Deep Learning을
연구해보고 싶습니다!!

Convolutional Neural Network
Recurrent Neural Network

만 이해할 수 있으면,
시작으로는 충분합니다!

[CNN] http://cs231n.stanford.edu/

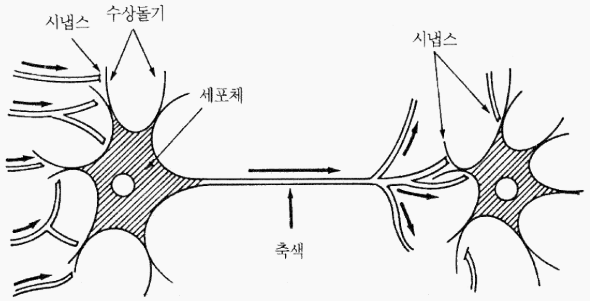
[RNN] http://colah.github.io/posts/2015-08-Understanding-LSTMs/

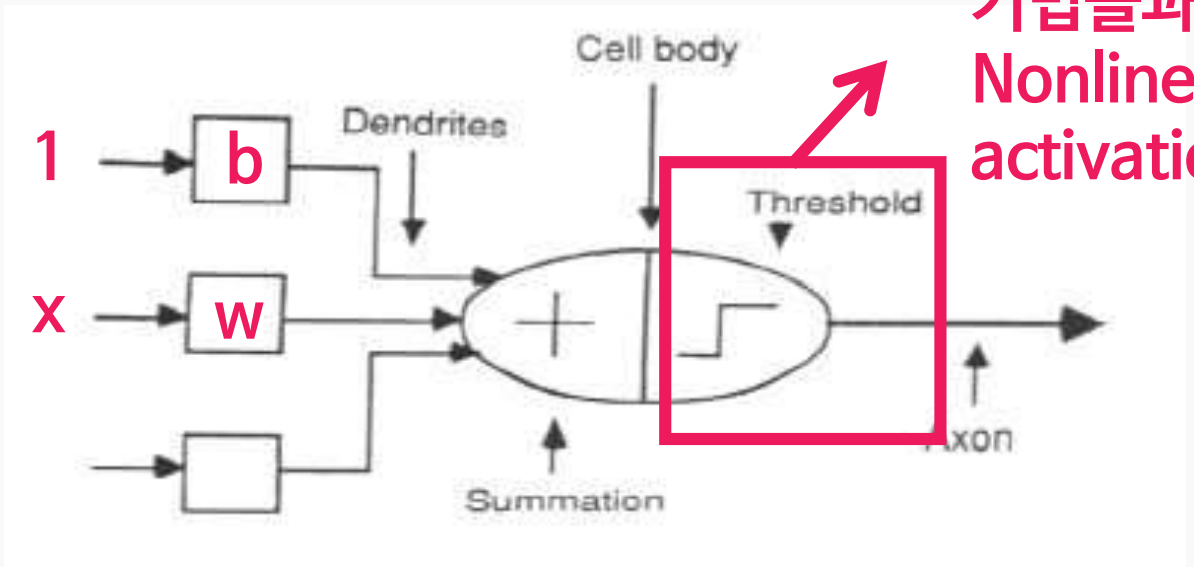
그런데 처음하시는 분들에게는
진입장벽이 있긴 합니다.

- 인공지능(Artificial Intelligence)
- 머신러닝(Machine Learning)
- 딥러닝(Deep Learning)
- **Convolutional Neural Network**
- Recurrent Neural Network
- 토론 : 인간과 인공지능

CNN에 들어가기에 앞서
가장 기본적인 Neural Network 부터
공부해봅시다.

인공지능 함수를 가장 간단한 1차함수로 모델링해보자
→ (vanilla) neural network

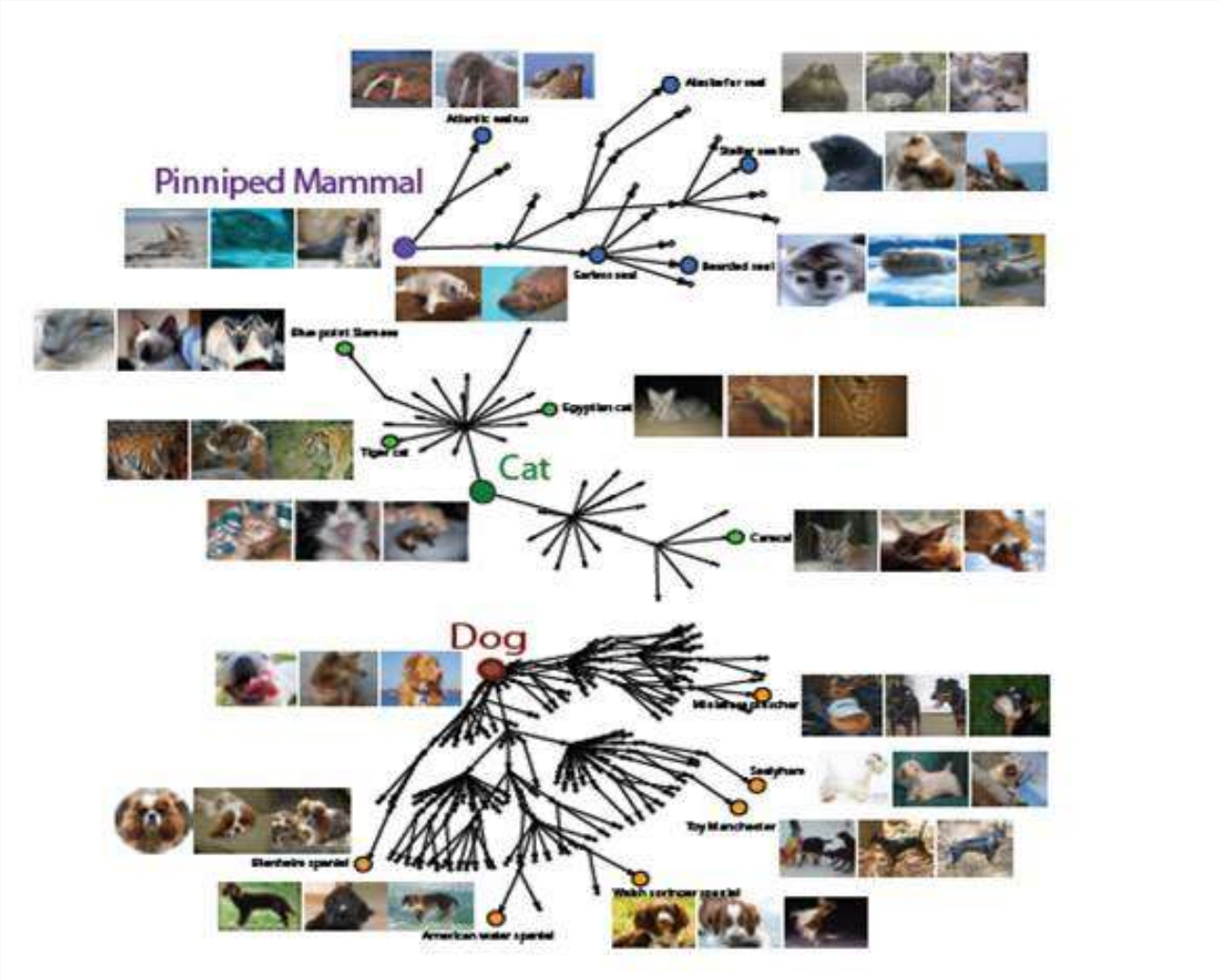




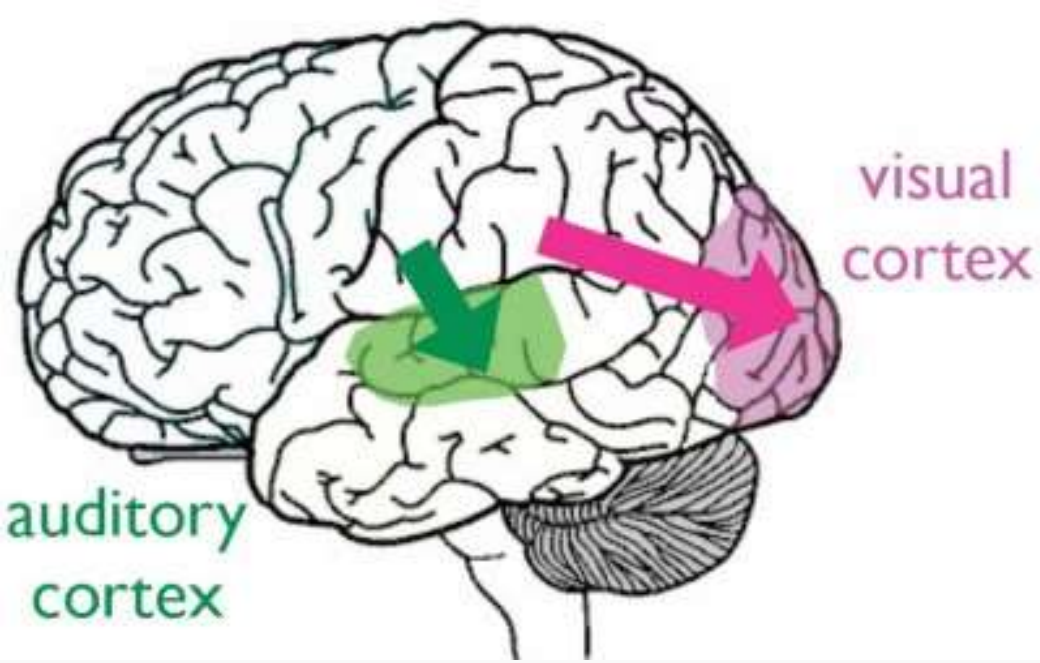
다른 머신러닝 기법들과의 차이점 1:
Nonlinear(복잡한) activation function g( )

$$\boldsymbol{w}^T\boldsymbol{x} + b \qquad g(\boldsymbol{w}^T\boldsymbol{x} + b)$$

DataSet이 복잡해진다면…



Neural Network를
영상처리에 특화시켜보자!
→ Convolutional Neural Network



Convolution (Operator)이란?

2+3

9−7

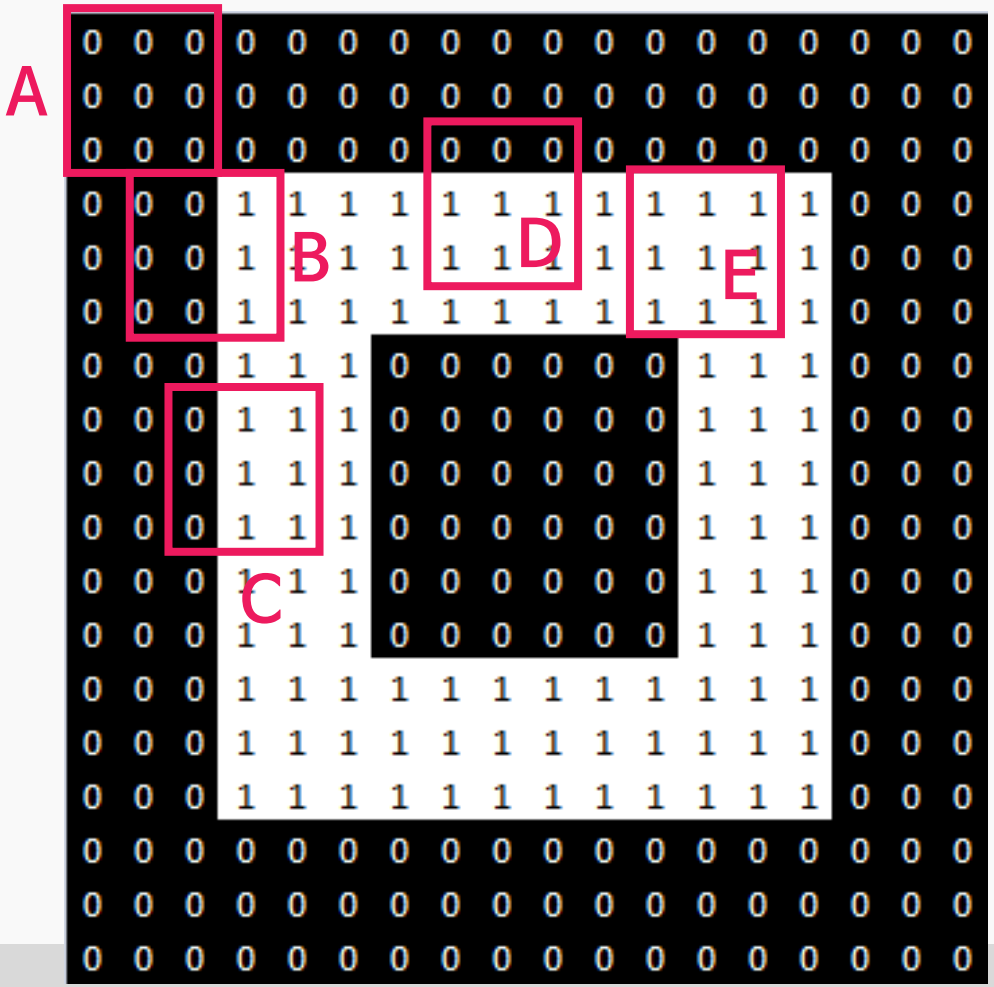
7x8

10/2

[2 3]*[1 1]

영상에서의 Convolution

-1	0	1
-1	0	1
-1	0	1



(1) A 영역의 Convolution 값은?
(2) B 영역의 Convolution 값은?
(3) C 영역의 Convolution 값은?
(4) D 영역의 Convolution 값은?
(5) E 영역의 Convolution 값은?
(6) 전체 이미지의 Convolution 값은?
(7) 이 filter의 역할은?

Convolution 연산자의 특징

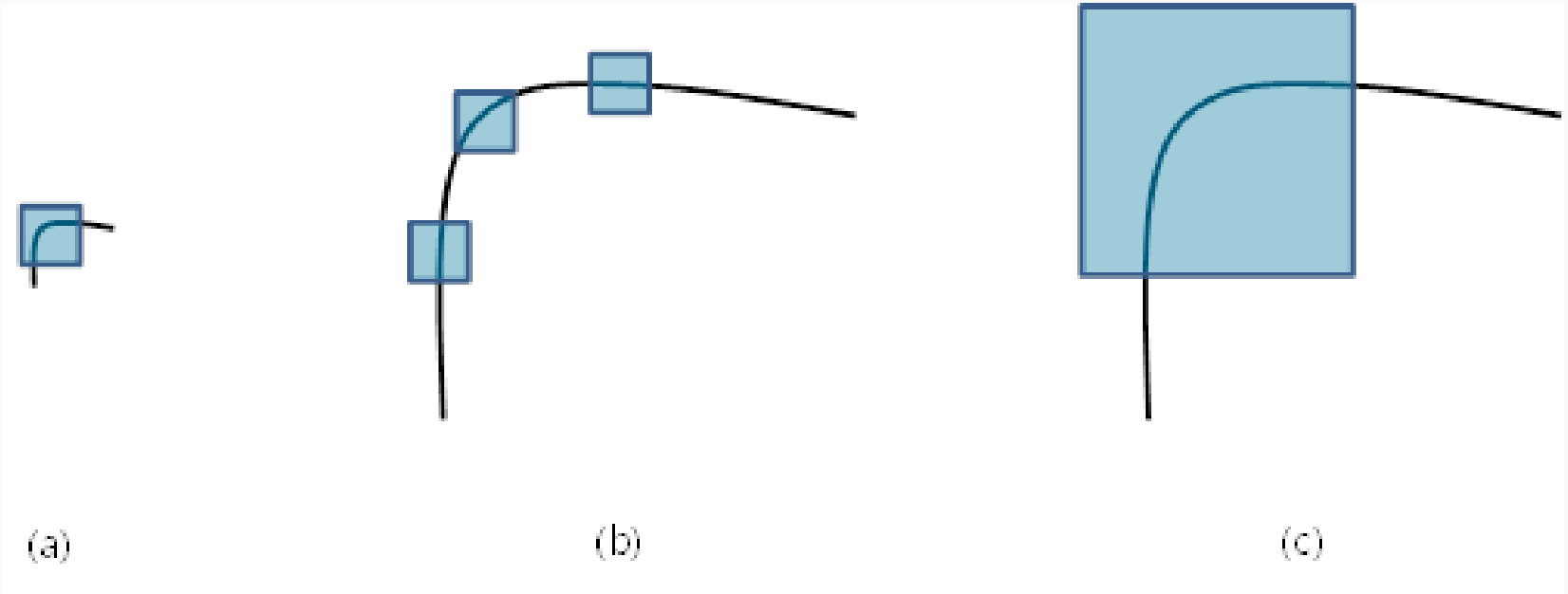
$(f*g)*h=f*(g*h)$

결합법칙이 성립한다.

[Ex] f : 입력영상,
g : R/G 통과 필터,
h : R 통과필터

입력 영상 f는 어떻게 변했을까?

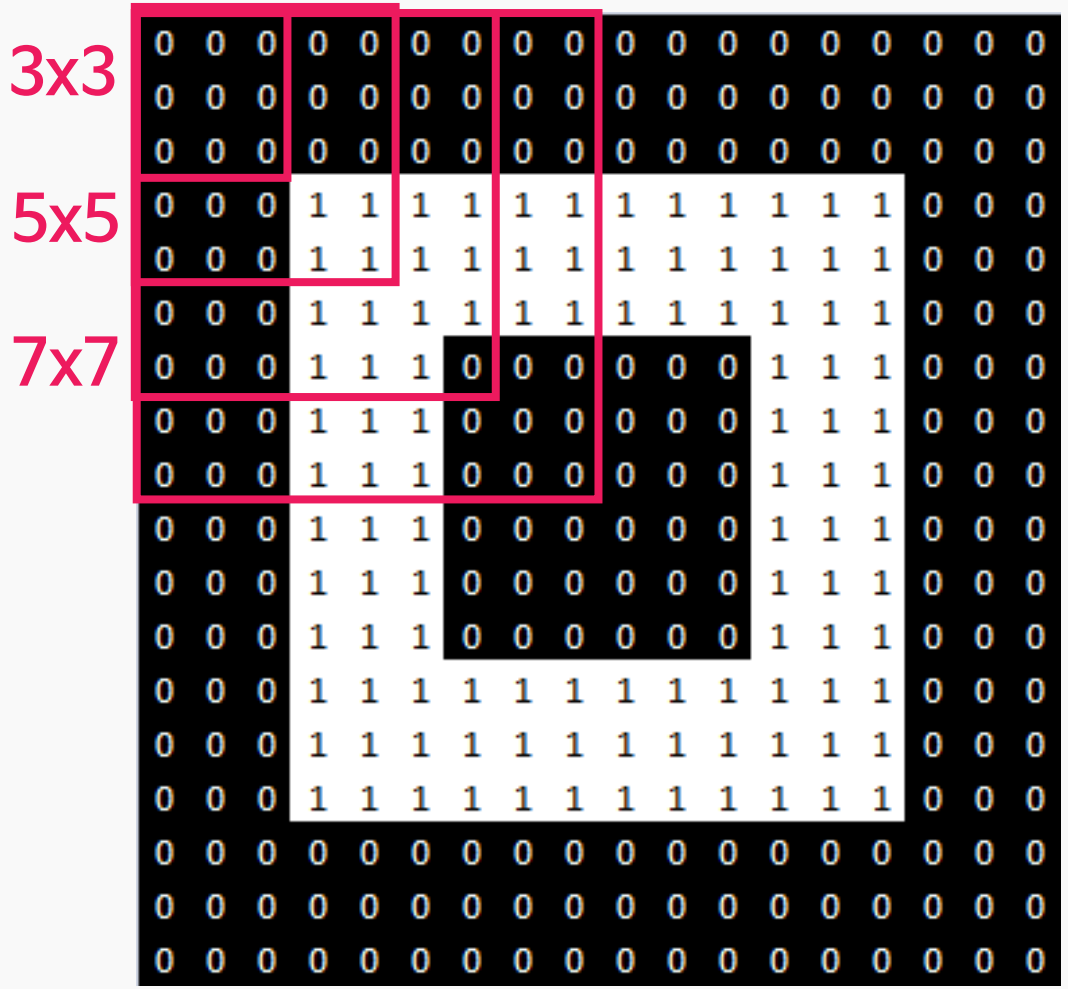
영상 분석의 기초 :
서로 다른 크기의 영상 feature가 필요하다



Corner Detection Example

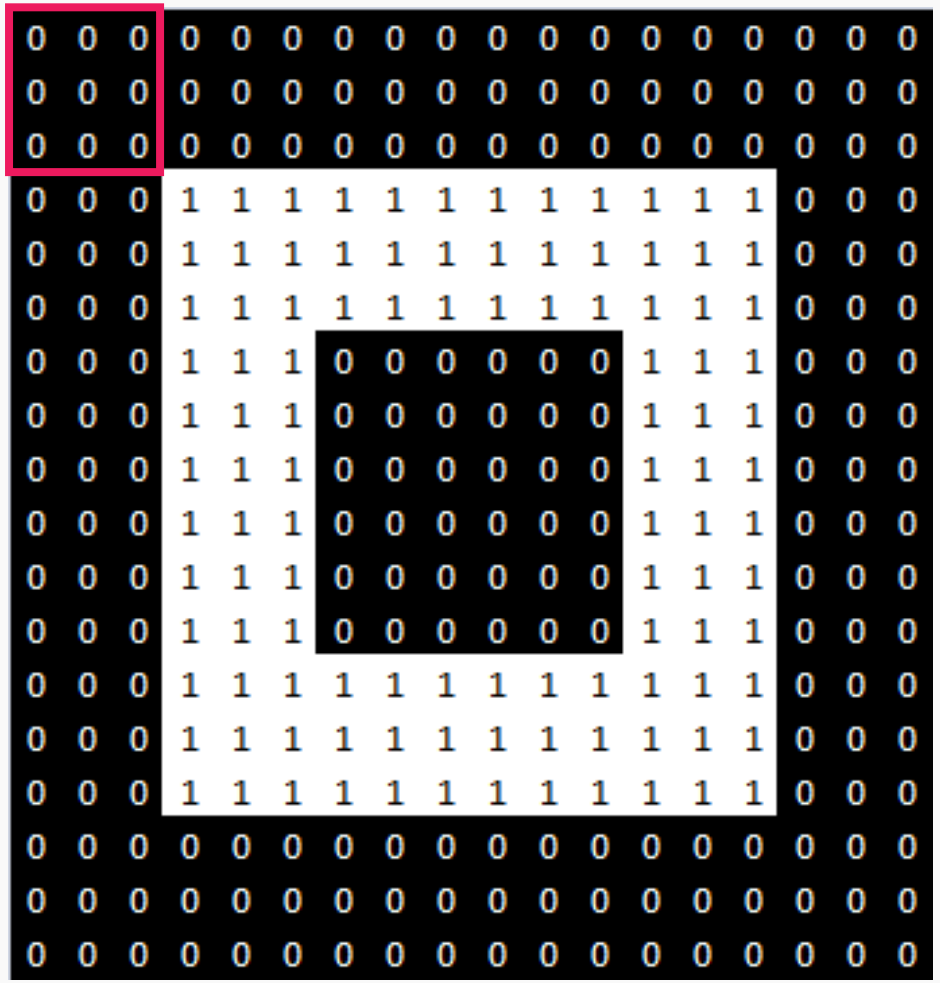
서로 다른 크기의
영상 feature를 만드는 두가지 방법!

1. 필터 사이즈를 점점 크게 만든다.

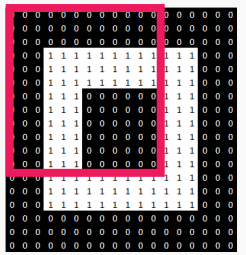


2. 영상 사이즈를 점점 작게 만든다.

3x3



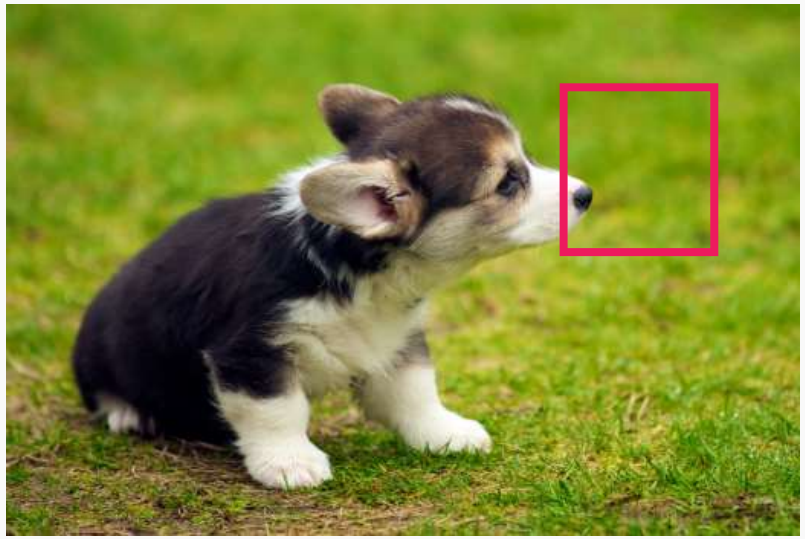
6x6



이 두가지를 모두 넣은 게
Convolutional Neural Network!

1. 필터 사이즈를 점점 크게 만든다.

입력 영상



3x3 3x3 3x3

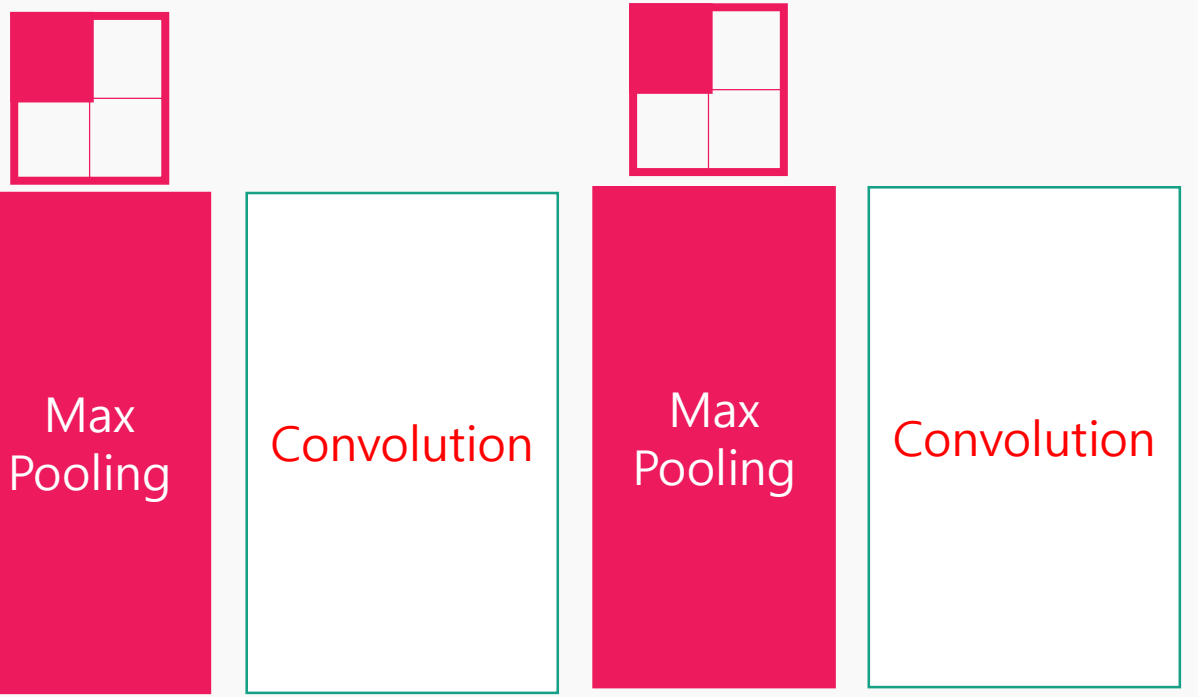
Convolution Convolution Convolution

5x5

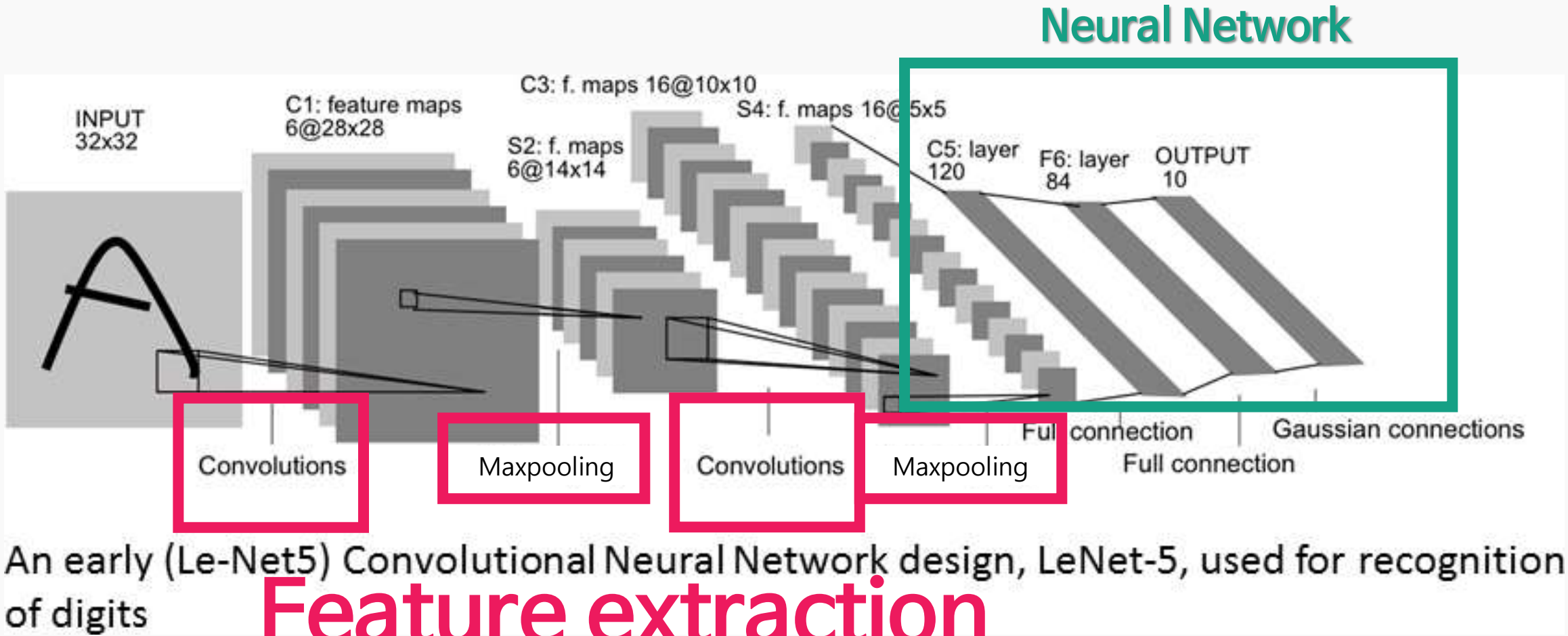
7x7

2. 영상 사이즈를 점점 작게 만든다.

입력 영상



Convolutional Neural Network (CNN)



An early (Le-Net5) Convolutional Neural Network design, LeNet-5, used for recognition of digits

Feature extraction

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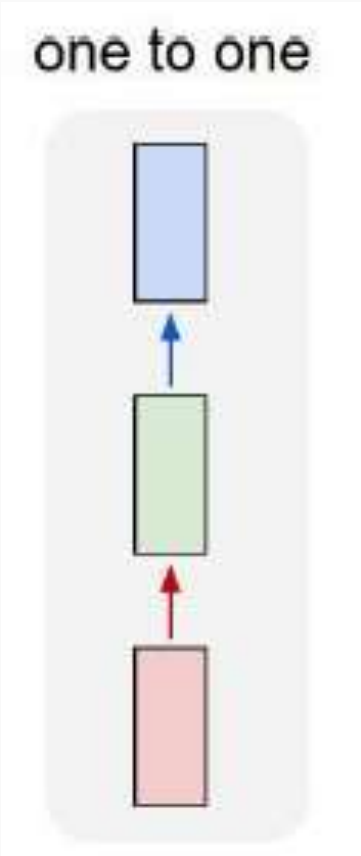
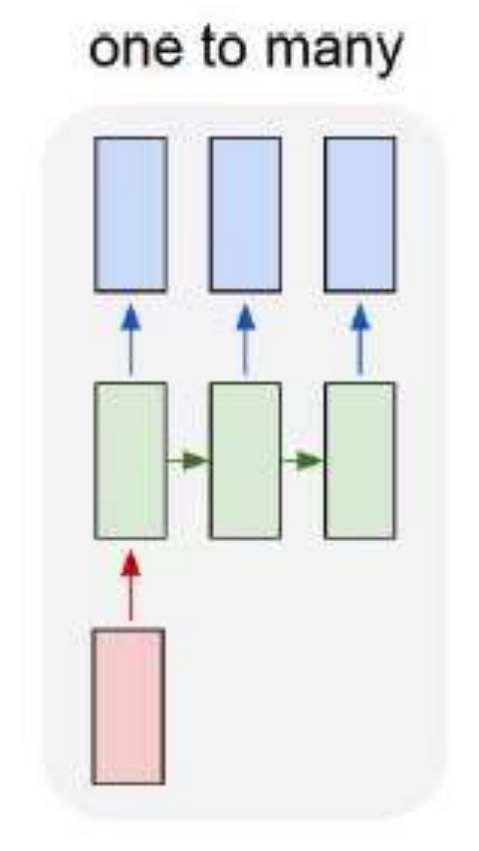
입력 또는 출력에 시간 순서가 있다면?

→ Recurrent Neural Network



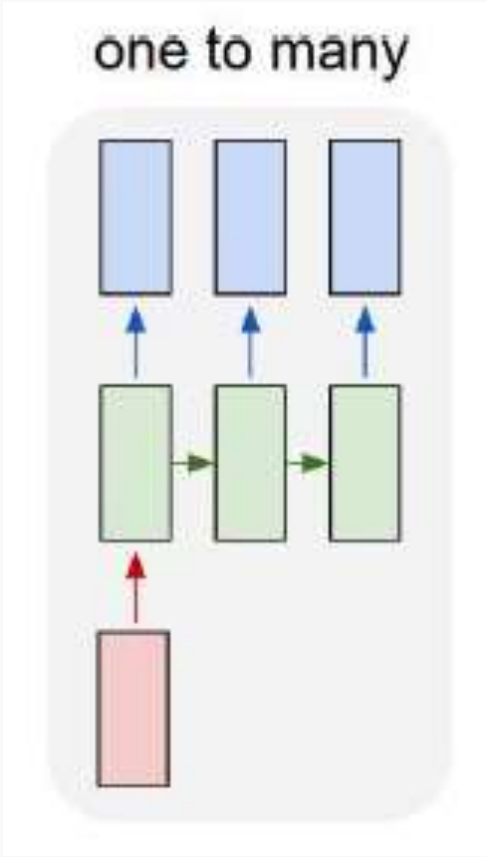
(Vanilla)
Neural Network

입력이 들어가면
출력이 하나 나온다.

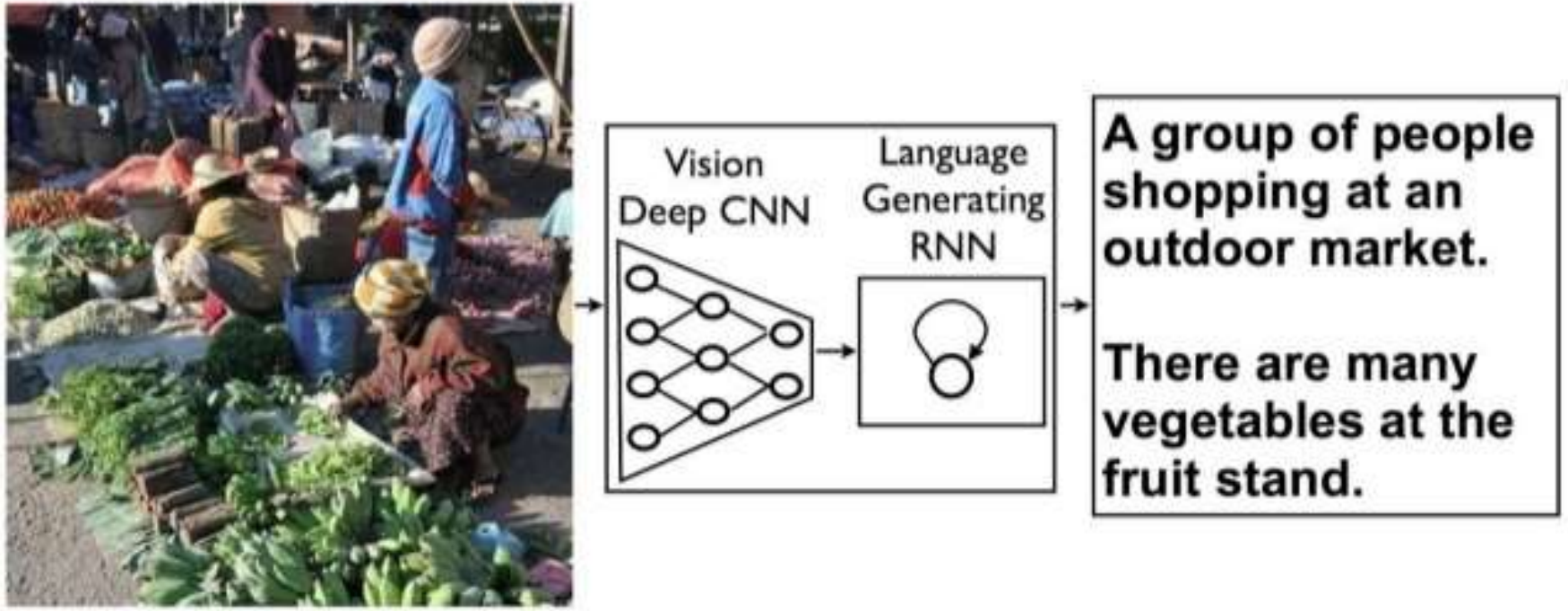


입력이 들어가면
출력이 순차적으로 나온다.

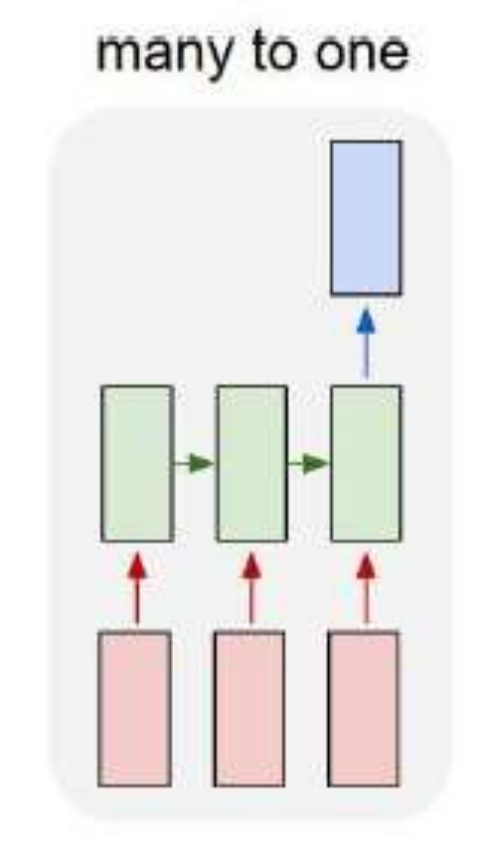
Image Caption Generation



출력에
시간순서가 있다면?

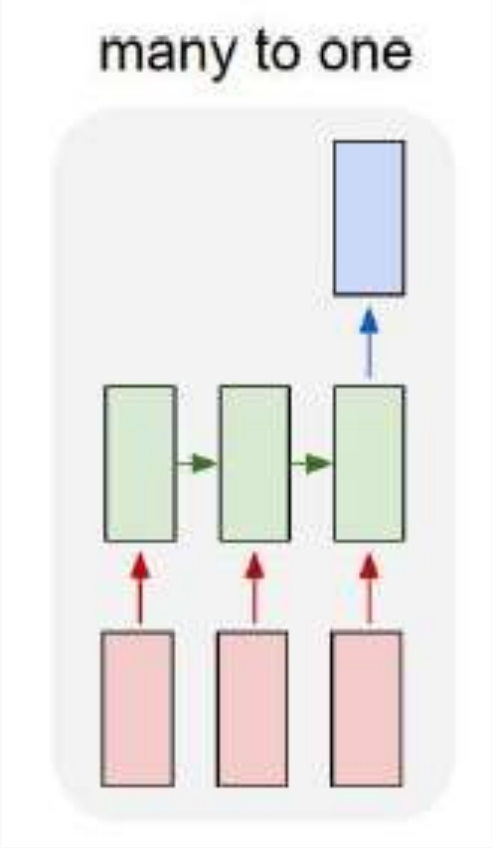


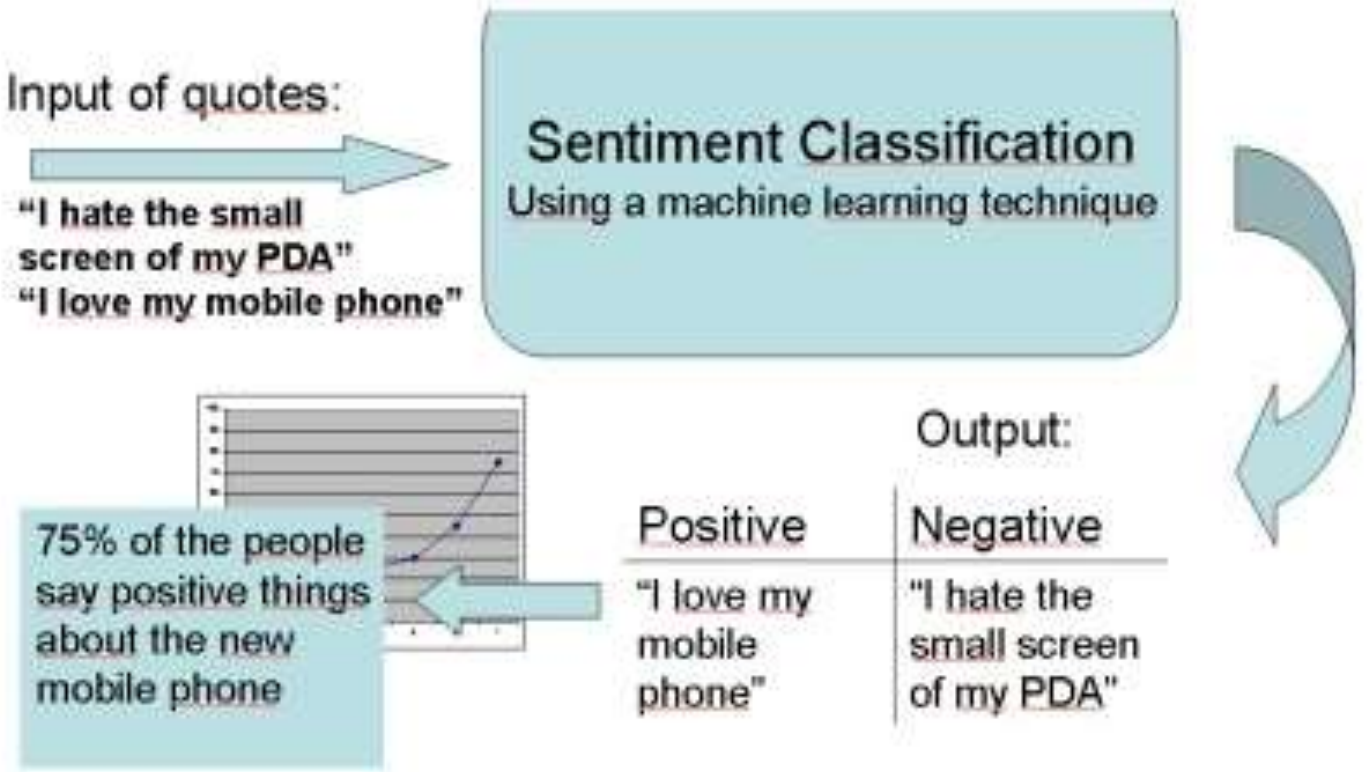
http://arxiv.org/abs/1411.4555 "Show and Tell: A Neural Image Caption Generator"

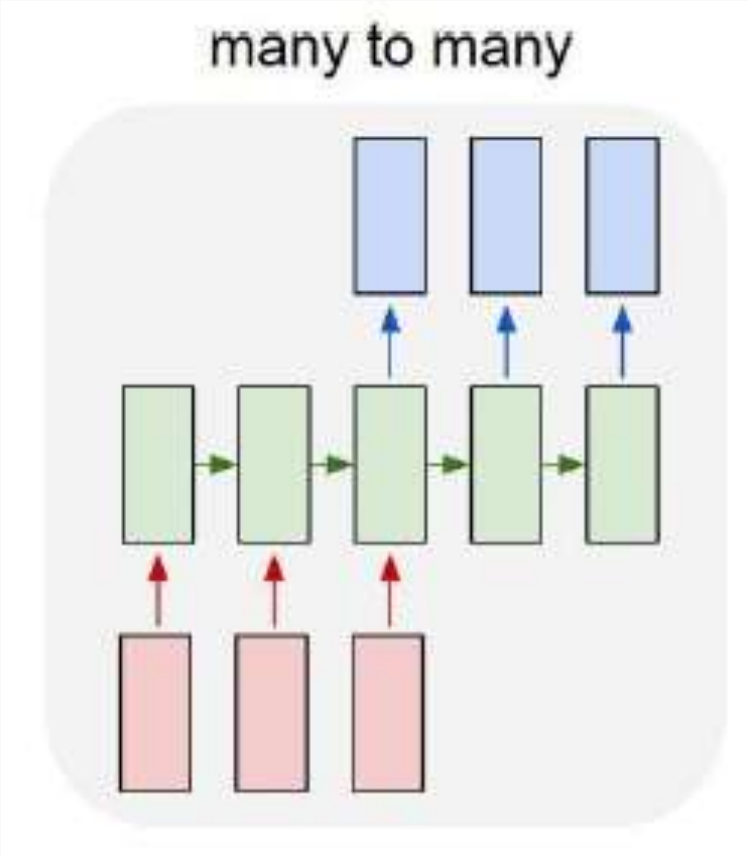


입력이 순차적으로 들어가면
출력이 나온다.

Sentiment Classification

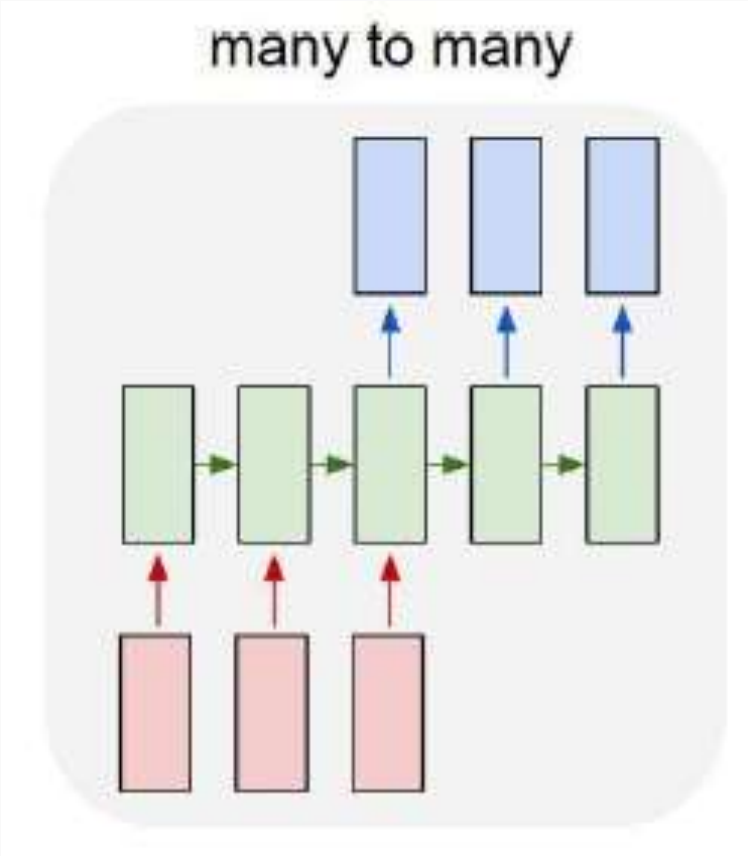


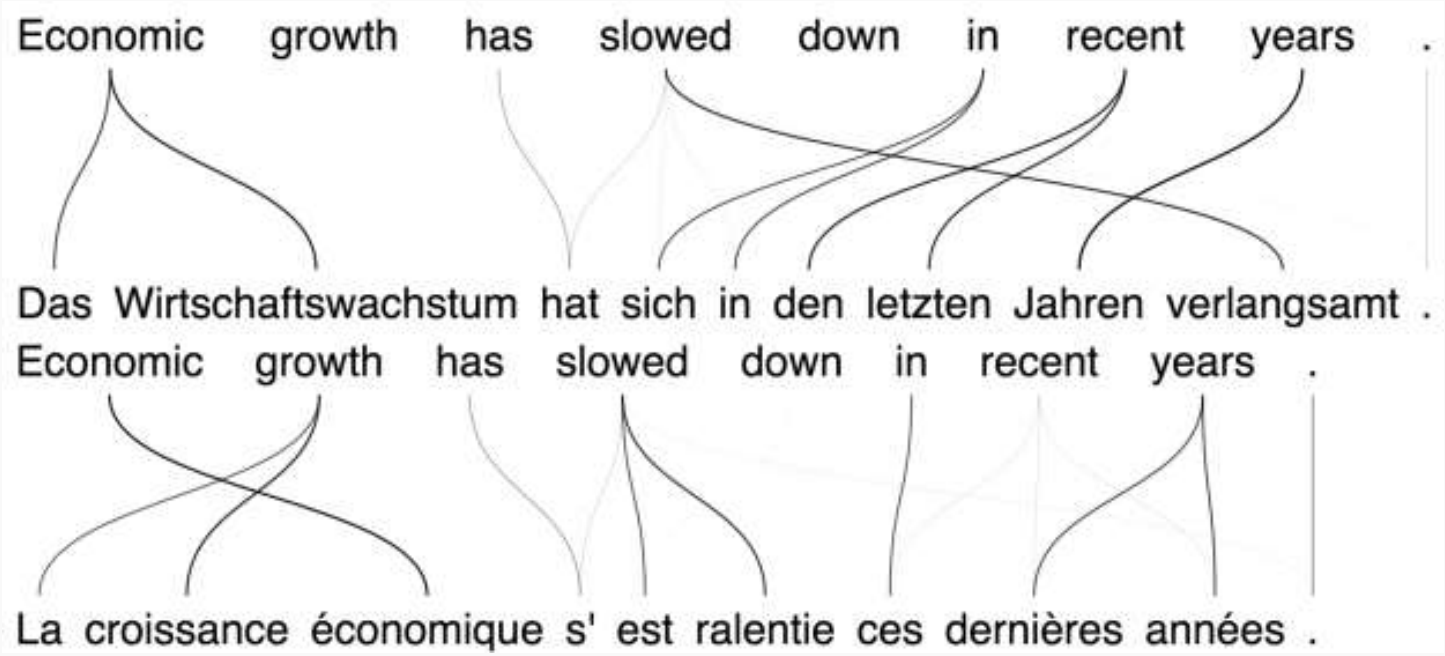




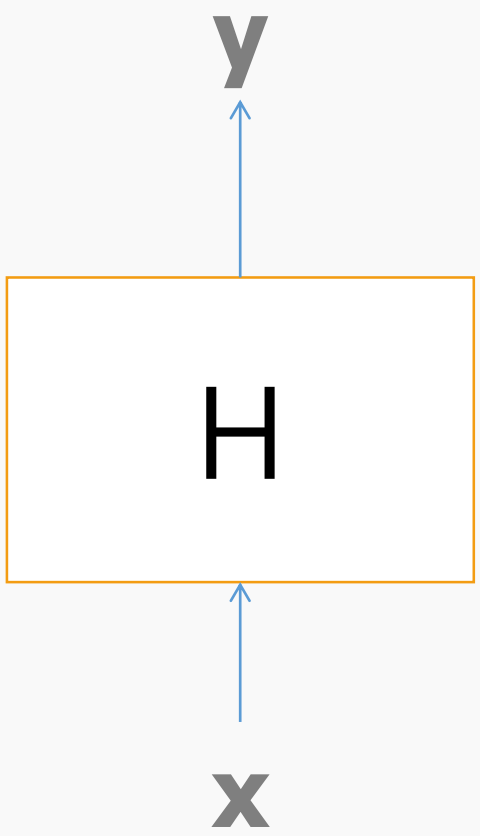
입력이 순차적으로 들어가면
출력이 순차적으로 나온다.

Machine Translation

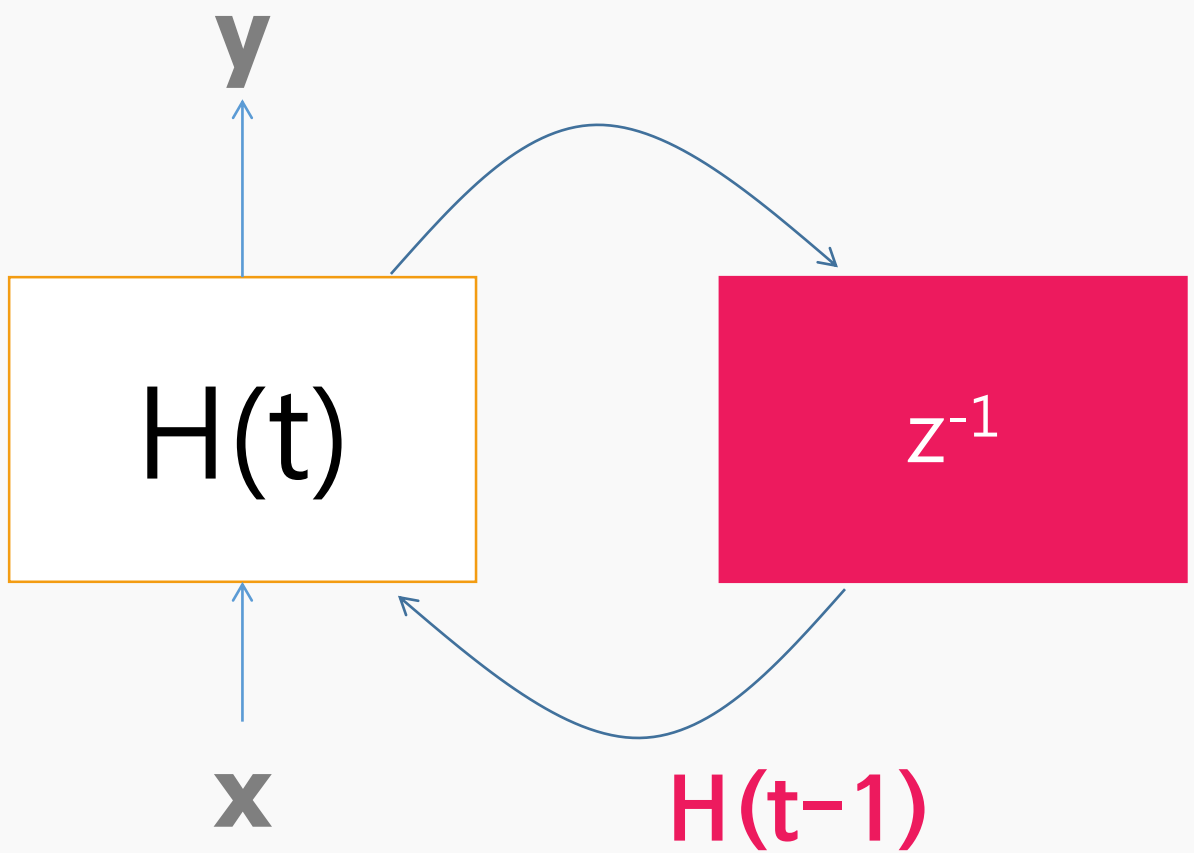




(Vanilla) Neural Network의 구조

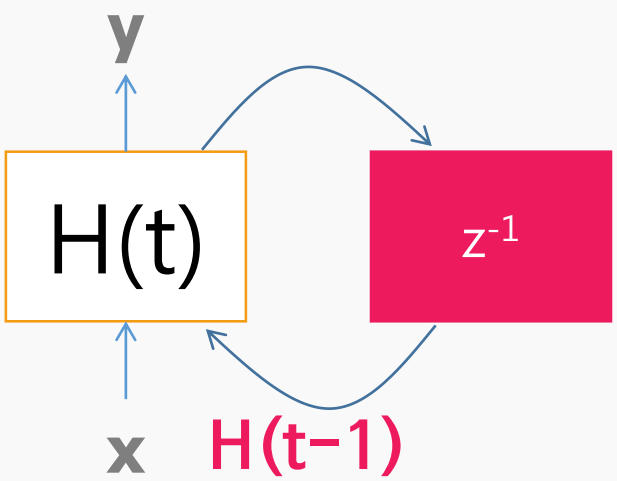


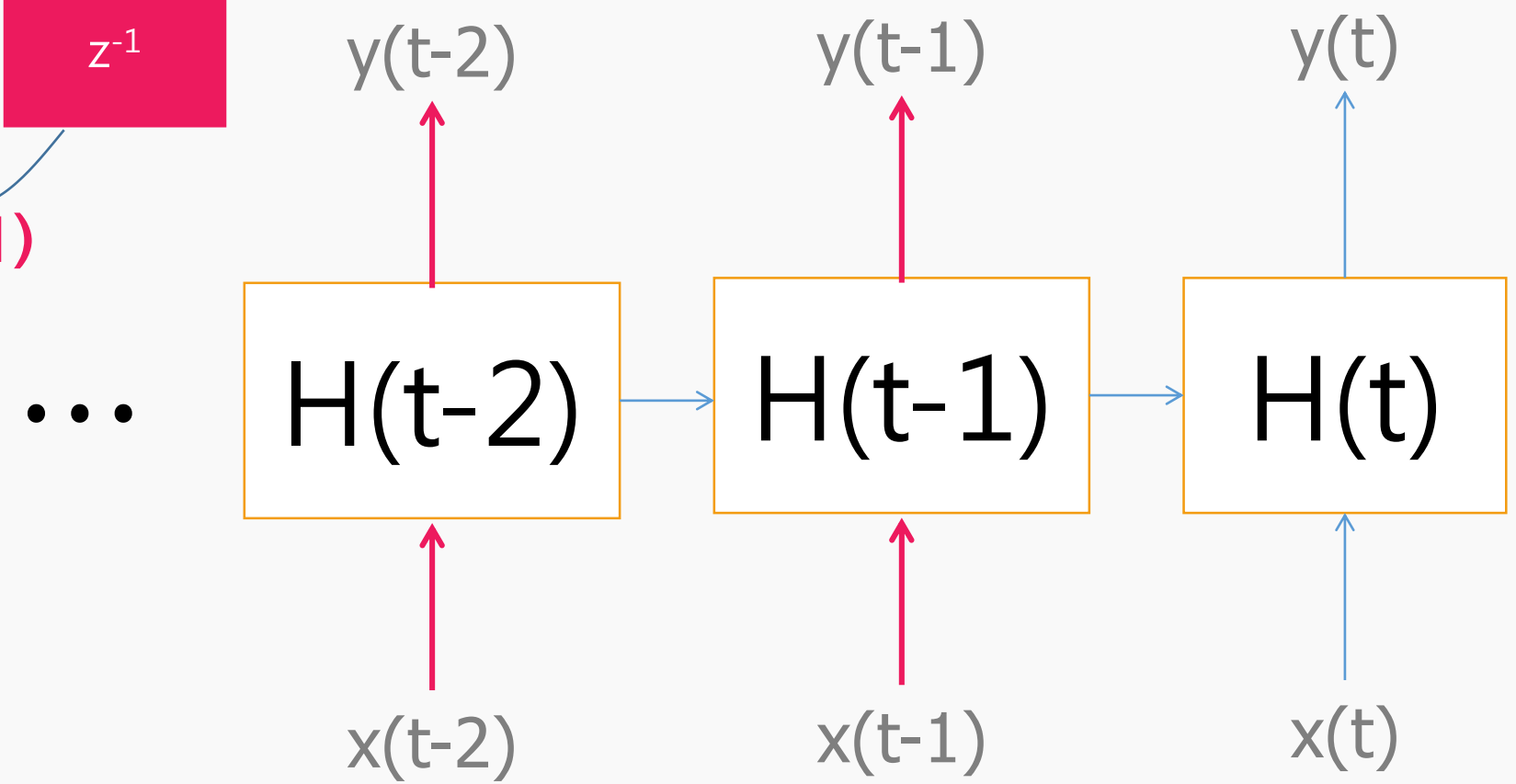
RNN의 구조



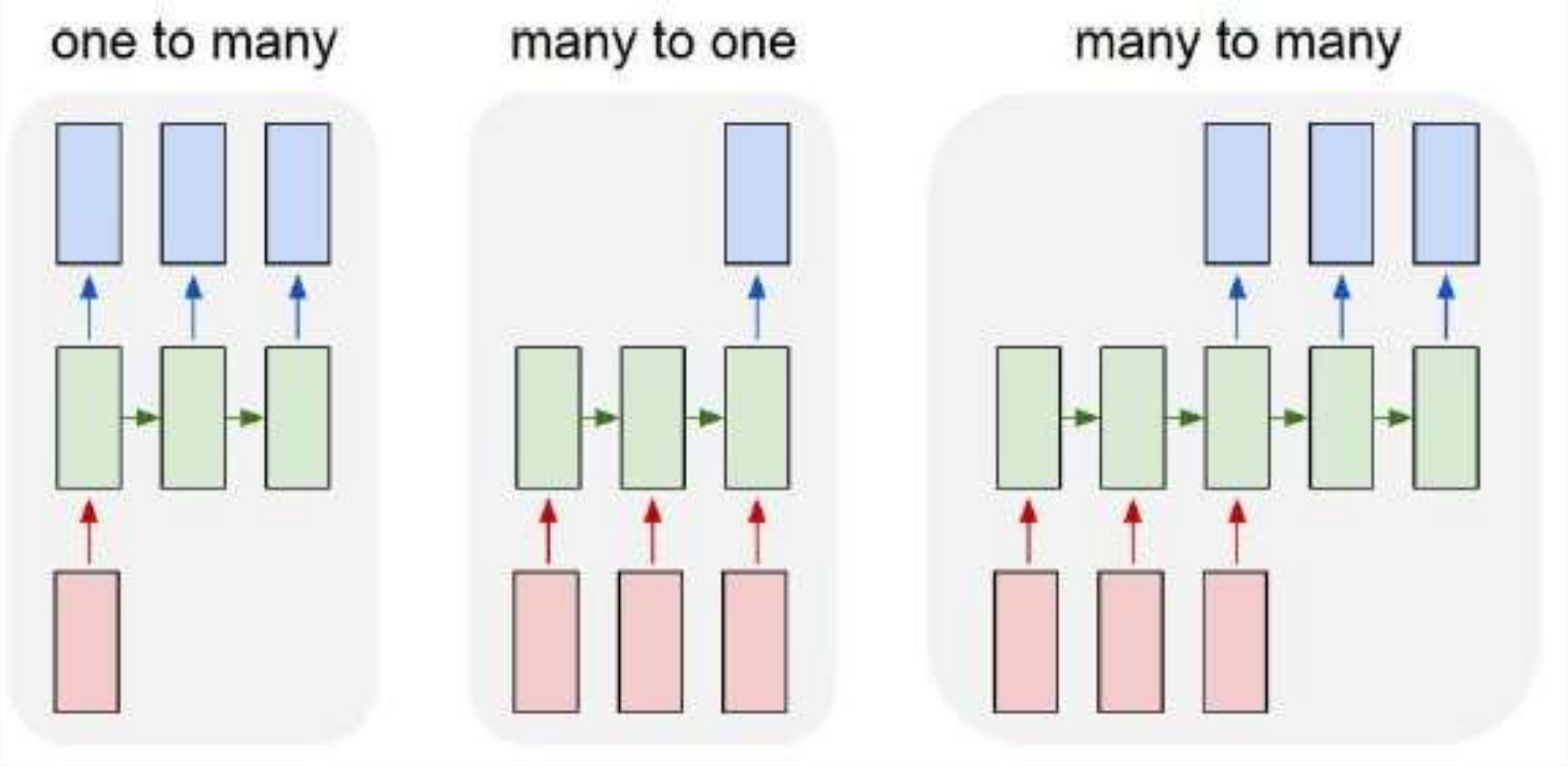
$$H(t)=W_1x+W_2H(t-1)$$

RNN의 구조





RNN 응용 구조는 이렇게 만들어진 것들..



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인공지능은
정말 지능을 가지고 있는 것일까요?

인공지능이 할 수 없는 것은 어떤 것일까요?