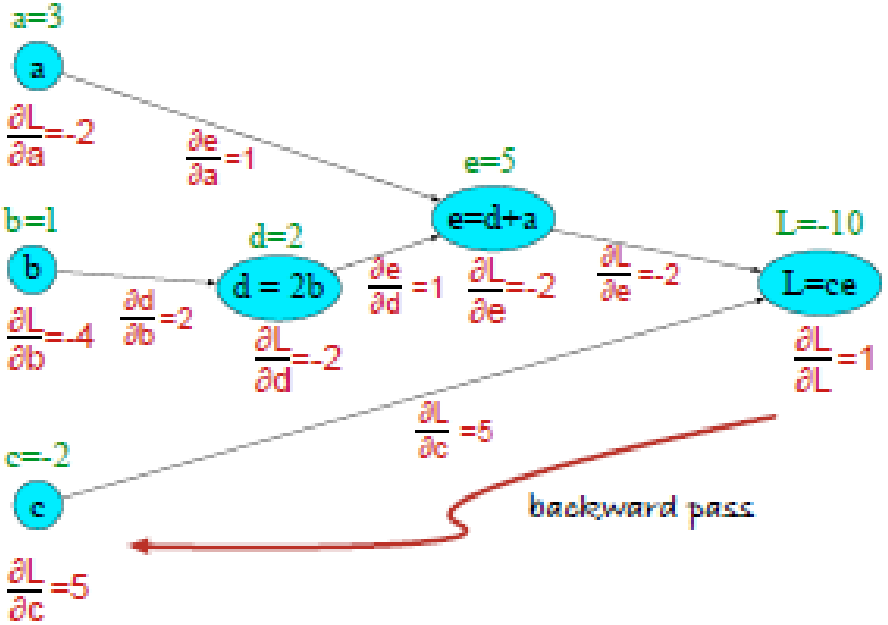
Review

- Multi-Layer Perceptron



Review

- Back Propagation



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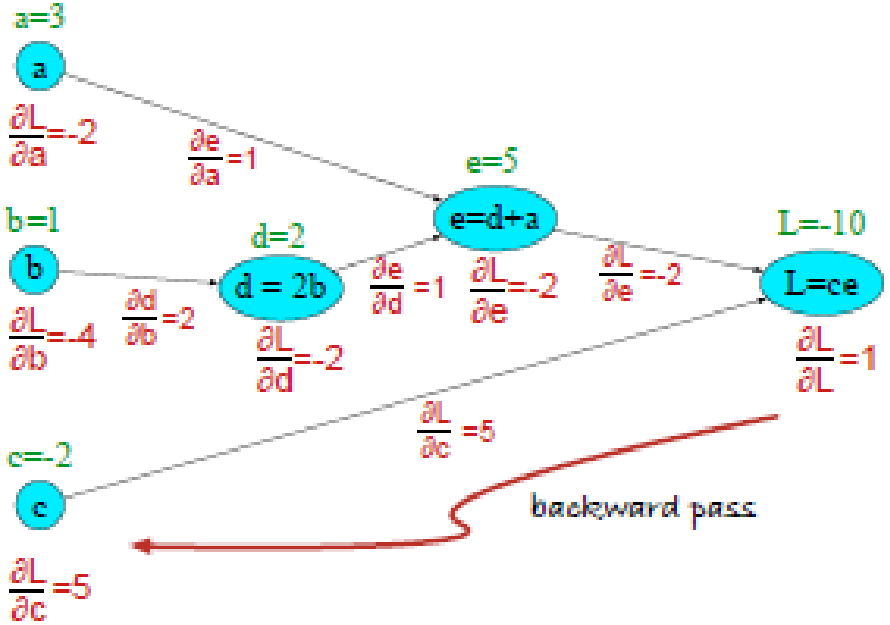
Review

- Back Propagation



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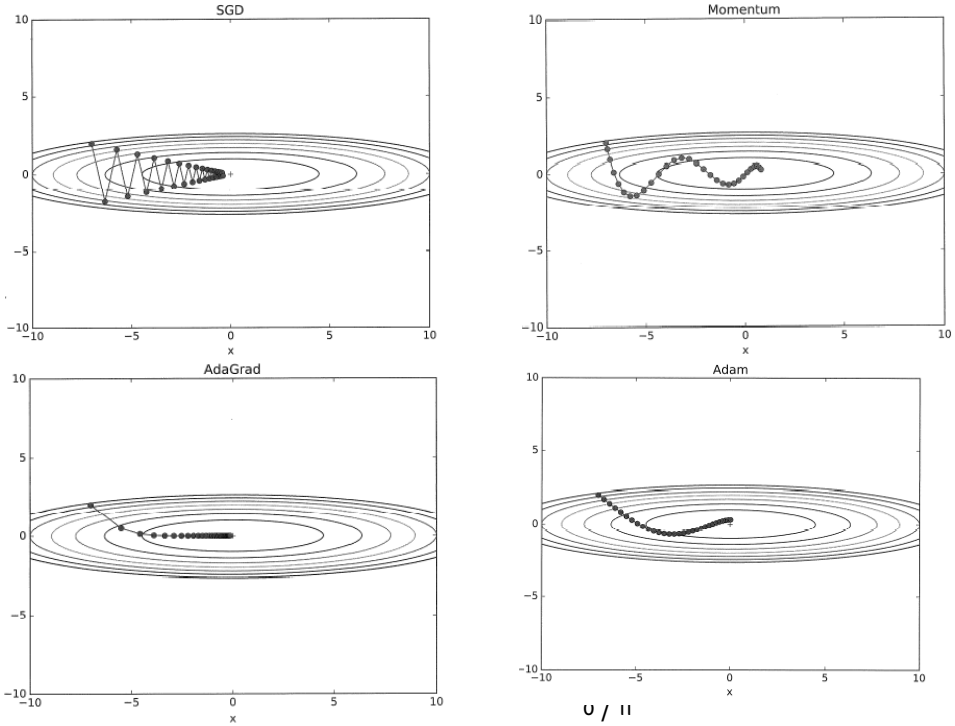
Review

- Optimizer



Review

- Weight Initialization

- Xavier Initialization

$$W \sim Unif\left(-\sqrt{\frac{6}{n_{in}+n_{out}}}, +\sqrt{\frac{6}{n_{in}+n_{out}}}\right)$$

$$W \sim N\left(0, \left(\sqrt{\frac{2}{n_{in}+n_{out}}}\right)^2\right)$$

- He Initialization

$$W \sim Unif\left(-\sqrt{\frac{6}{n_{in}}}, +\sqrt{\frac{6}{n_{in}}}\right)$$

$$W \sim N\left(0, \left(\sqrt{\frac{2}{n_{in}}}\right)^2\right)$$

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Review

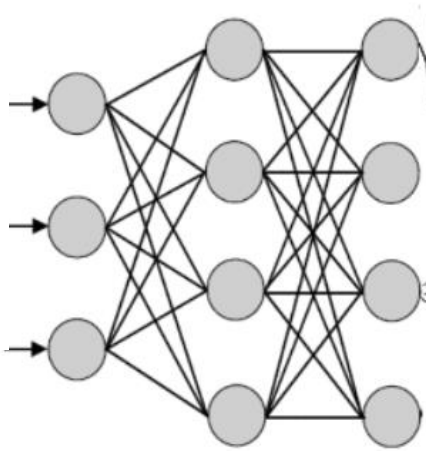
- Batch Normalizatioin & Dropout

$$\mu_{\mathcal{B}} \leftarrow \frac{1}{m}\sum_{i=1}^{m} x_i \qquad \text{// mini-batch mean}$$

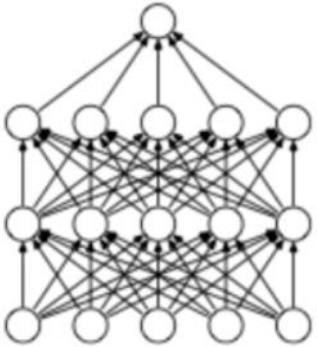
$$\sigma^2_{\mathcal{B}} \leftarrow \frac{1}{m}\sum_{i=1}^{m} (x_i - \mu_{\mathcal{B}})^2 \qquad \text{// mini-batch variance}$$

$$\hat{x}_i \leftarrow \frac{x_i - \mu_{\mathcal{B}}}{\sqrt{\sigma^2_{\mathcal{B}} + \epsilon}} \qquad \text{// normalize}$$

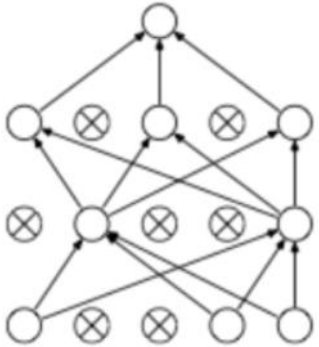
$$y_i \leftarrow \gamma \hat{x}_i + \beta \equiv \mathrm{BN}_{\gamma,\beta}(x_i) \qquad \text{// scale and shift}$$



Dropout: A Simple Way to Prevent Neural Networks from Overfitting [Srivastava et al. 2014]



(a) Standard Neural Net



(b) After applying dropout.

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Week3

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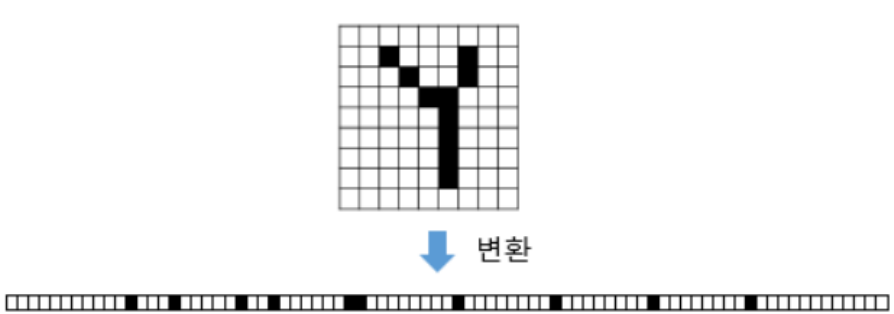
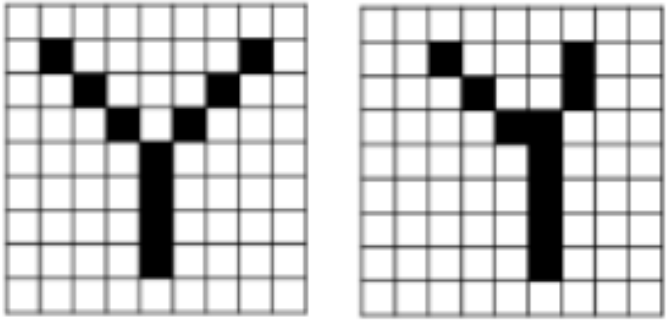
Multi-Layer Perceptron

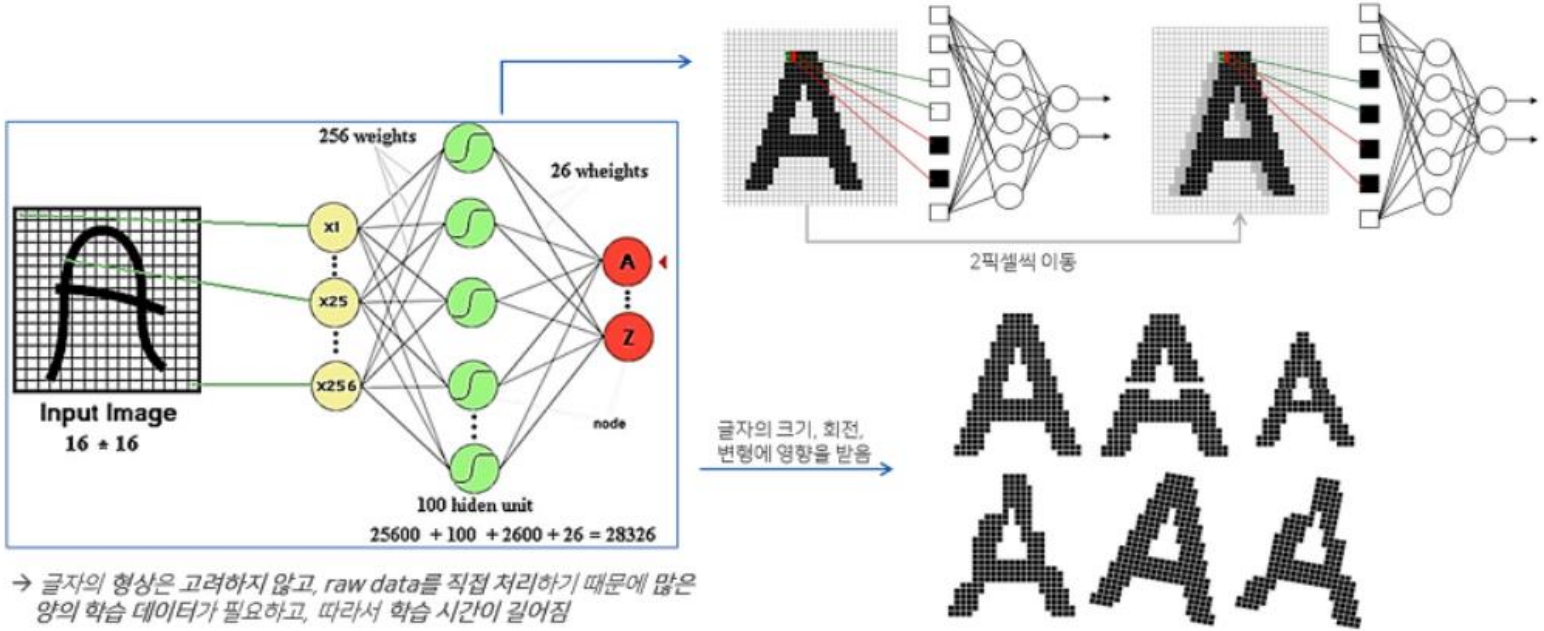
- Problem





Multi-Layer Perceptron

- Problem



→ *글자의 형상은 고려하지 않고, raw data를 직접 처리하기 때문에 많은 양의 학습 데이터가 필요하고, 따라서 학습 시간이 길어짐*

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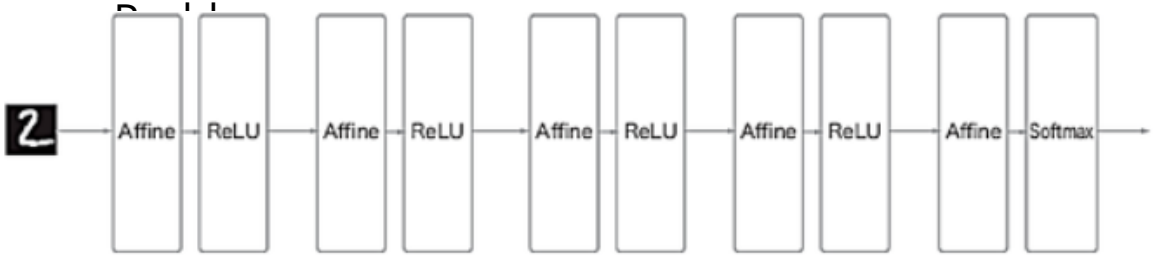
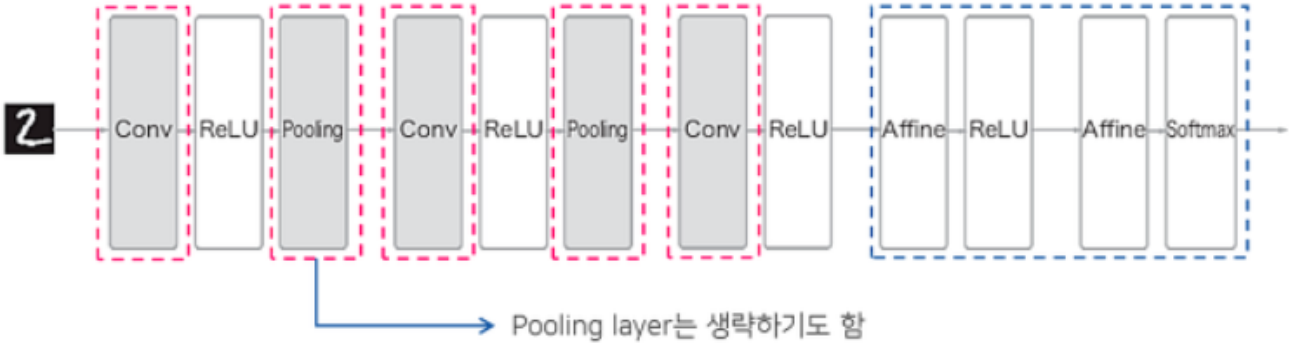
CNN (Convolution Neural Network)





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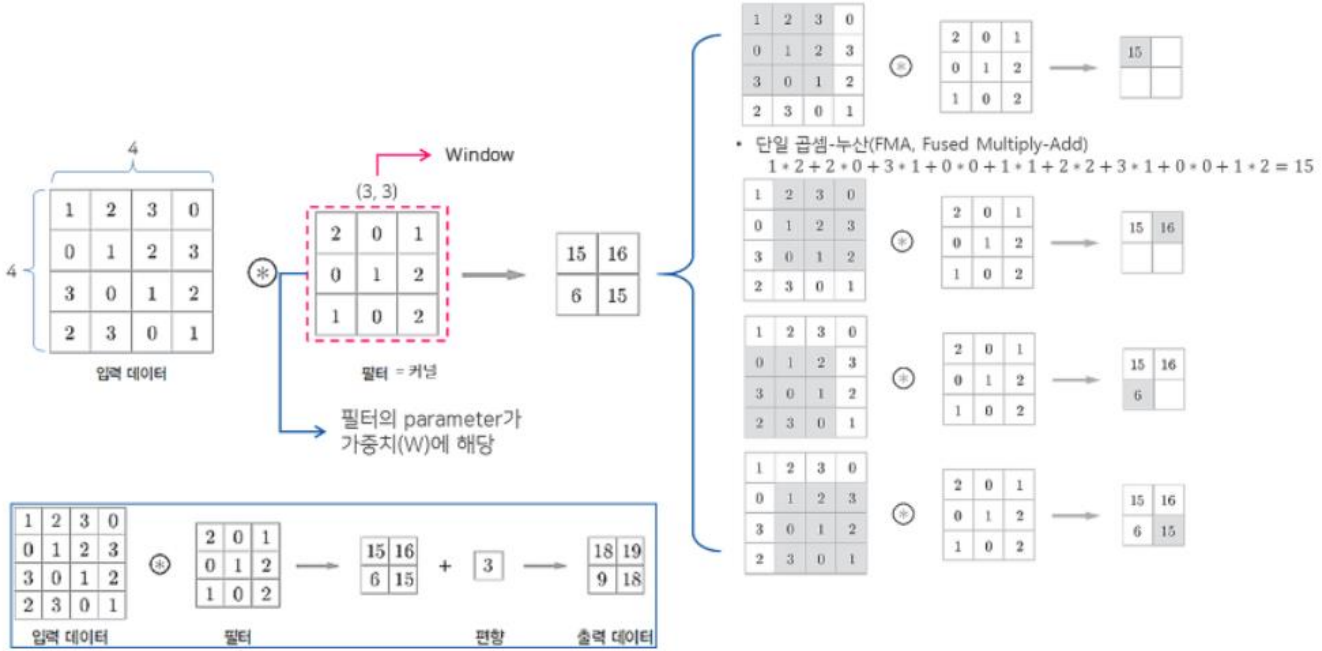
CNN (Convolution Neural Network)

- Convolution



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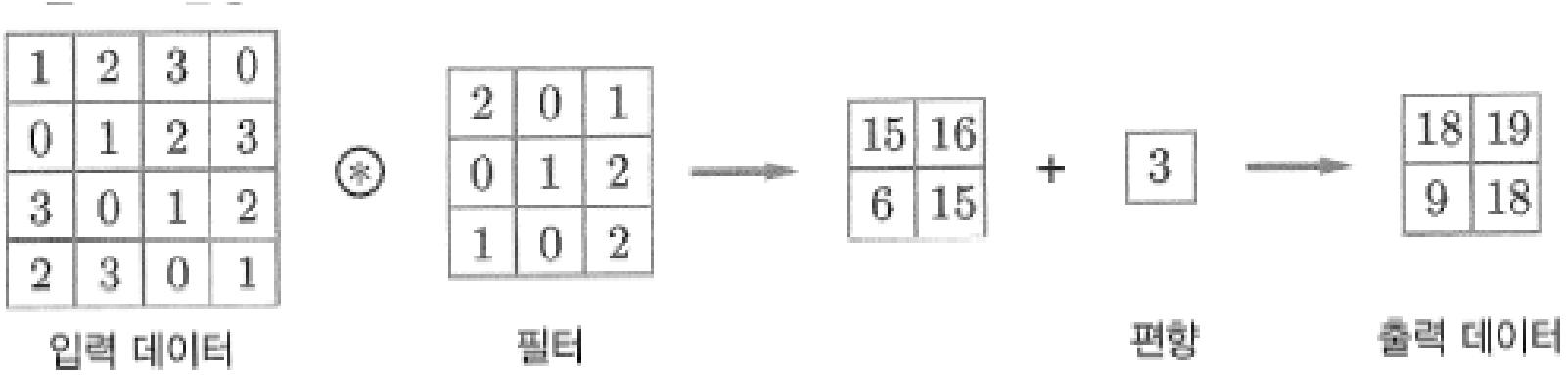
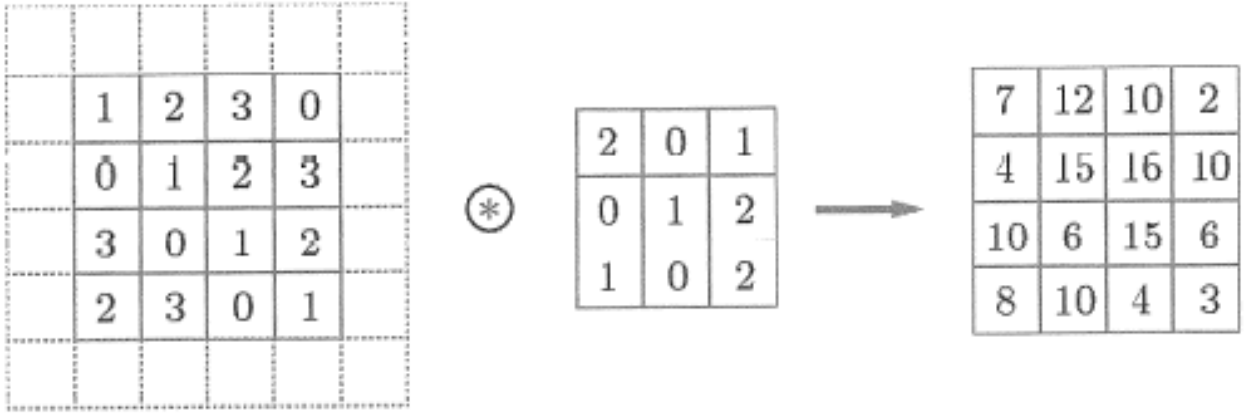
CNN (Convolution Neural Network)

- Padding



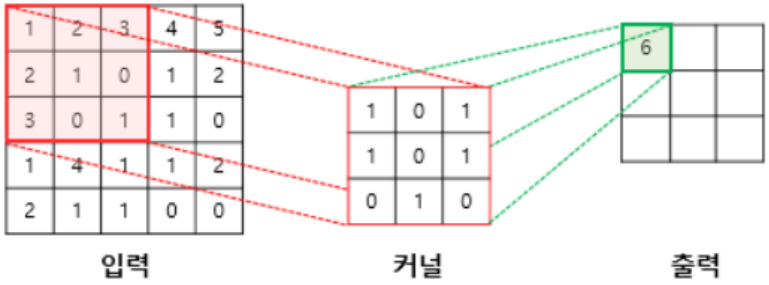
CNN (Convolution Neural Network)

- Padding

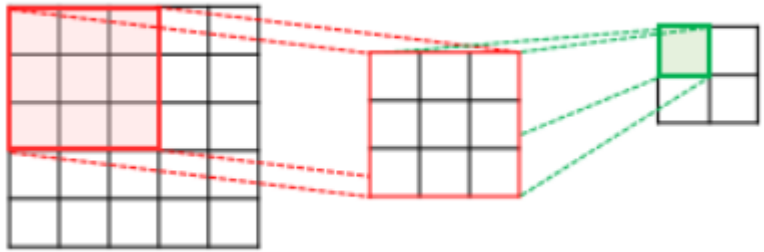


CNN (Convolution Neural Network)

- Stride



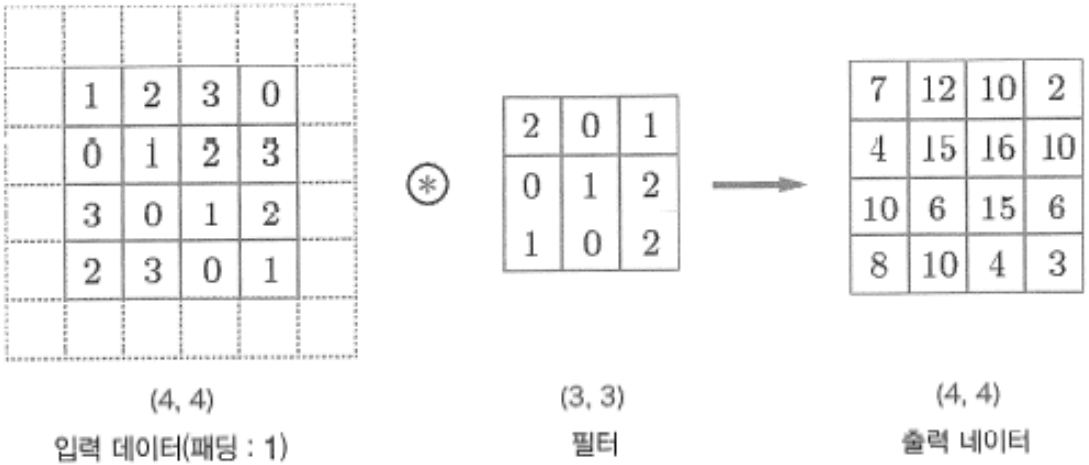
Stride:1



Stride:2

CNN (Convolution Neural Network)

- Feature map size



(4, 4)
입력 데이터(패딩 : 1)

(3, 3)
필터

(4, 4)
출력 데이터

$$OH = \frac{H + 2P - FH}{S} + 1$$

$$OW = \frac{W + 2P - FW}{S} + 1$$

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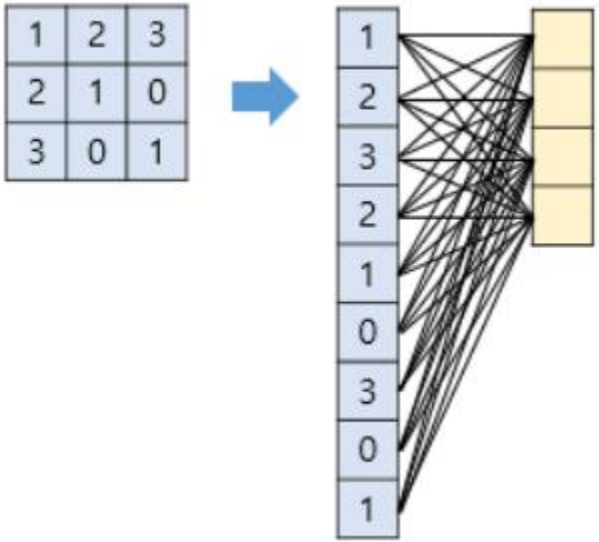
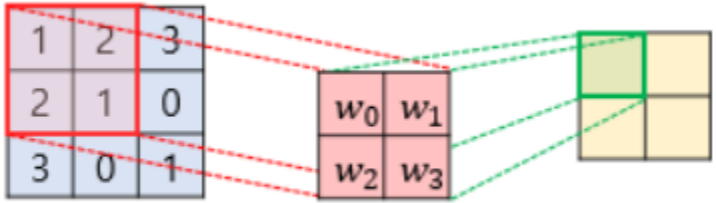
CNN (Convolution Neural Network)

- Parameter





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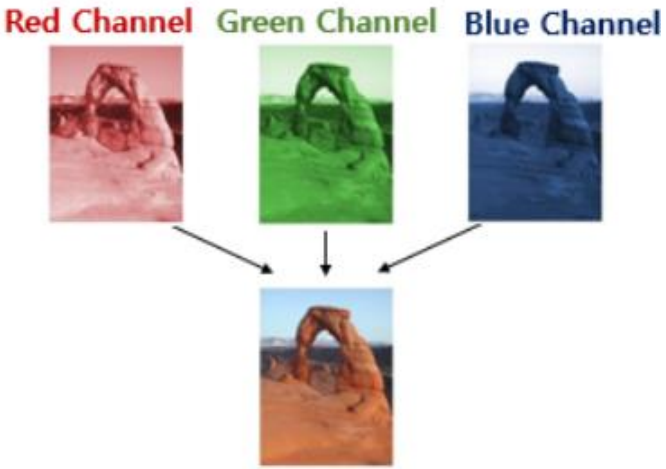
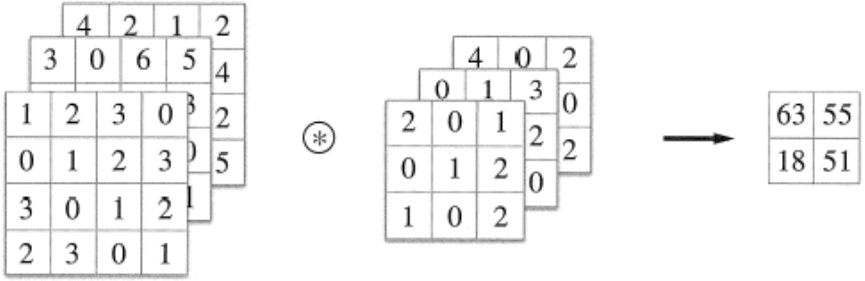
CNN (Convolution Neural Network)

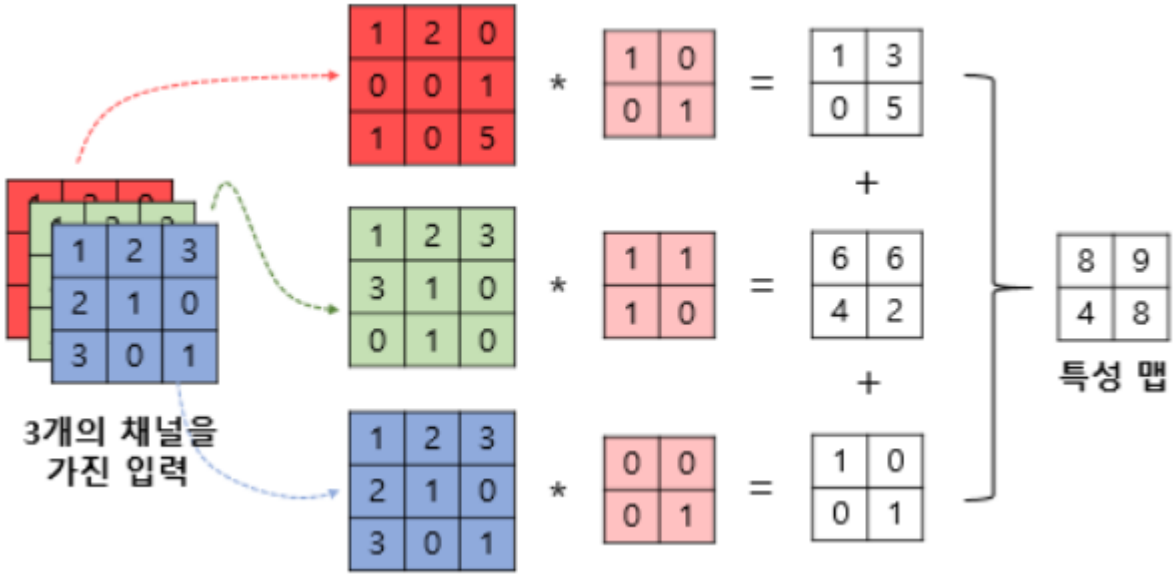
- Channel





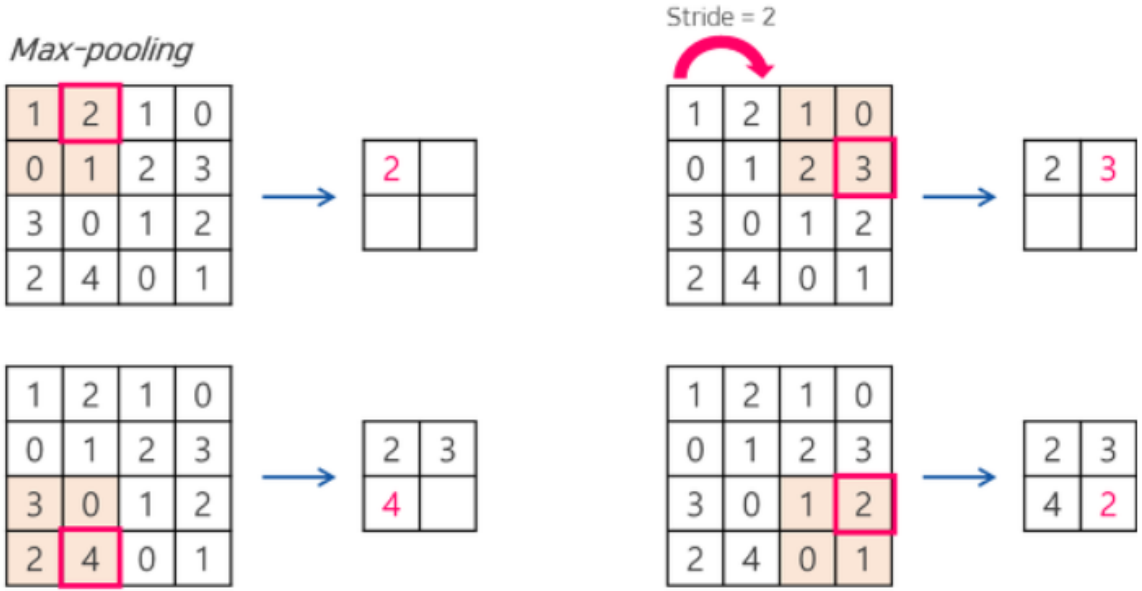
CNN (Convolution Neural Network)

- 3-Dimensional Convolution



CNN (Convolution Neural Network)

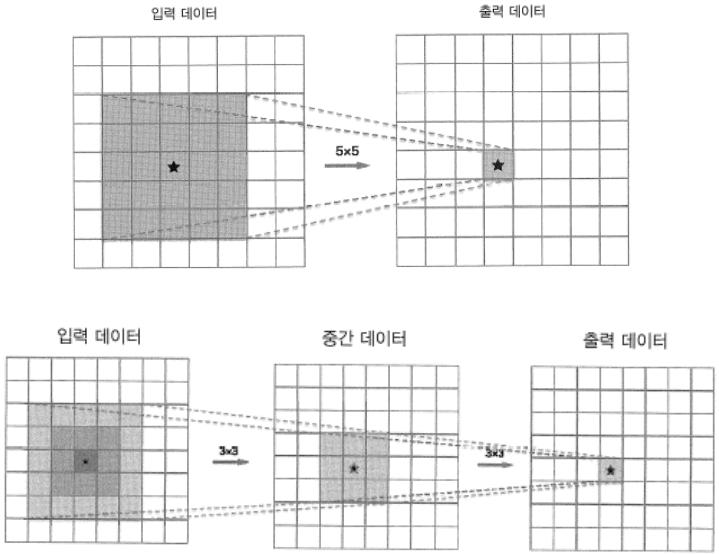
- Pooling

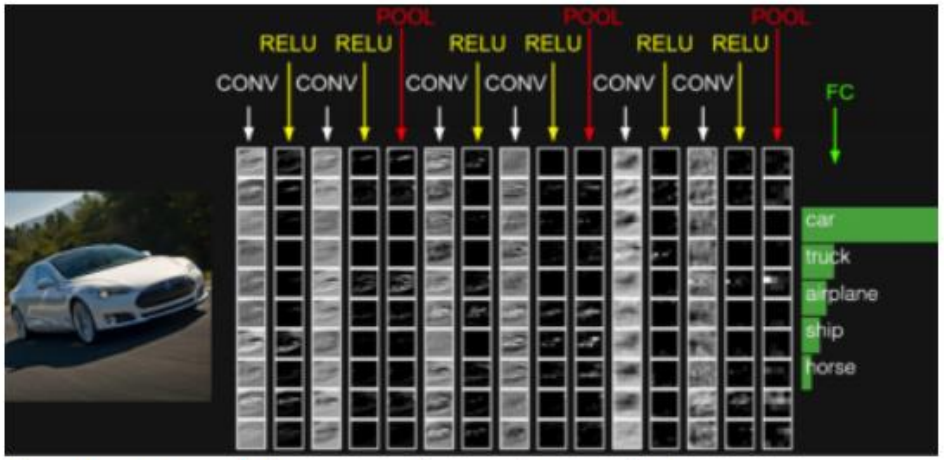


[그림 7] Max-pooling 예제

CNN (Convolution Neural Network)

- Deep Learning





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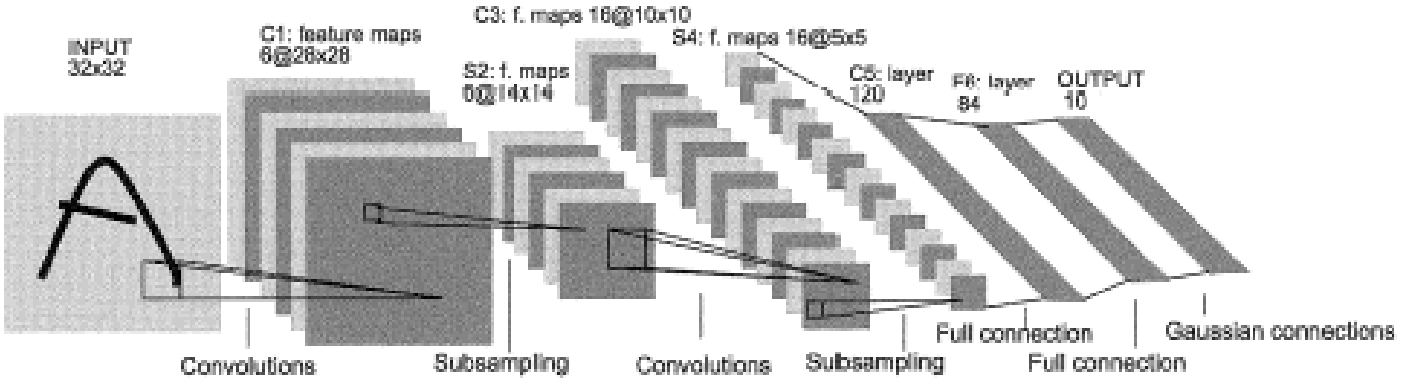
CNN (Convolution Neural Network)

- LeNet

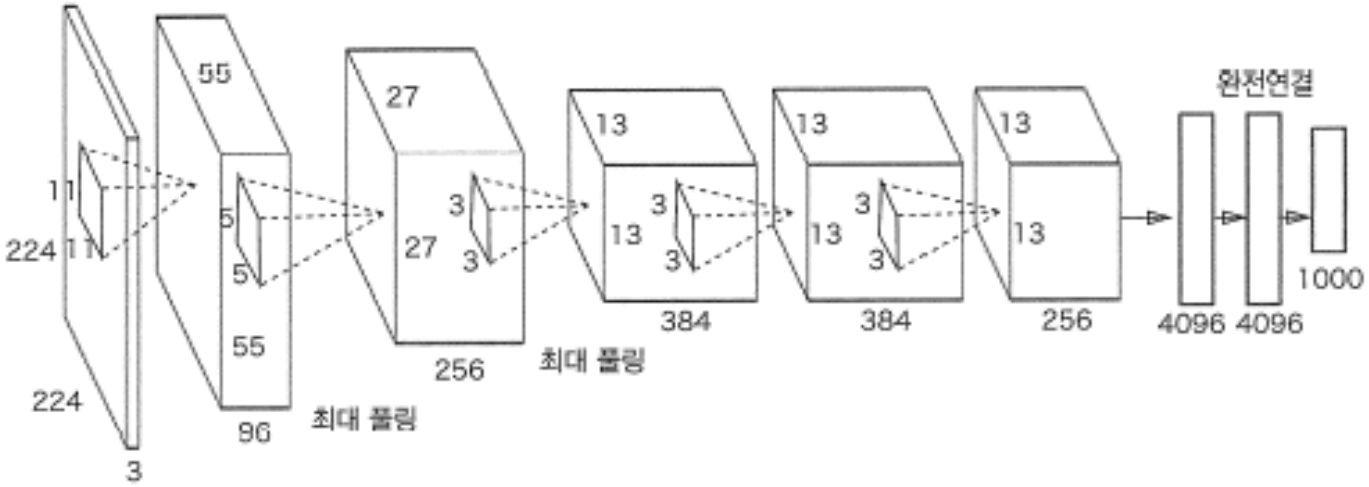
그림 7-27 LeNet의 구성[20]



CNN (Convolution Neural Network)

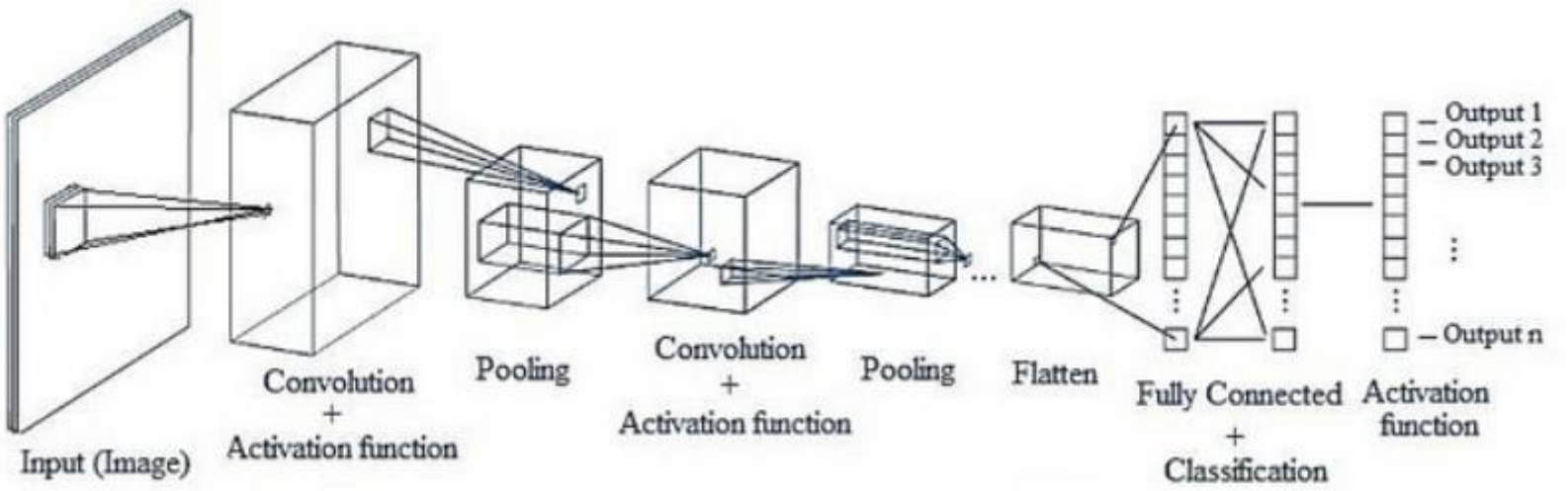
- AlexNet

그림 7-28 AlexNet의 구성[21]



CNN (Convolution Neural Network)

- Alex net Structure



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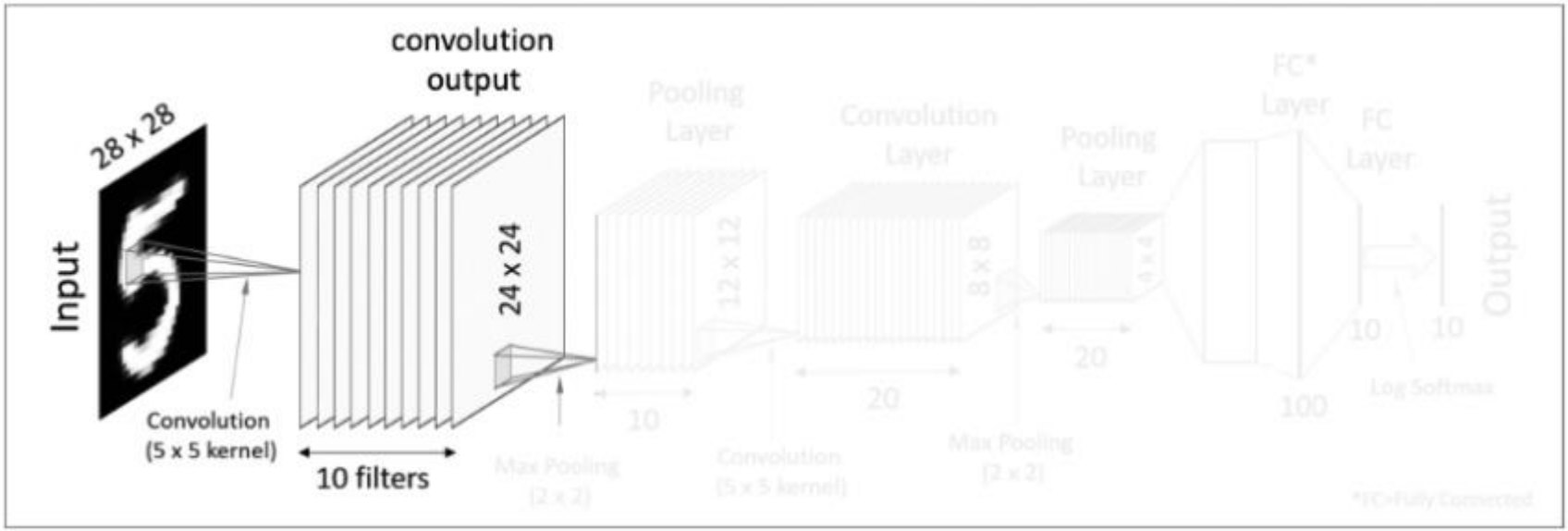
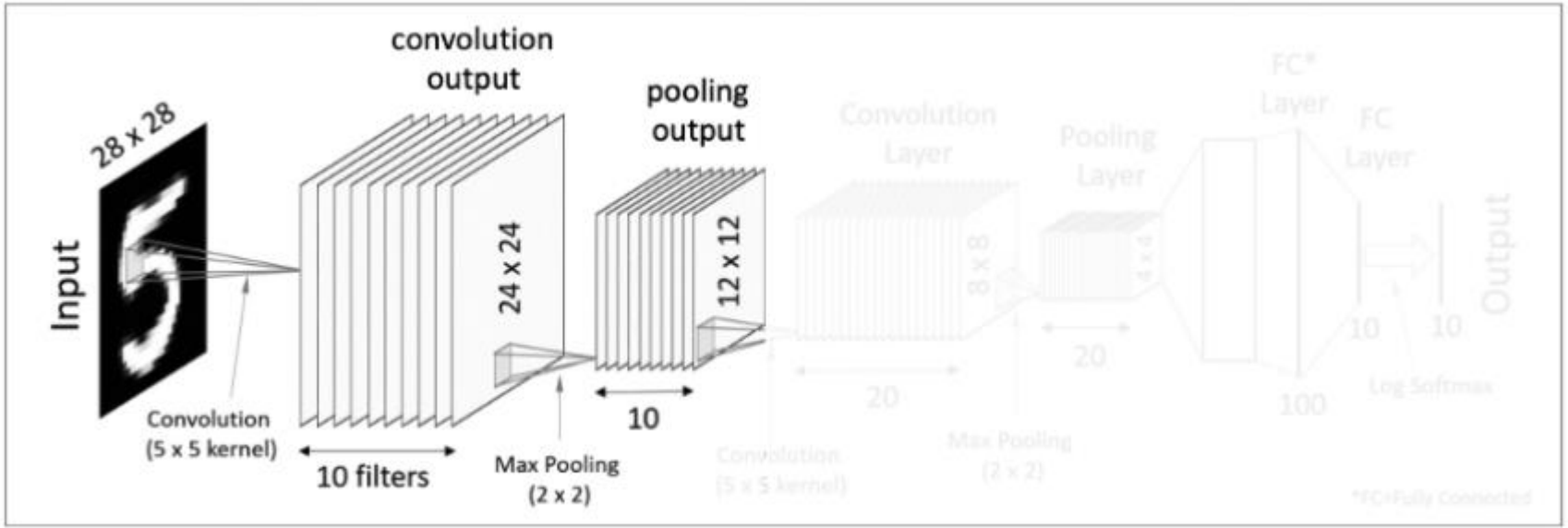
CNN (Convolution Neural Network)

- 1st Convolution Layer



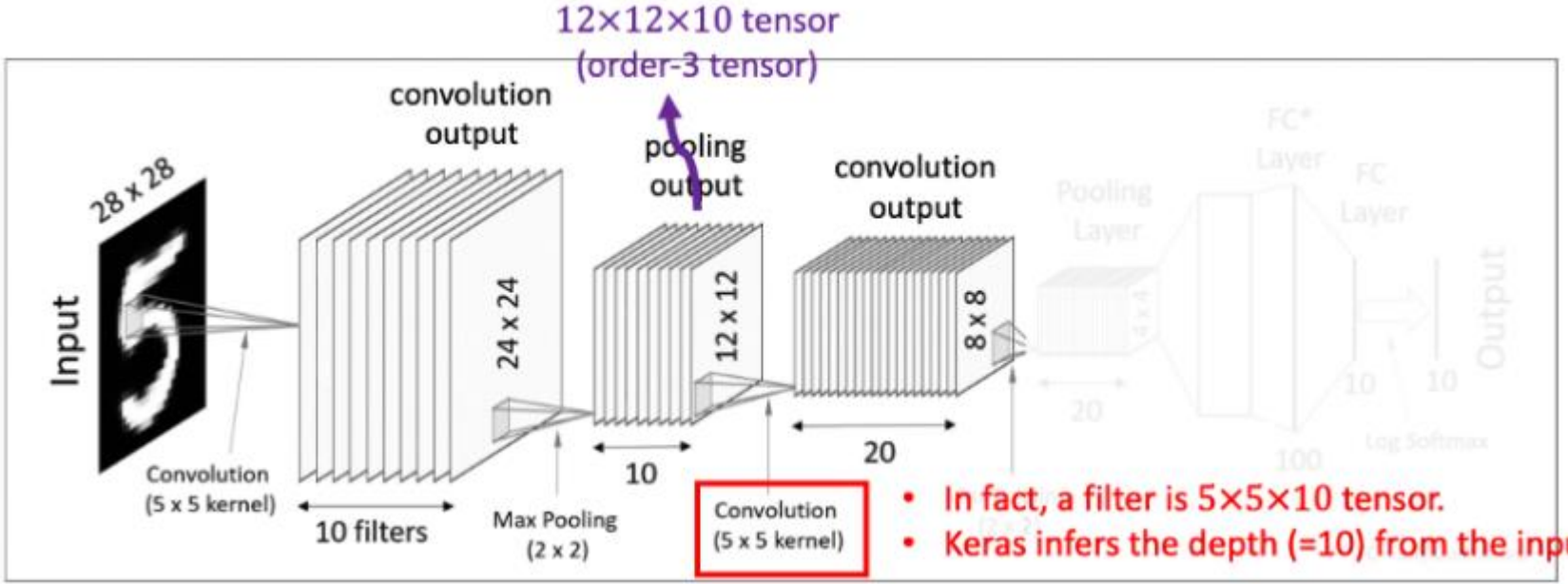
CNN (Convolution Neural Network)

- 1st Pooling Layer



CNN (Convolution Neural Network)

- 2nd Convolution Layer



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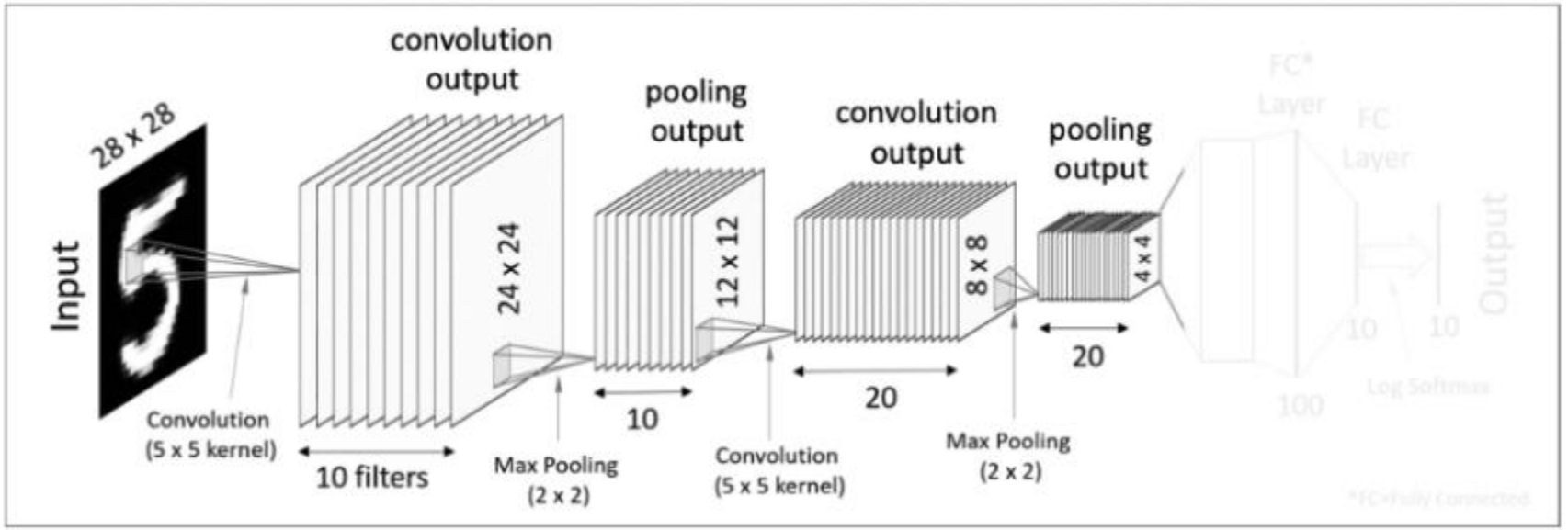
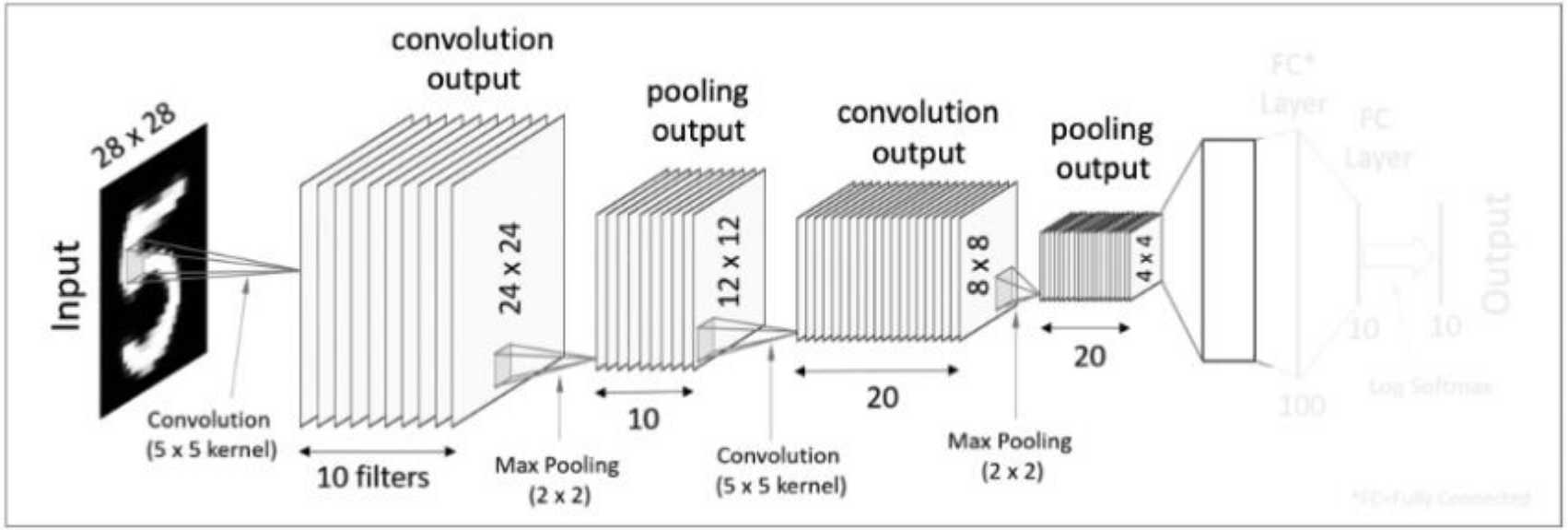
CNN (Convolution Neural Network)

- 2nd Pooling Layer



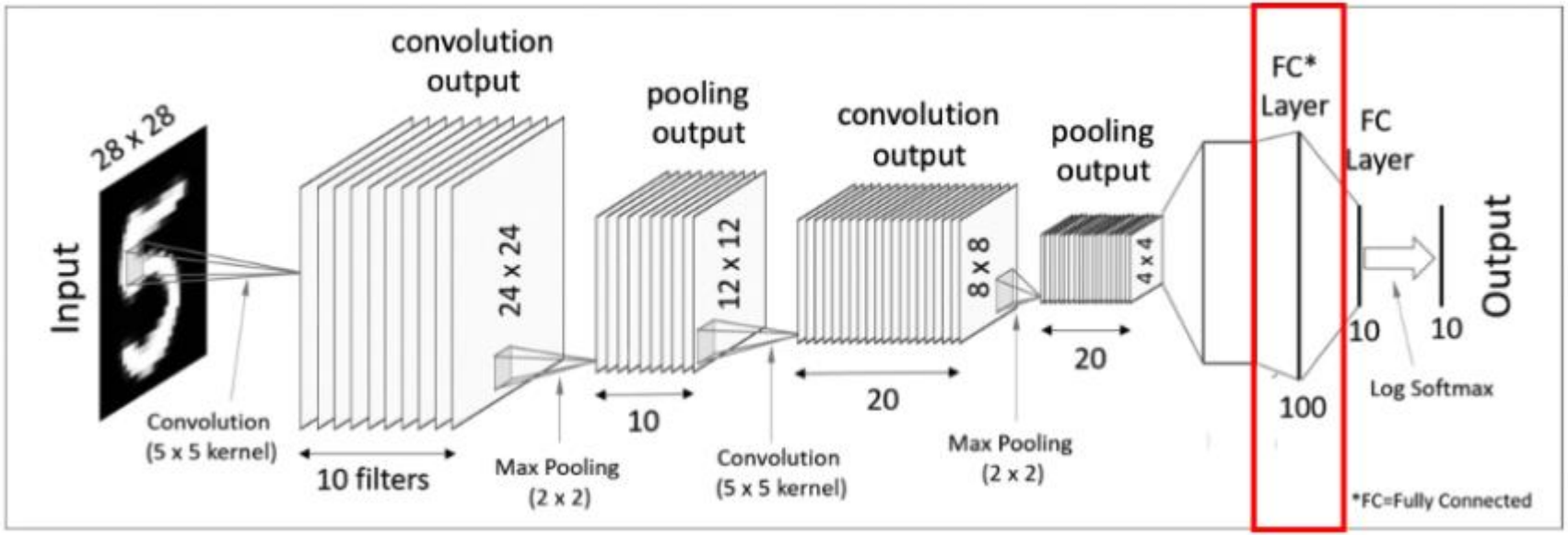
CNN (Convolution Neural Network)

- Flatten



CNN (Convolution Neural Network)

- Fully Connected Layer



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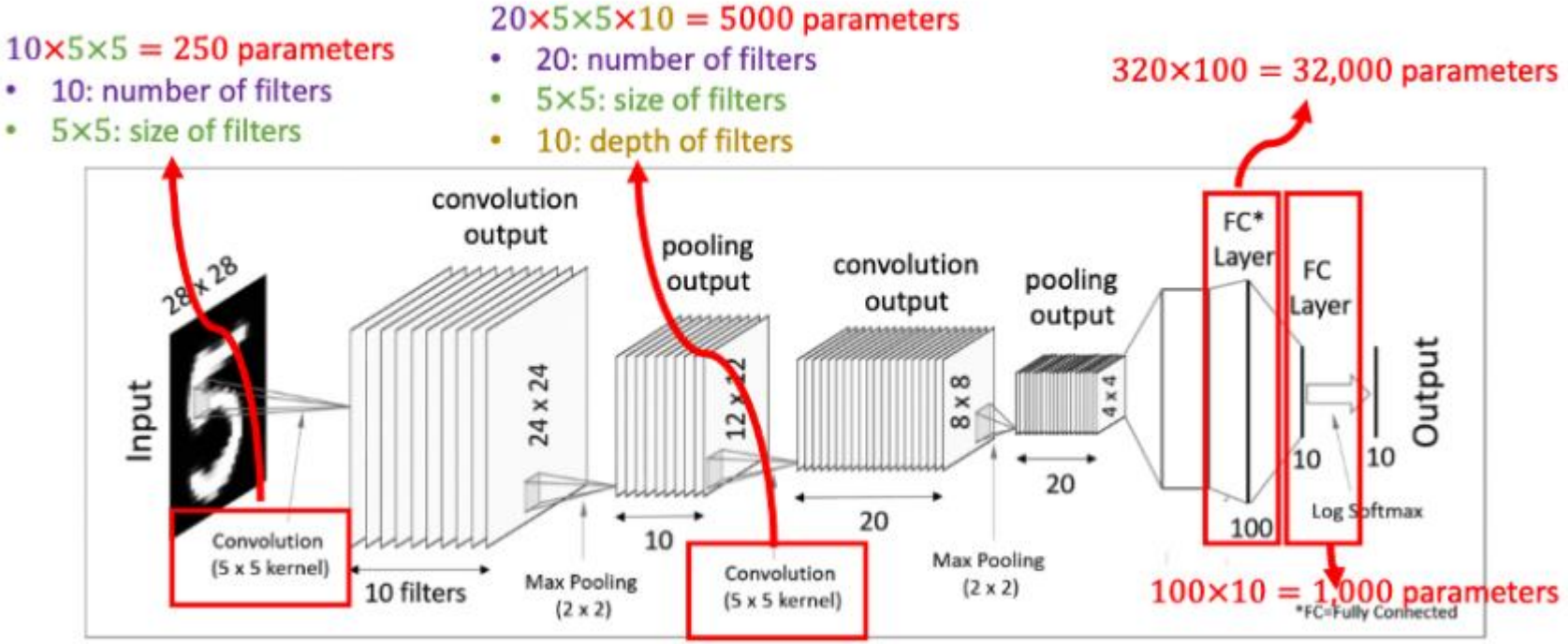
CNN (Convolution Neural Network)



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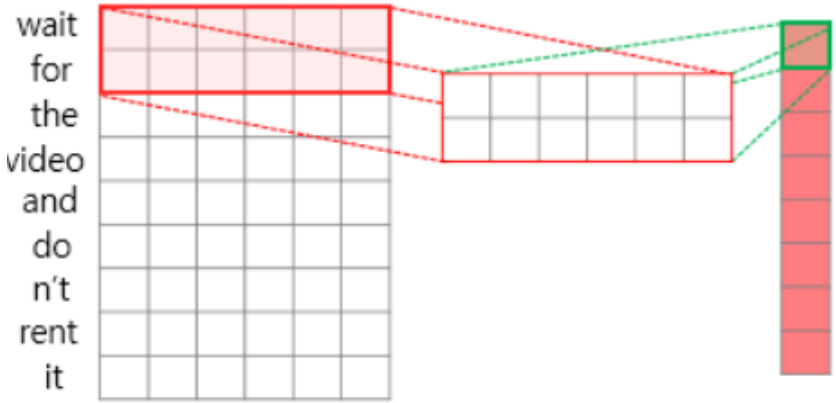
CNN (Convolution Neural Network)

- Hyper-Parameter

- Convolutional layers : 필터 개수, 필터 크기, stride 값, zero-padding
- Pooling Layer : Pooling 방식, Pool 크기, Pool stride 값
- Fully-Connected Layers : 넓이 (width)
- 활성함수 : ReLU, SoftMax, Sigmoid
- Loss Function :
- Optimizer : SGD, AdaGrad, Momentum, Adam + learning rate
- Random Initialization : Gaussian or uniform

1d CNN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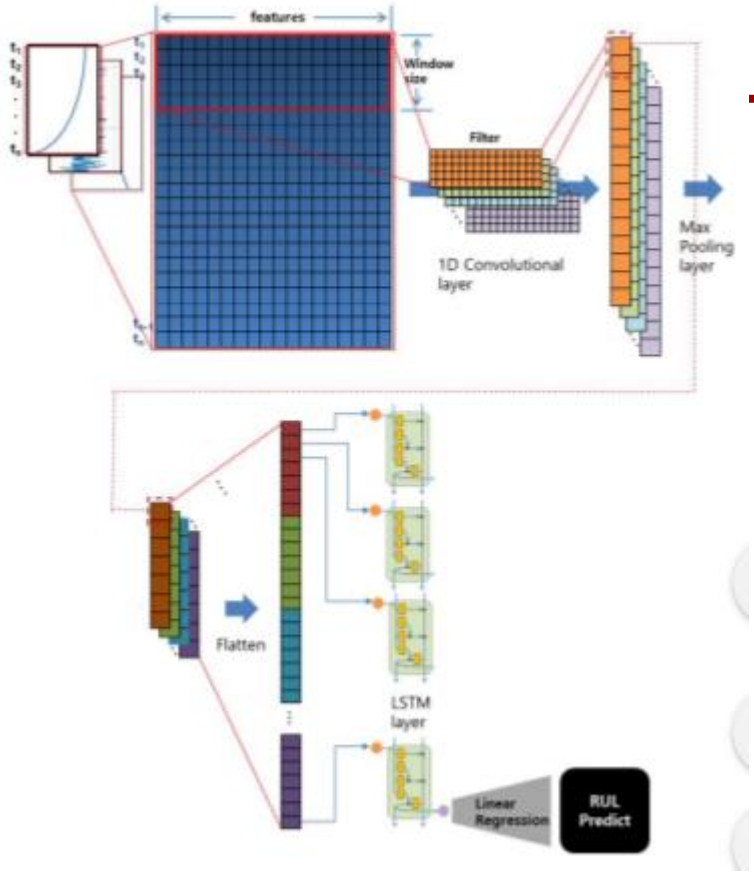
features
Window size
Filter
1D Convolutional layer
Max Pooling layer
Flatten
LSTM layer
Linear Regression
RUL Predict

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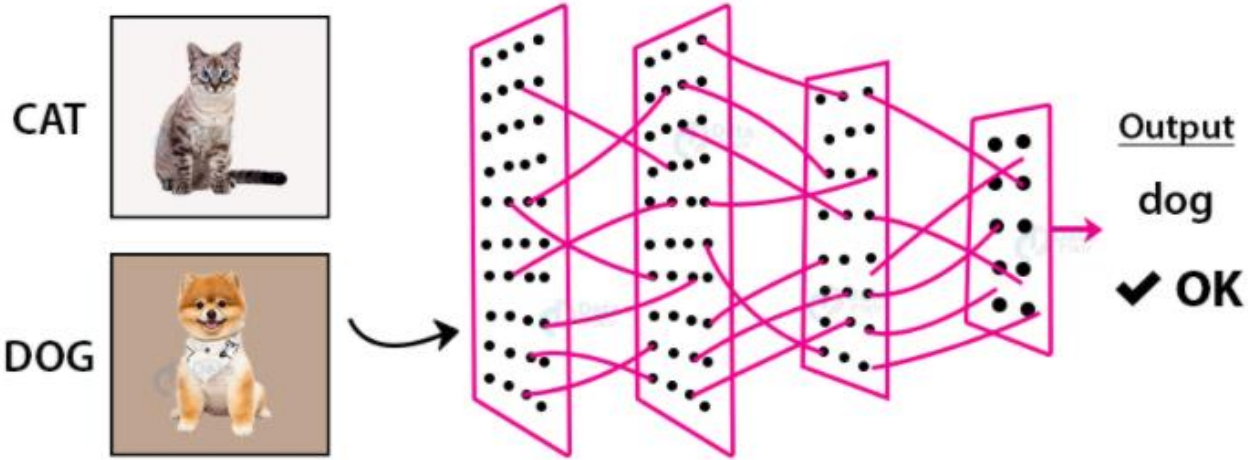
Dogs vs cats

- practice



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