

6주차(3/3)

# 다층 퍼셉트론

파이썬으로 배우는 기계학습

한동대학교  
김영섭 교수

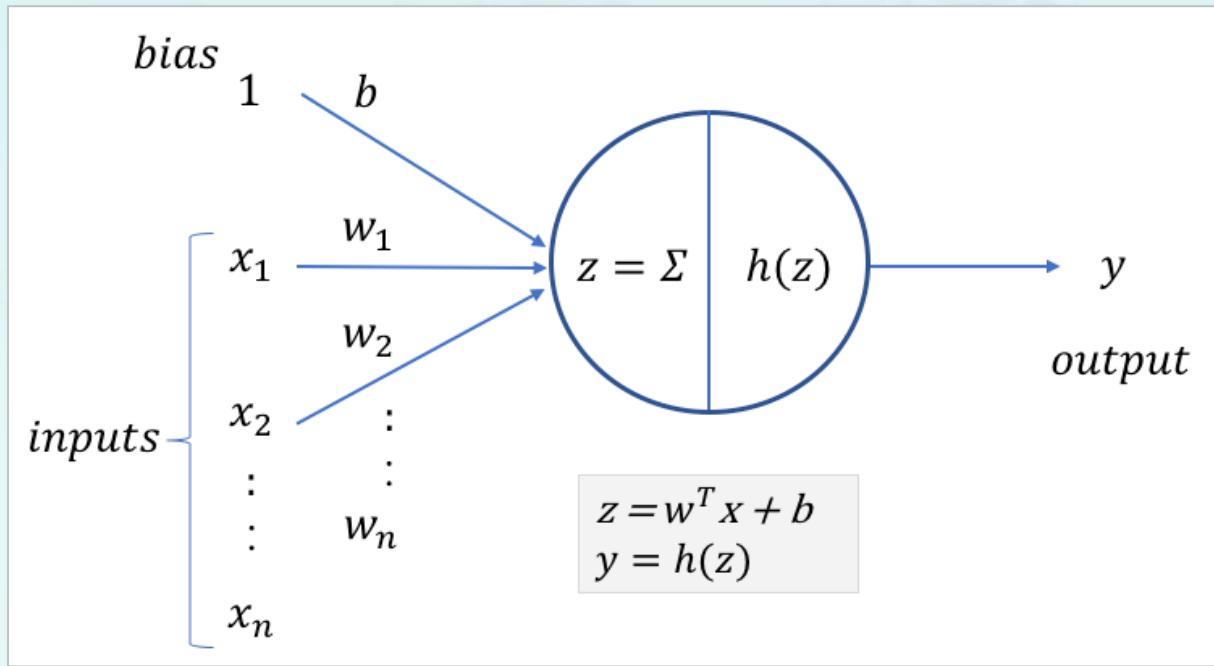
# 다층 퍼셉트론

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- 학습 목표
  - 다층 퍼셉트론의 구조와 학습방법을 이해한다.
  - 생물학적 뉴런의 구조와 인공신경망을 비교한다.
- 학습 내용
  - 퍼셉트론 다시보기
  - 다층 퍼셉트론
  - 생물학적 뉴런

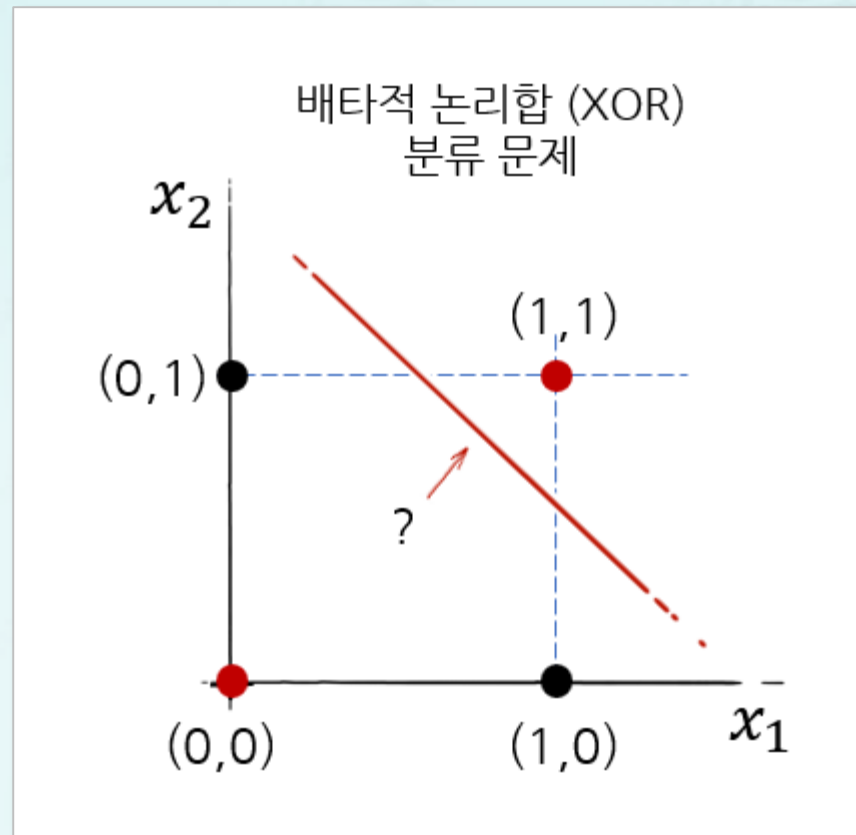
# 1. 퍼셉트론 다시 보기

- 인공 뉴런
- 최초의 인공 신경망



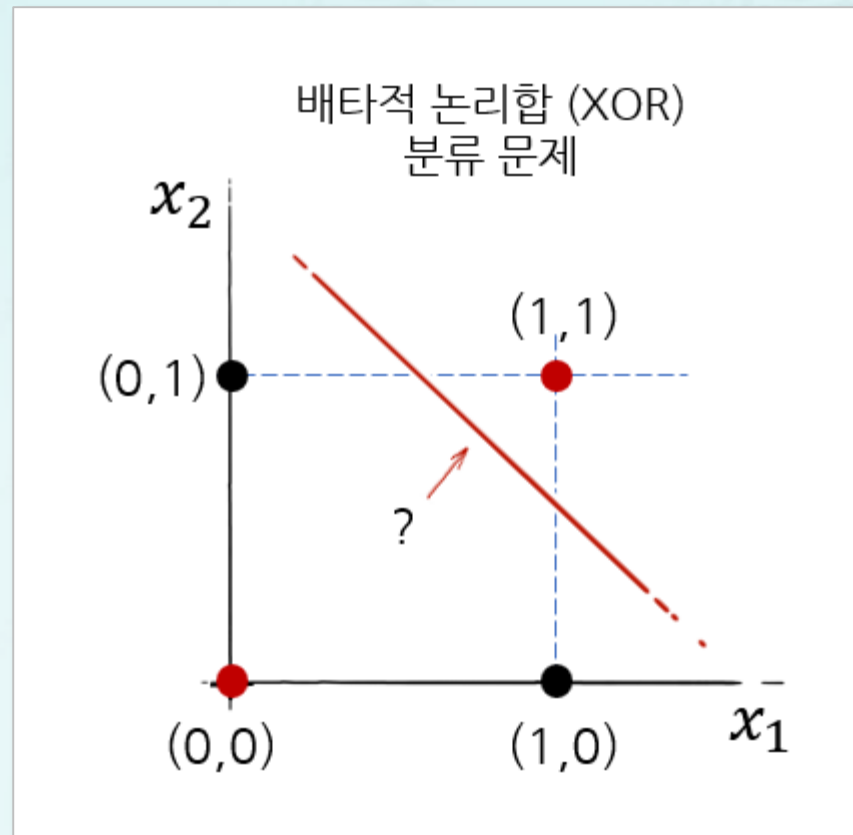
# 1. 퍼셉트론 다시 보기

- 배타적 논리합(XOR) 문제
  - Perceptron

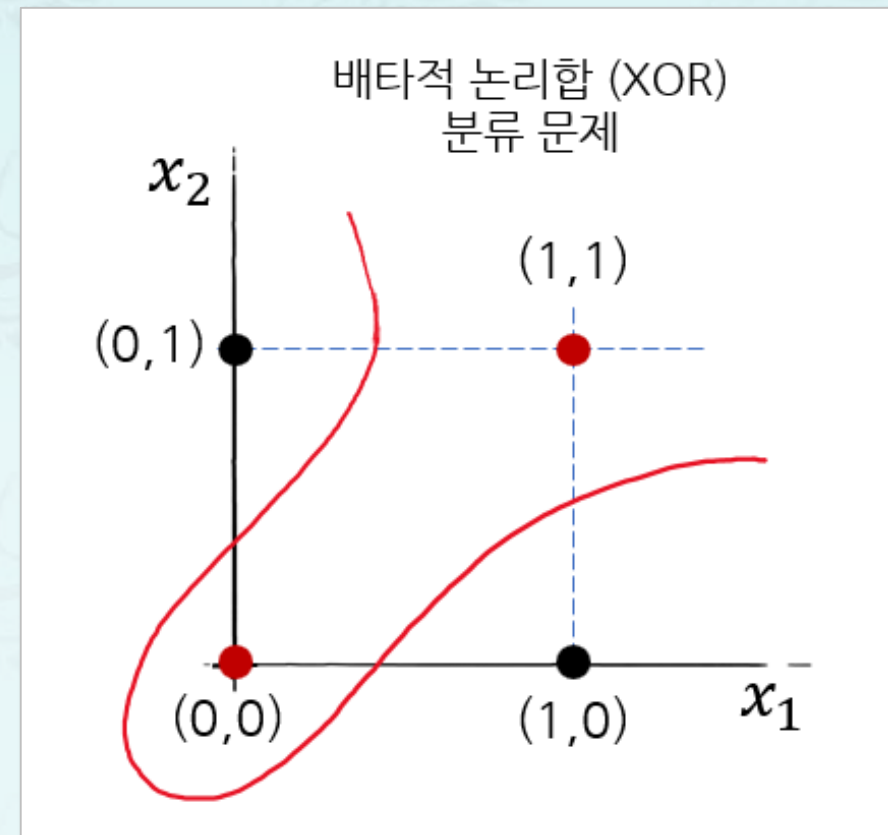


# 1. 퍼셉트론 다시 보기

- 배타적 논리합(XOR) 문제
  - Perceptron

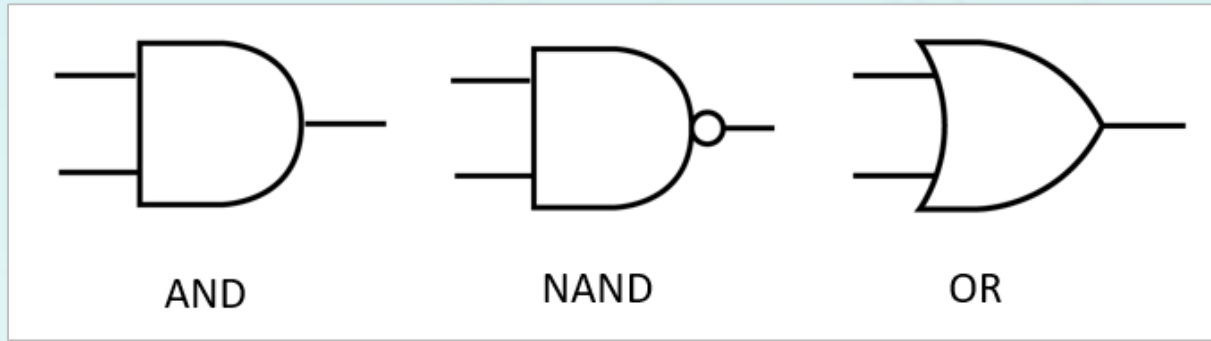


- 다층 퍼셉트론(MLP)
  - Multi-layer Perceptron



## 2.다층 퍼셉트론

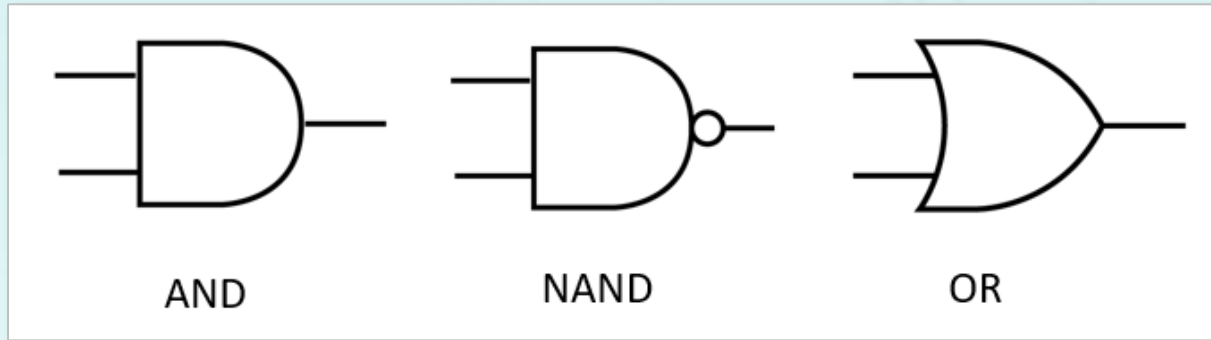
- 퍼셉트론 + 퍼셉트론 + ...



## 2.다층 퍼셉트론

■ 퍼셉트론 + 퍼셉트론 + ...

■ XOR



$x_1$	$x_2$	$y$
0	0	0
0	1	0
1	0	0
1	1	1

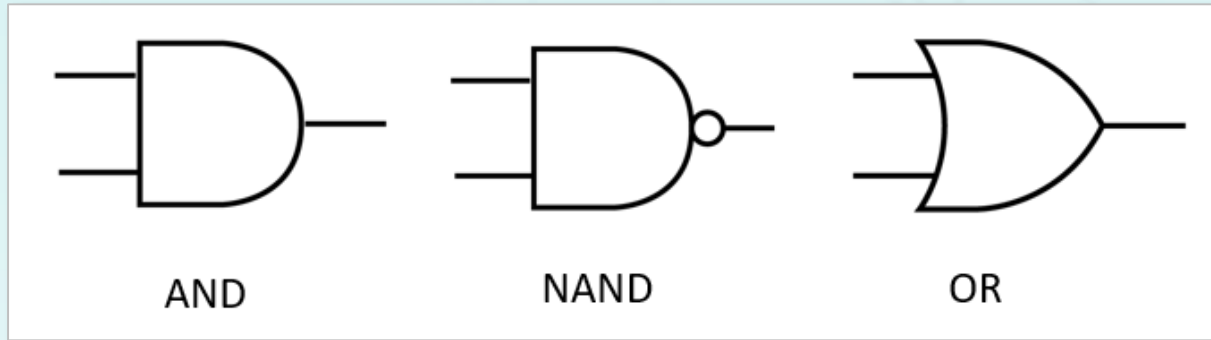
$x_1$	$x_2$	$y$
0	0	1
0	1	1
1	0	1
1	1	0

$x_1$	$x_2$	$y$
0	0	0
0	1	1
1	0	1
1	1	1

## 2.다층 퍼셉트론

■ 퍼셉트론 + 퍼셉트론 + ...

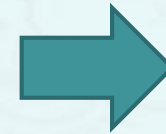
■ XOR



$x_1$	$x_2$	$y$
0	0	0
0	1	0
1	0	0
1	1	1

$x_1$	$x_2$	$y$
0	0	1
0	1	1
1	0	1
1	1	0

$x_1$	$x_2$	$y$
0	0	0
0	1	1
1	0	1
1	1	1



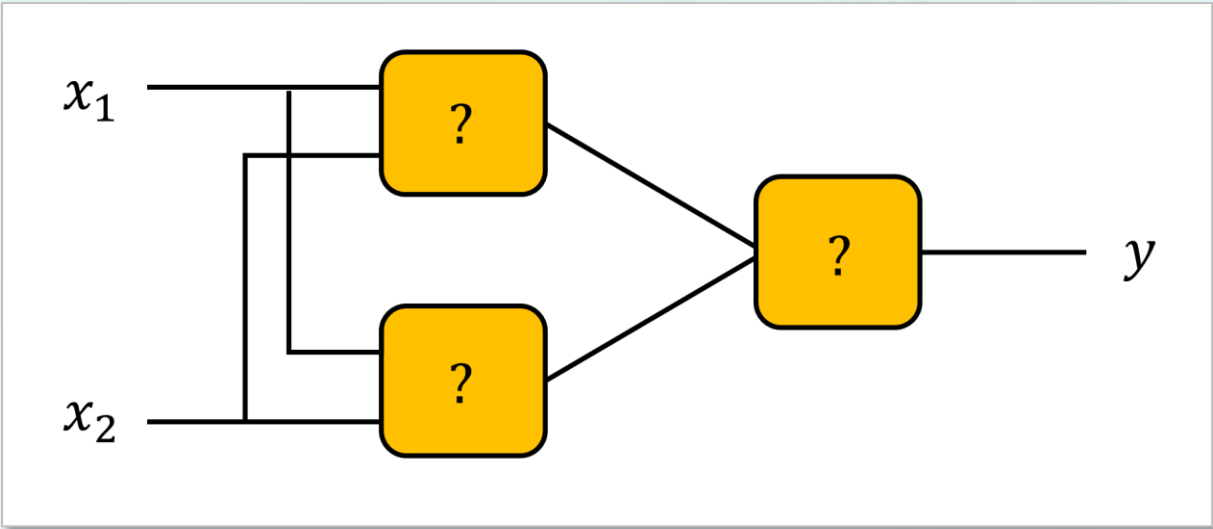
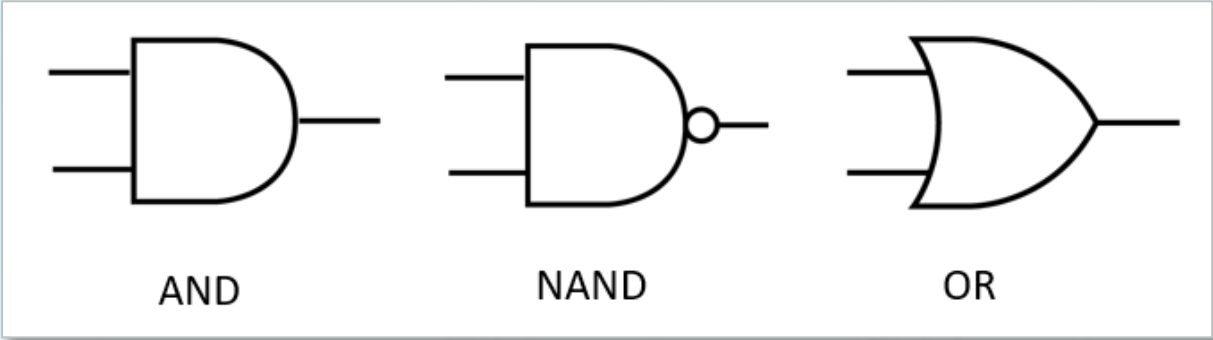
$x_1$	$x_2$	$y$
0	0	0
0	1	1
1	0	1
1	1	0



# 2.다층 퍼셉트론

■ 퍼셉트론 + 퍼셉트론 + ...

■ XOR

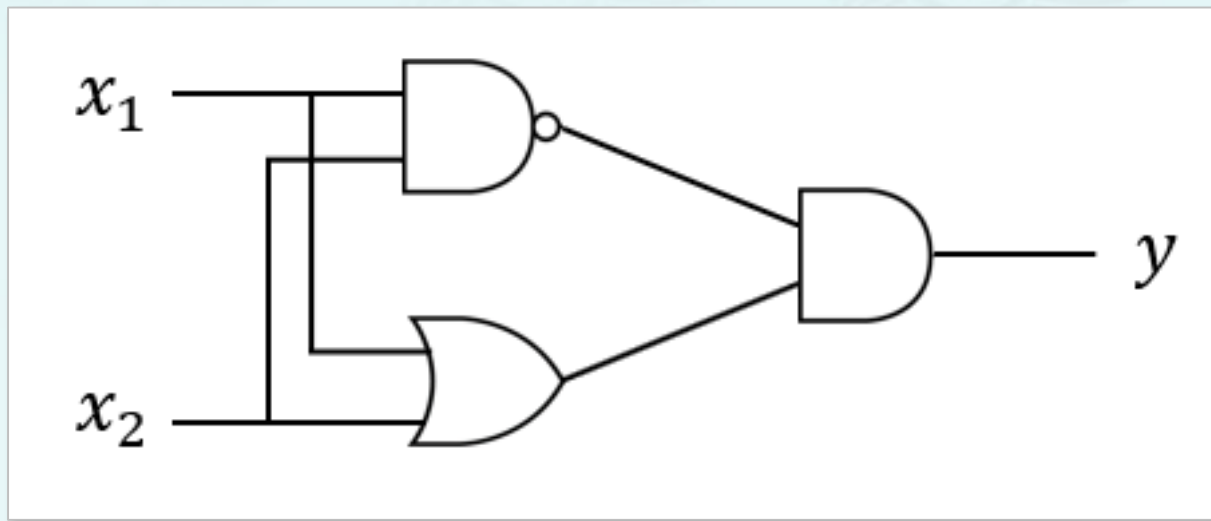
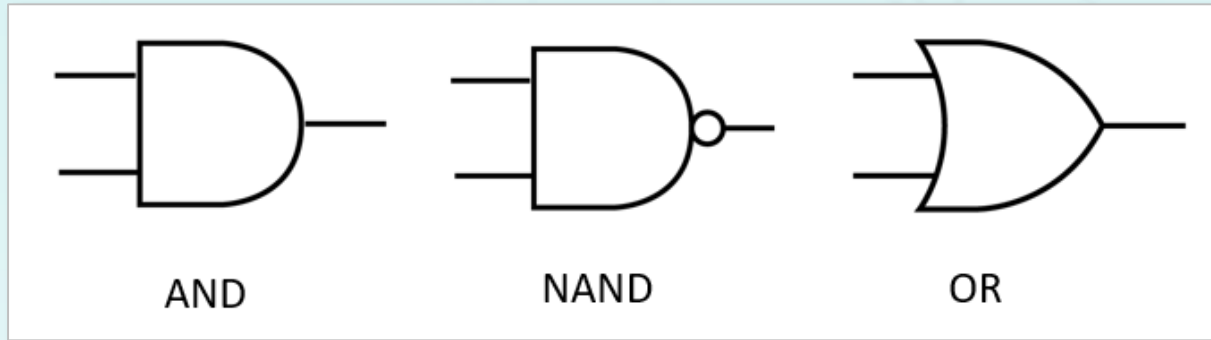


$x_1$	$x_2$	$y$
0	0	0
0	1	1
1	0	1
1	1	0

## 2.다층 퍼셉트론

■ 퍼셉트론 + 퍼셉트론 + ...

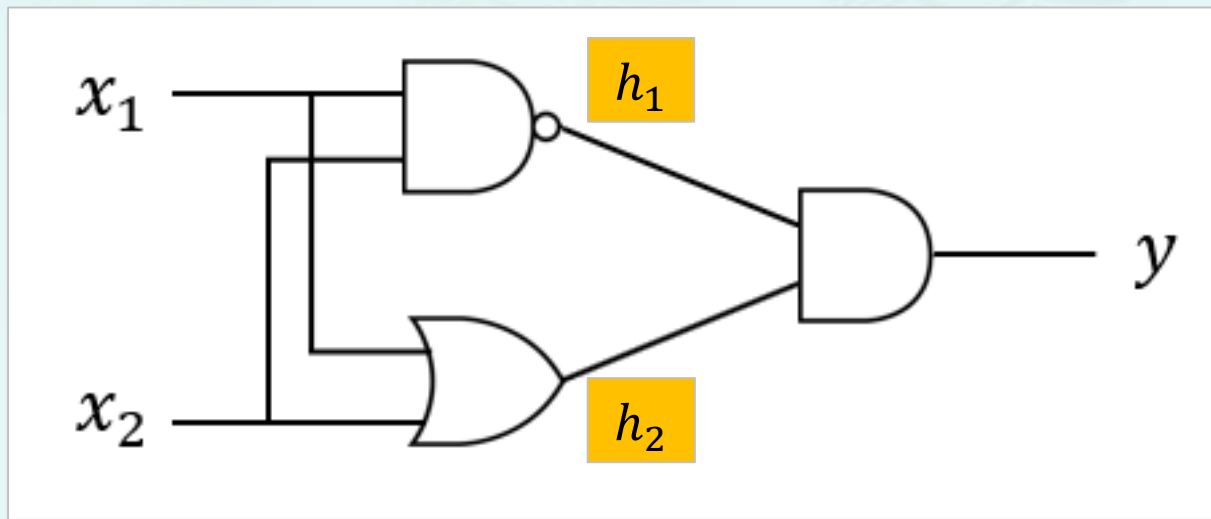
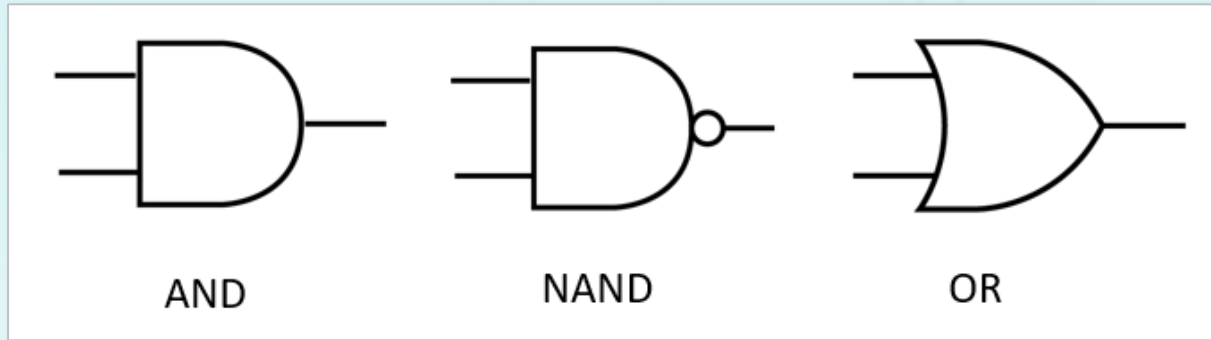
■ XOR



## 2.다층 퍼셉트론

■ 퍼셉트론 + 퍼셉트론 + ...

■ XOR

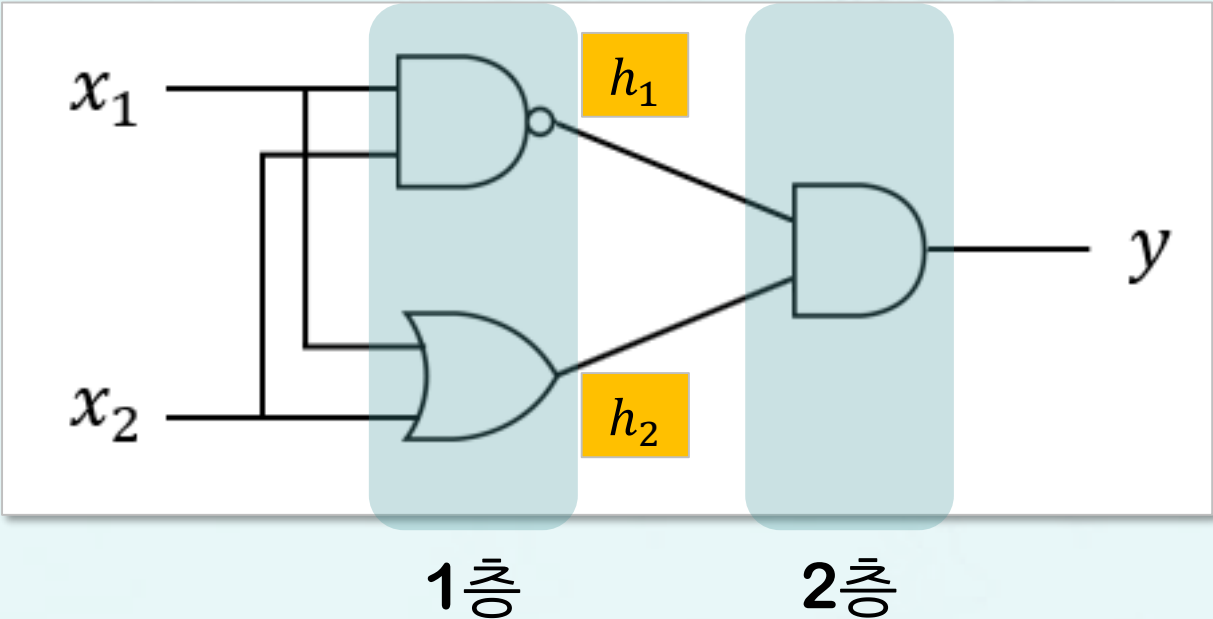
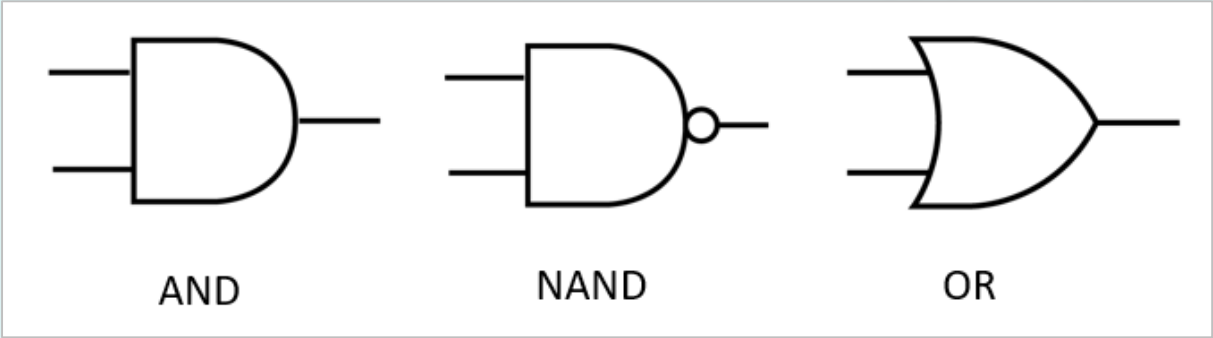


		NAND	OR	XOR
$x_1$	$x_2$	$h_1$	$h_2$	$y$
0	0	1	0	0
0	1	1	1	1
1	0	1	1	1
1	1	0	1	0

# 2.다층 퍼셉트론

■ 퍼셉트론 + 퍼셉트론 + ...

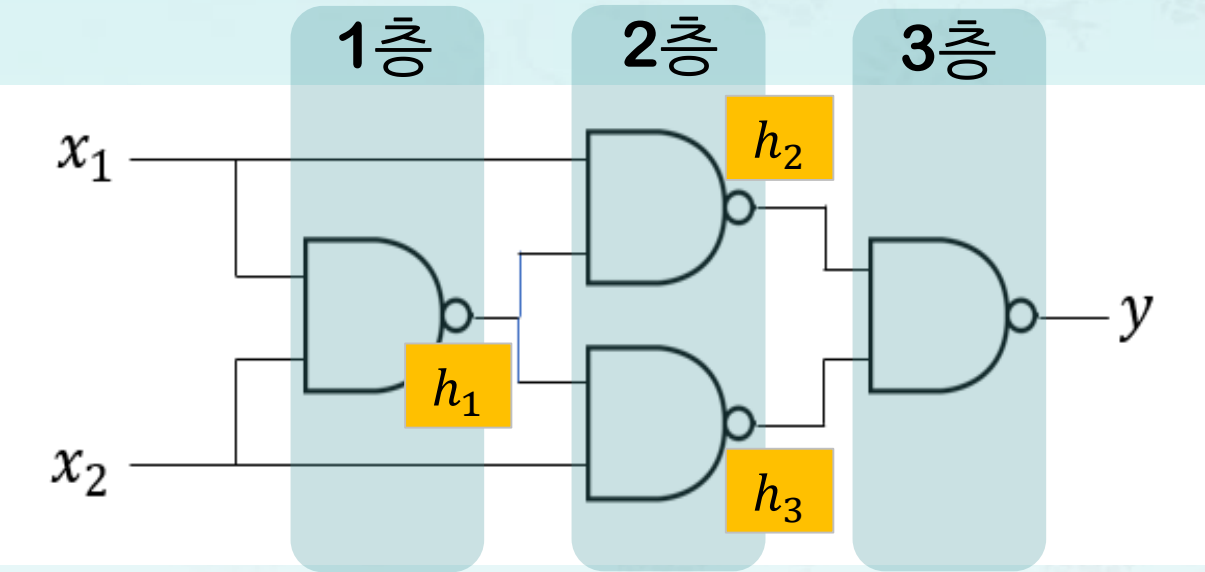
■ XOR



		NAND	OR	XOR
$x_1$	$x_2$	$h_1$	$h_2$	$y$
0	0	1	0	0
0	1	1	1	1
1	0	1	1	1
1	1	0	1	0

# 2.다층 퍼셉트론

- 퍼셉트론 + 퍼셉트론 + ...



- XOR

NAND NAND NAND XOR

$x_1$	$x_2$	$h_1$	$h_2$	$h_3$	$y$
0	0	1	1	1	0
0	1	1	1	0	1
1	0	1	0	1	1
1	1	0	1	1	0





### 3. 다층 구조 네트워크

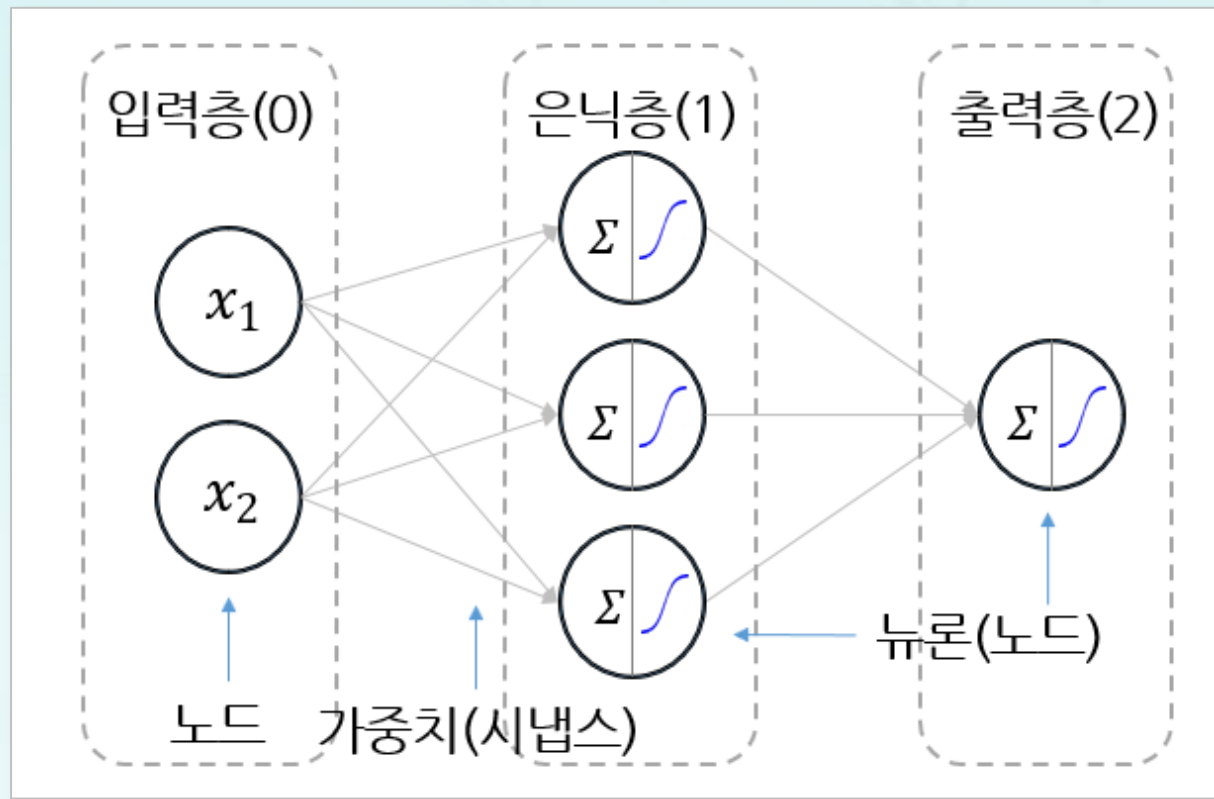
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- 다층 구조 인공신경망



### 3. 다층 구조 네트워크

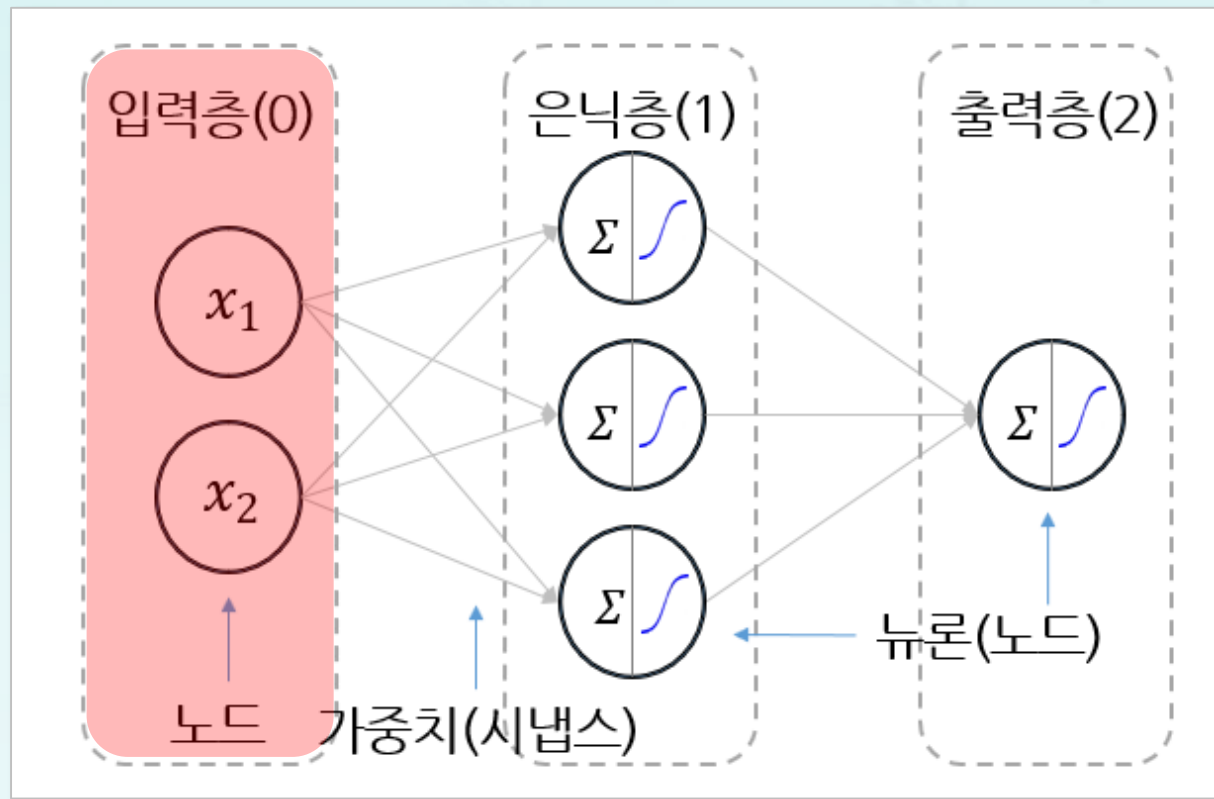
- 다층 구조 인공신경망





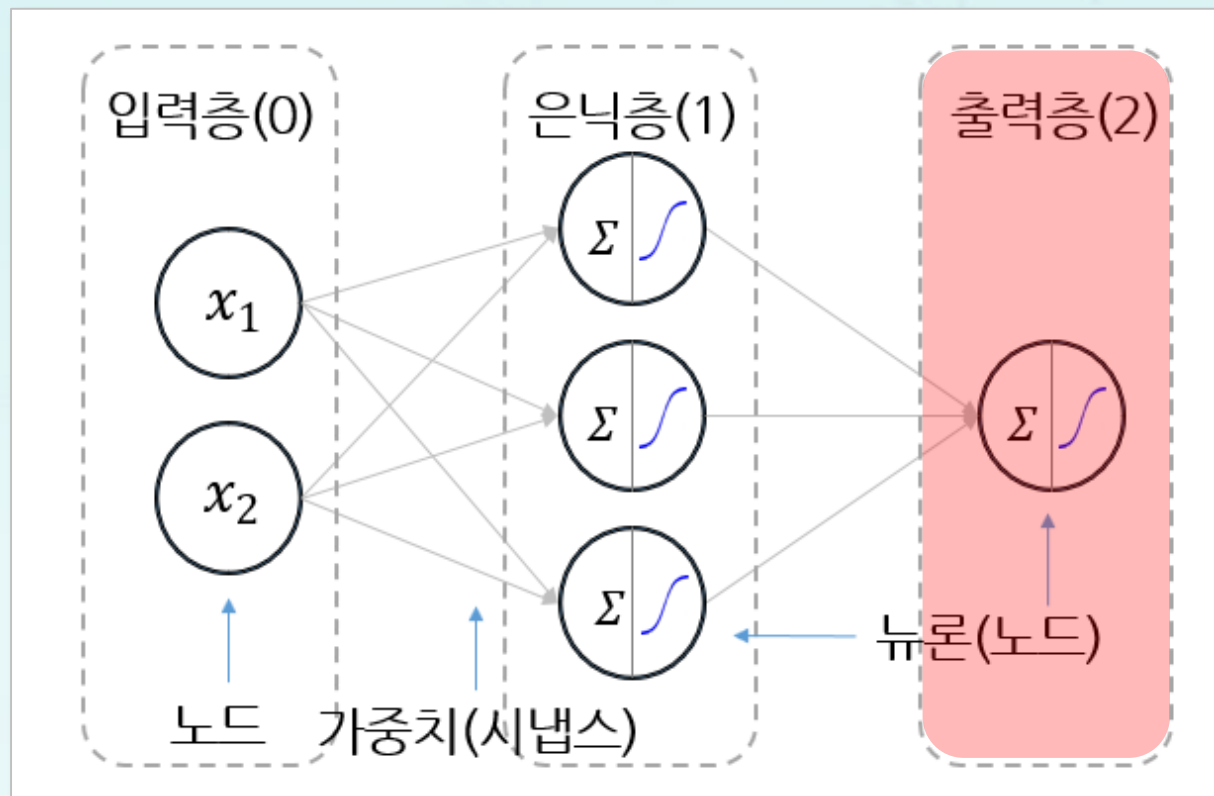
### 3. 다층 구조 네트워크: 입력층

- 다층 구조 인공신경망



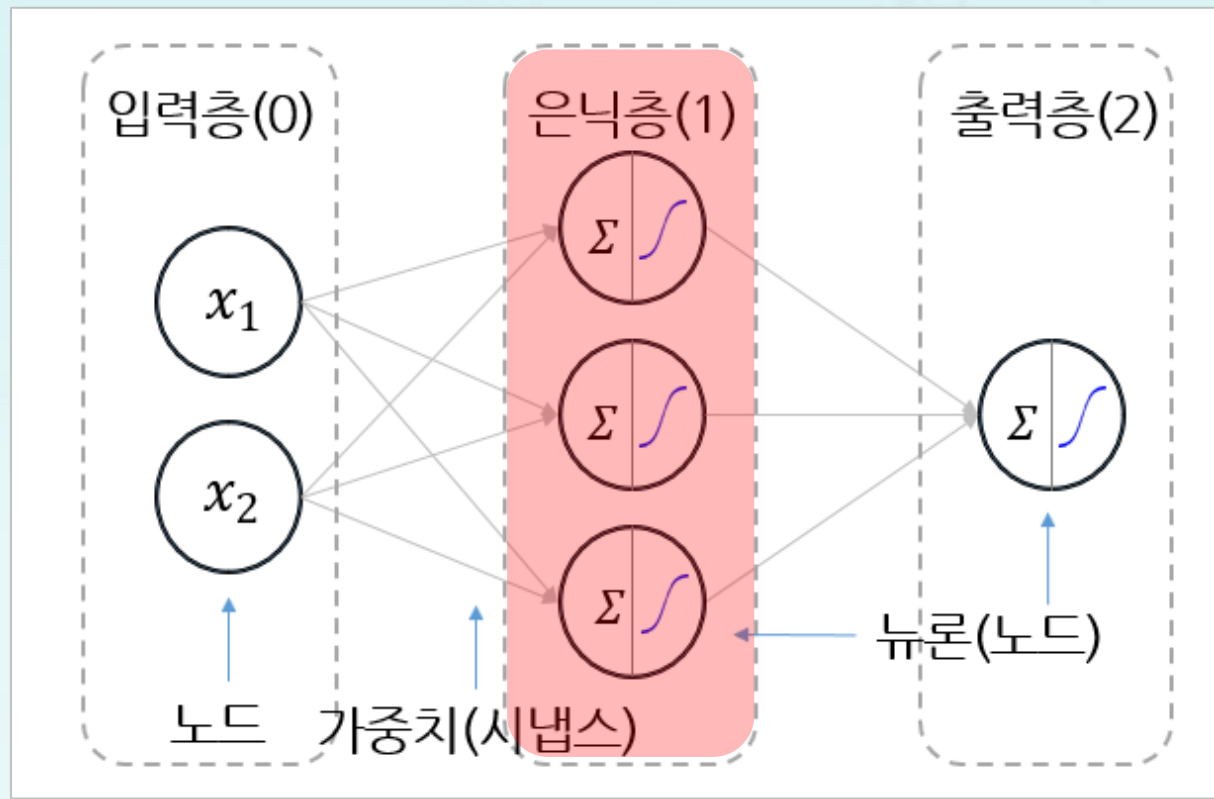
### 3. 다층 구조 네트워크: 출력층

- 다층 구조 인공신경망



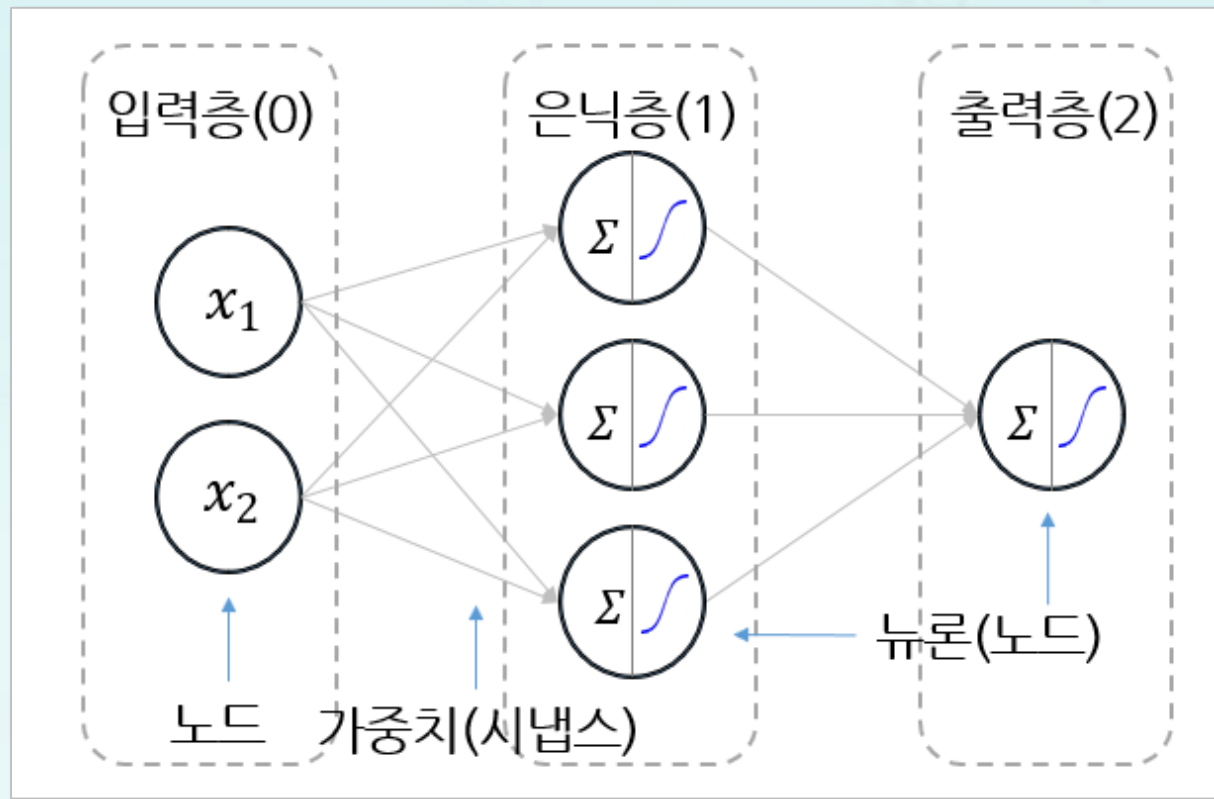
### 3. 다층 구조 네트워크: 은닉층

- 다층 구조 인공신경망



### 3. 다층 구조 네트워크: 층수

- 다층 구조 인공신경망



## 4. 생물학적 뉴론: 복습

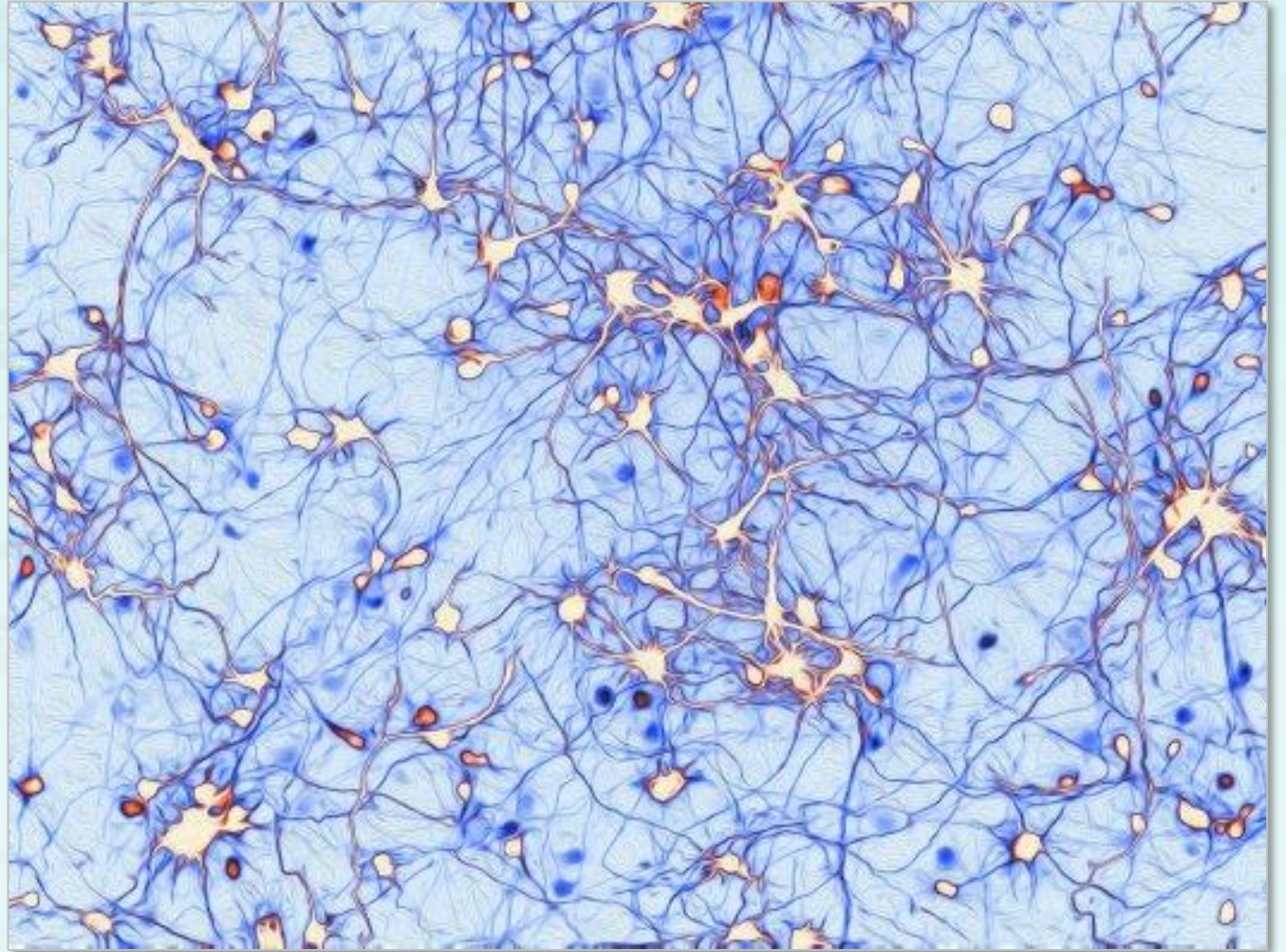
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- 뉴론



## 4. 생물학적 뉴론: 복습

- 뉴론
  - 시냅스( > 임계값)

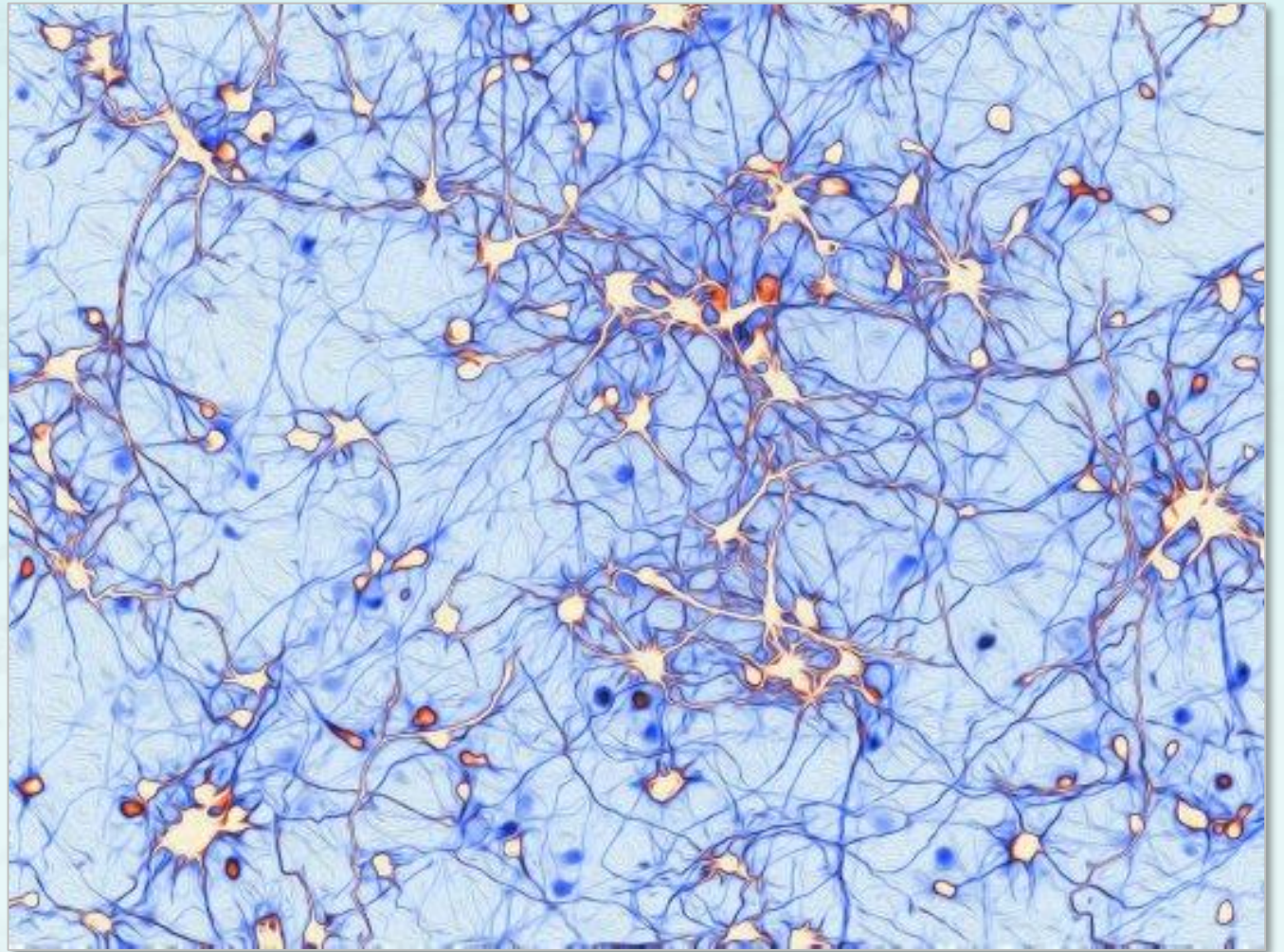


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## 4. 생물학적 뉴론: 복습

- 뉴론
  - 시냅스(> 임계값)
  - 출력 =  $\sum$  입력



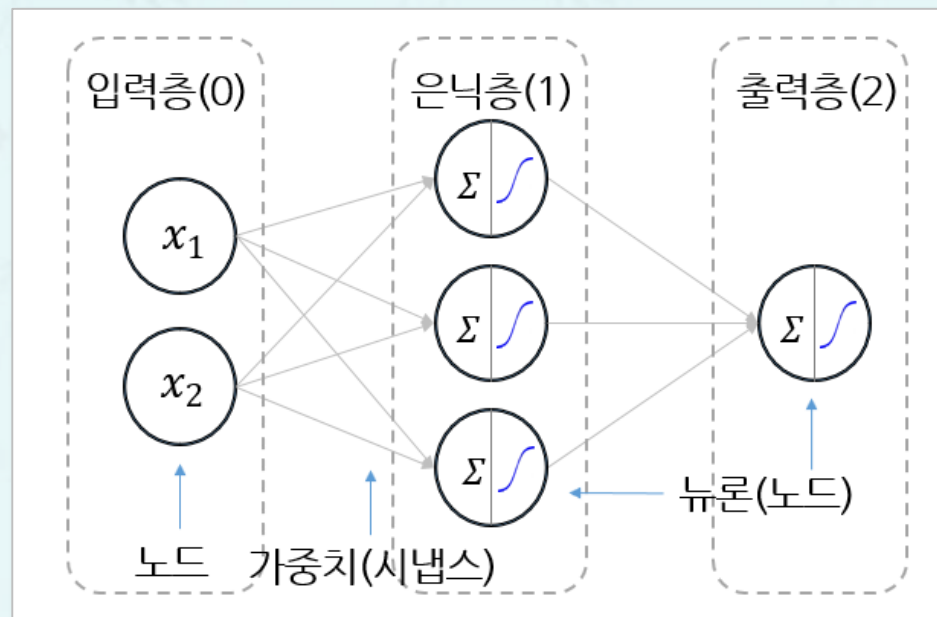
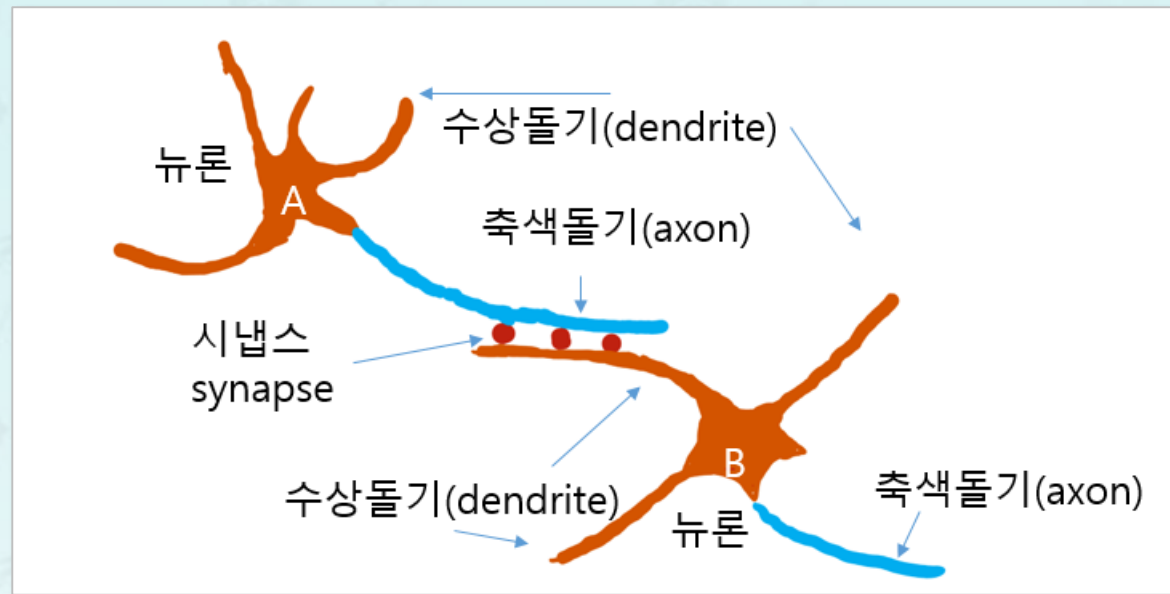
© Victor Anggono, 2015

## 4. 생물학적 뉴론: 인공신경망과의 비교

### ■ 뉴론 vs. 퍼셉트론

생물학적 신경망

인공 신경망

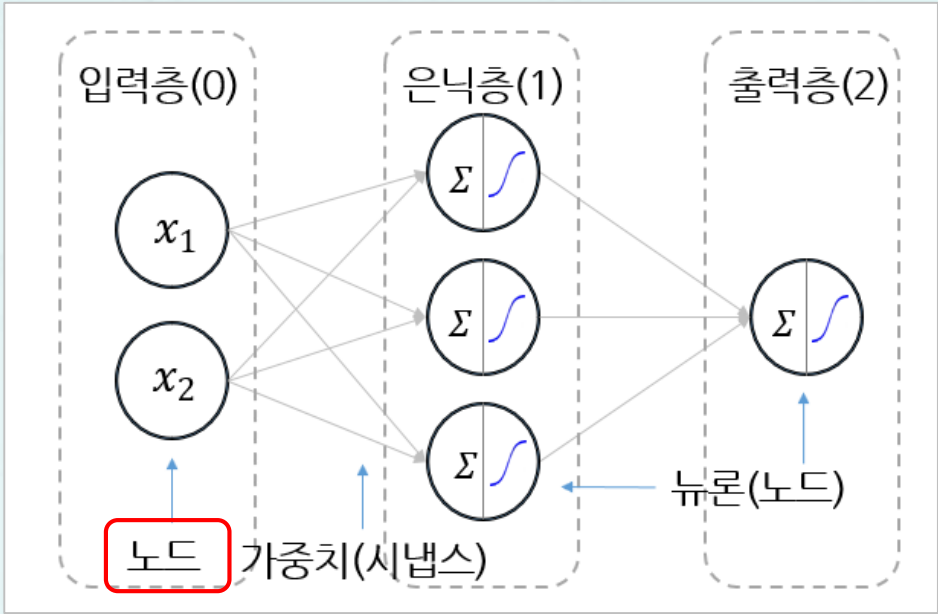
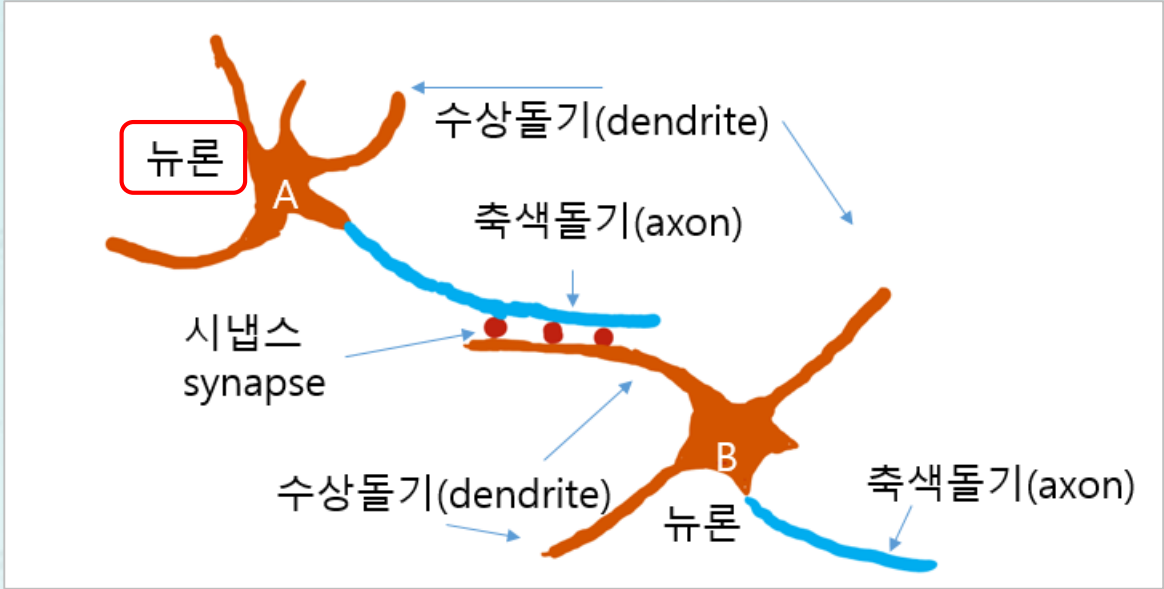




# 4. 생물학적 뉴론: 인공신경망과의 비교

## ■ 뉴론 vs. 퍼셉트론

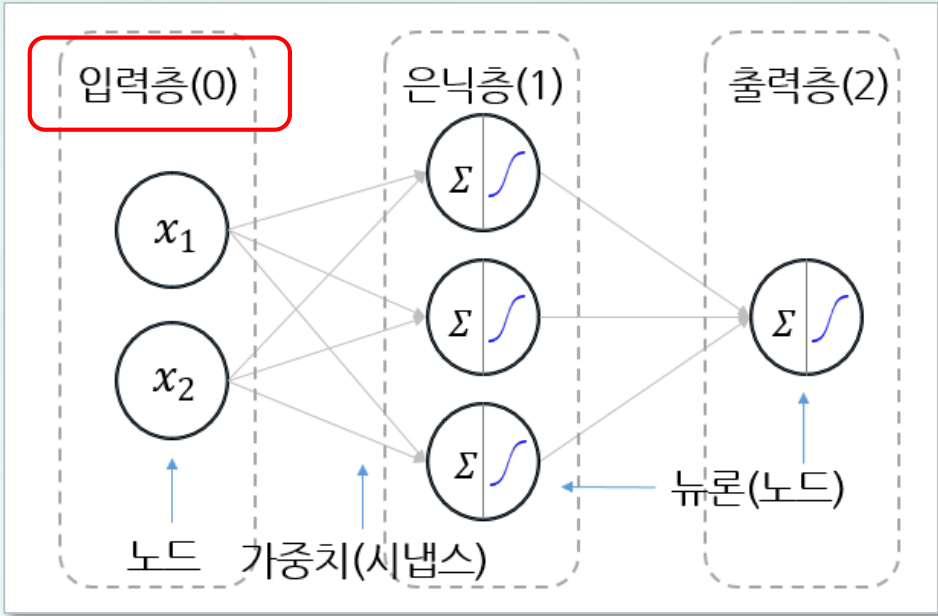
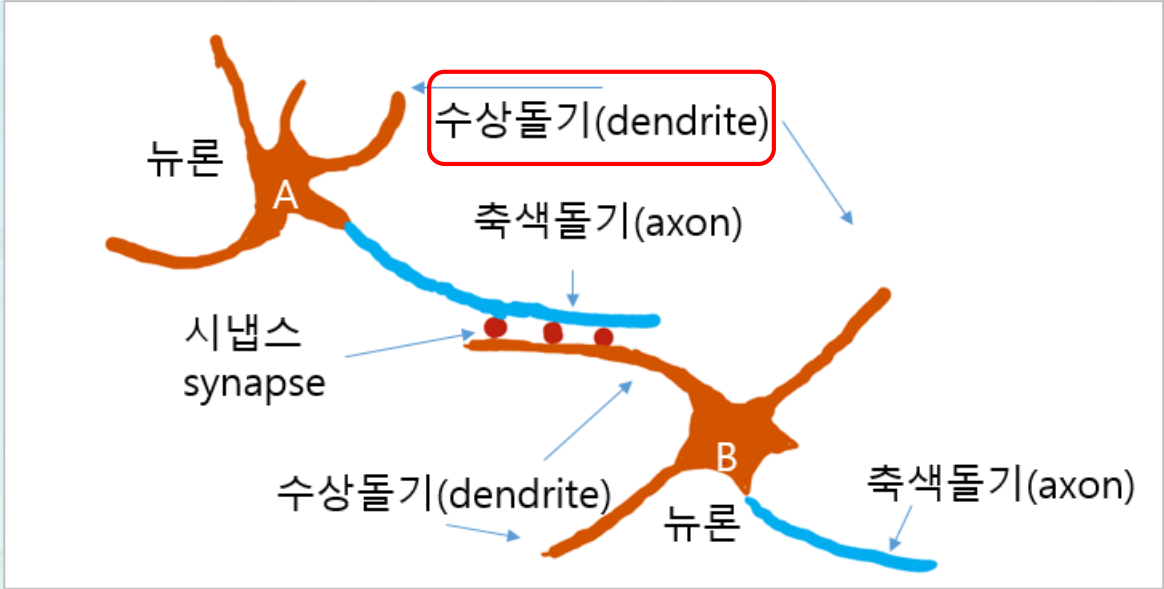
생물학적 신경망	인공 신경망
뉴론(Neuron)	노드(Node)



# 4. 생물학적 뉴론: 인공신경망과의 비교

## ■ 뉴론 vs. 퍼셉트론

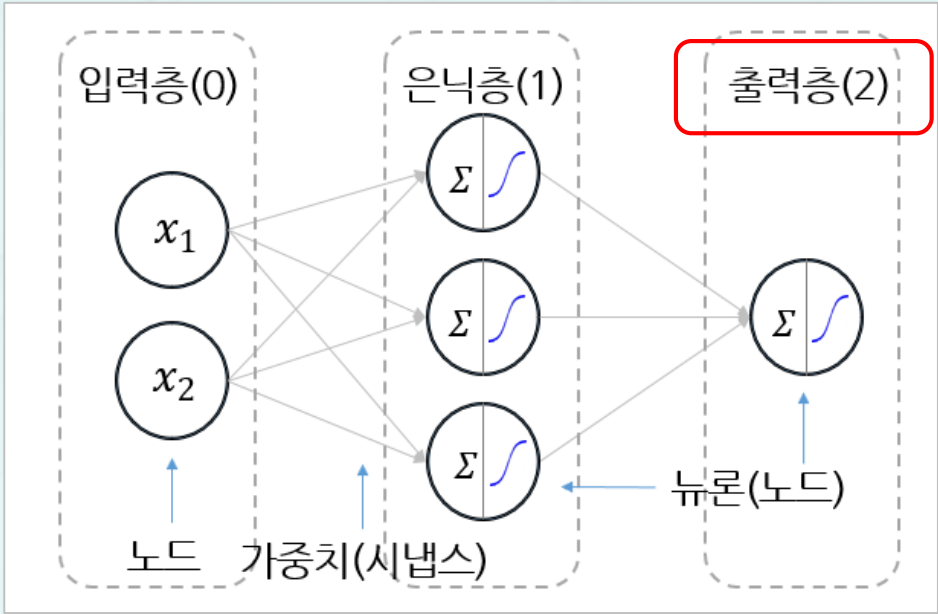
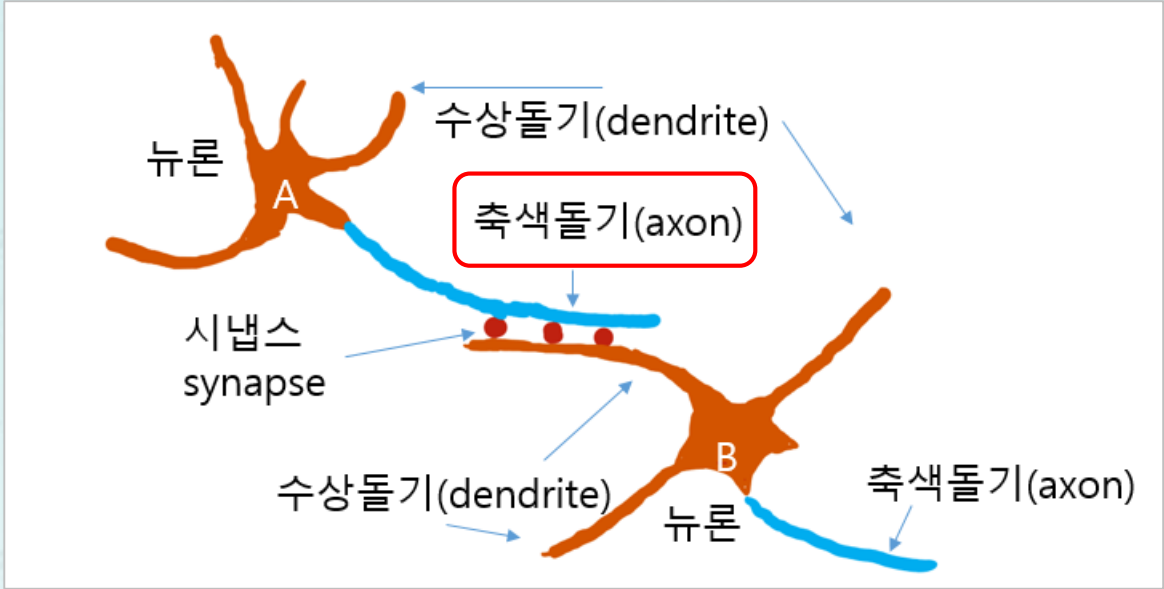
생물학적 신경망	인공 신경망
뉴론(Neuron)	노드(Node)
수상돌기(Dendrite)	입력(Input)



# 4. 생물학적 뉴론: 인공신경망과의 비교

## ■ 뉴론 vs. 퍼셉트론

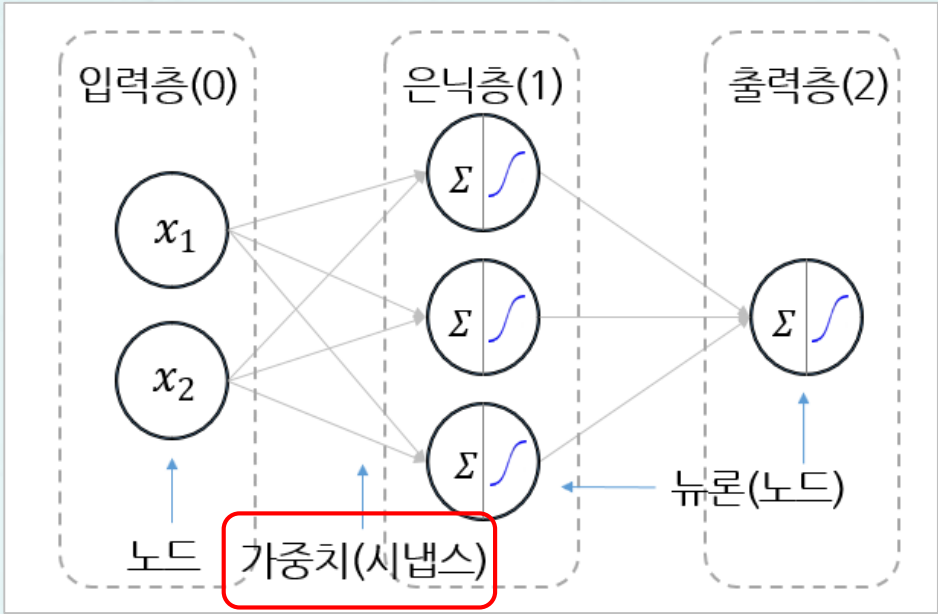
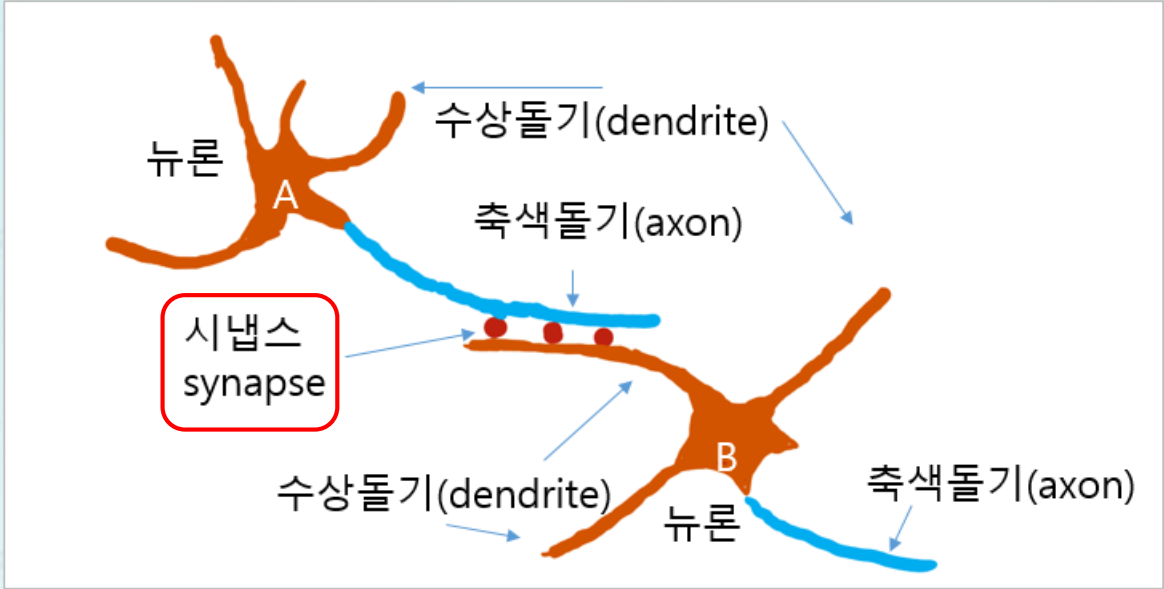
생물학적 신경망	인공 신경망
뉴론(Neuron)	노드(Node)
수상돌기(Dendrite)	입력(Input)
축색돌기(Axon)	출력(Output)



# 4. 생물학적 뉴론: 인공신경망과의 비교

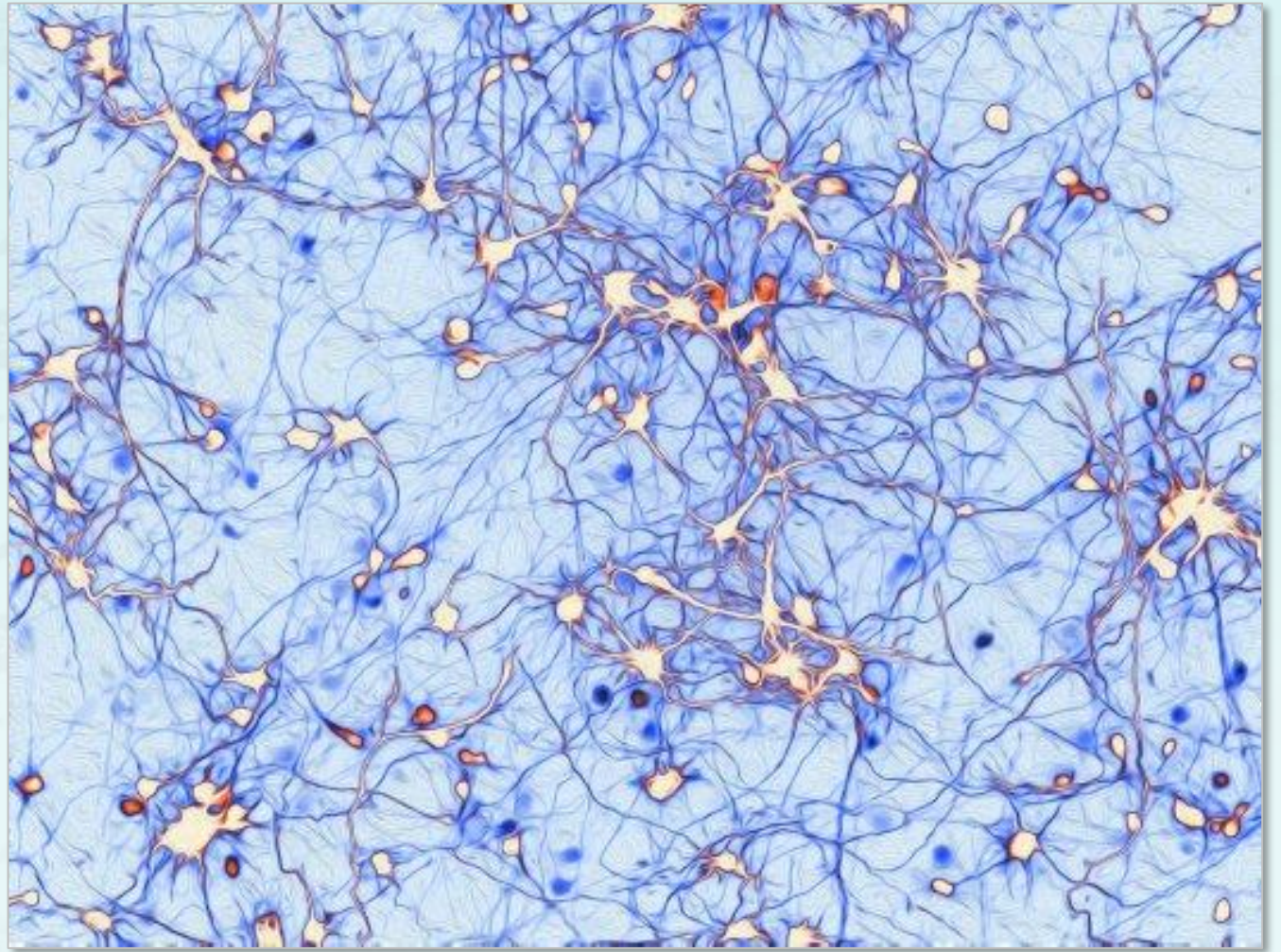
## ■ 뉴론 vs. 퍼셉트론

생물학적 신경망	인공 신경망
뉴론(Neuron)	노드(Node)
수상돌기(Dendrite)	입력(Input)
축색돌기(Axon)	출력(Output)
시냅스(Synapse)	가중치(Weight)





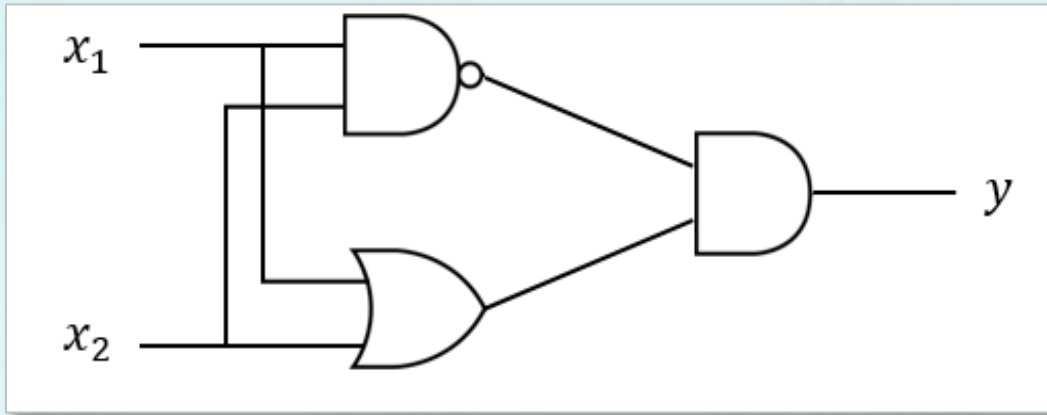
## 4. 생물학적 뉴런: 인공신경망과의 비교



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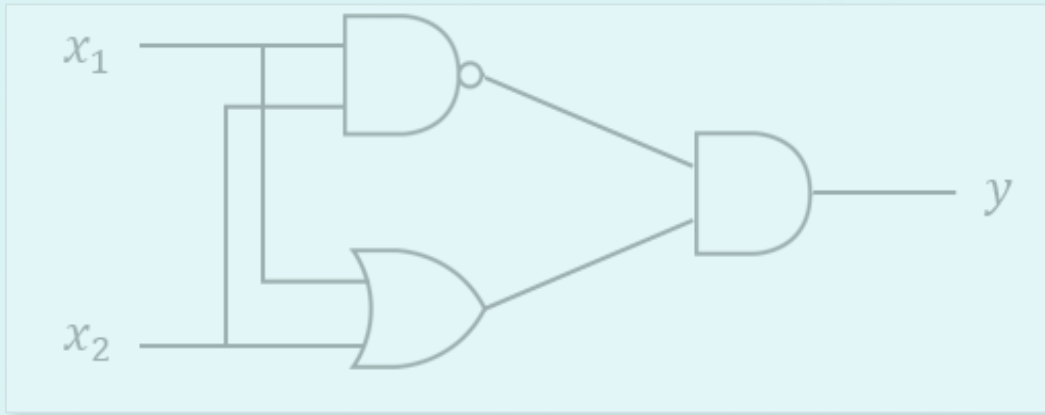
## 5. 다층 퍼셉트론 활용

- AND + NAND + OR

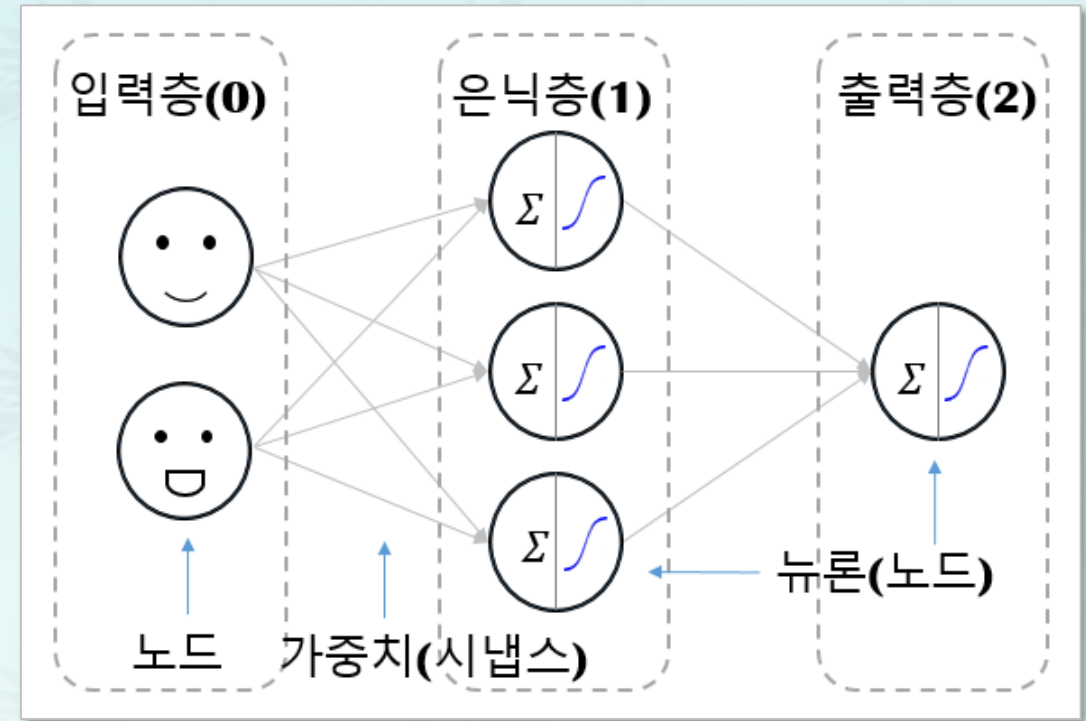


## 5. 다층 퍼셉트론 활용

- AND + NAND + OR



- 신경망 학습



## 5. 다층 퍼셉트론 활용

### Chinese man caught by facial recognition at pop concert

13 April 2018

f     Share

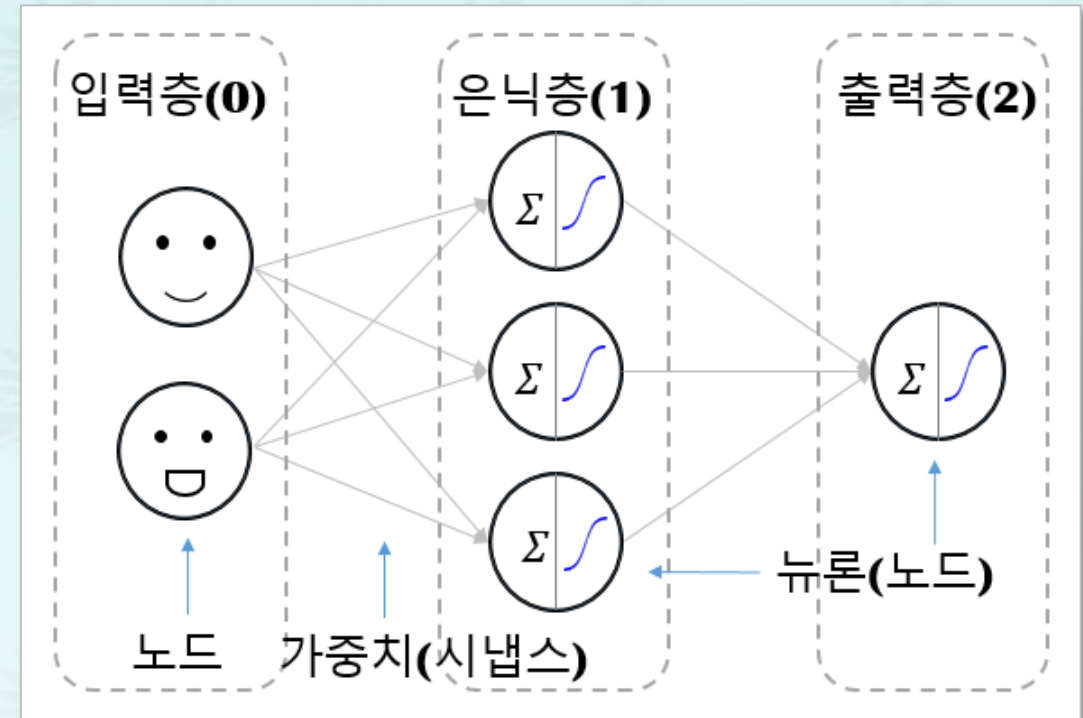


GETTY IMAGES

(File Photo) There are an estimated 170 million CCTV cameras already in place in China

출처: BBC 뉴스, [www.bbc.com](http://www.bbc.com), 2018.4

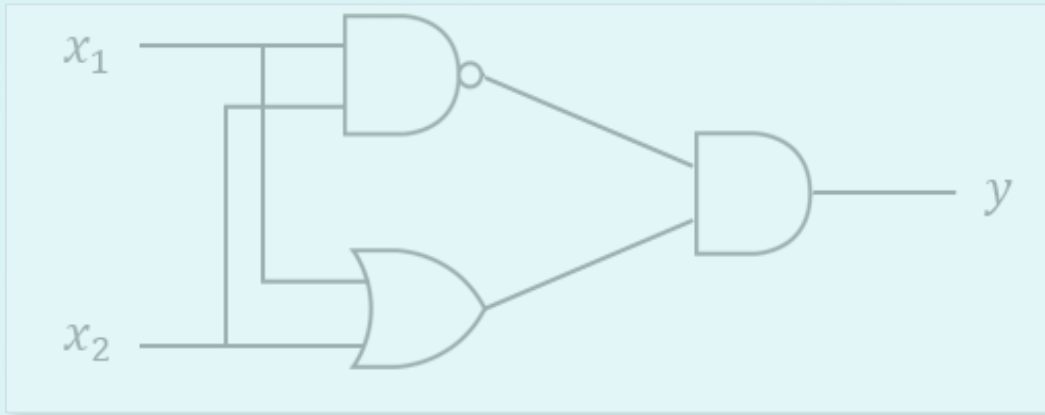
### ■ 신경망 학습



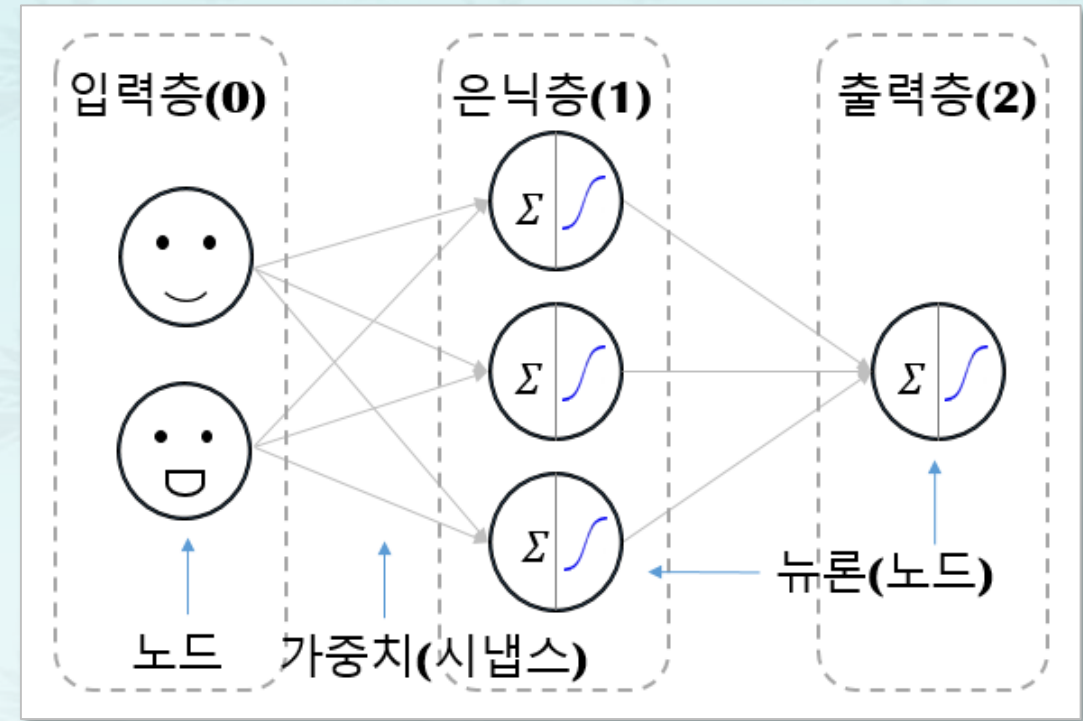


## 5. 다층 퍼셉트론 활용

- AND + NAND + OR



- 신경망 학습



# 다층 퍼셉트론

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- 학습 정리
  - 단순 퍼셉트론의 한계를 파악하고,
  - 다층 퍼셉트론의 구조와 학습방법을 이해하기
  - 생물학적 뉴런의 구조와 인공신경망을 비교하기
- 차시 예고
  - **7-1** 순방향 신경망

6주차(3/3)

# 다층 퍼셉트론

파이썬으로 배우는 기계학습

한동대학교  
김영섭 교수

여러분 곁에 항상 열려 있는 K-MOOC 강의실에서 만나 뵙기를 바랍니다.