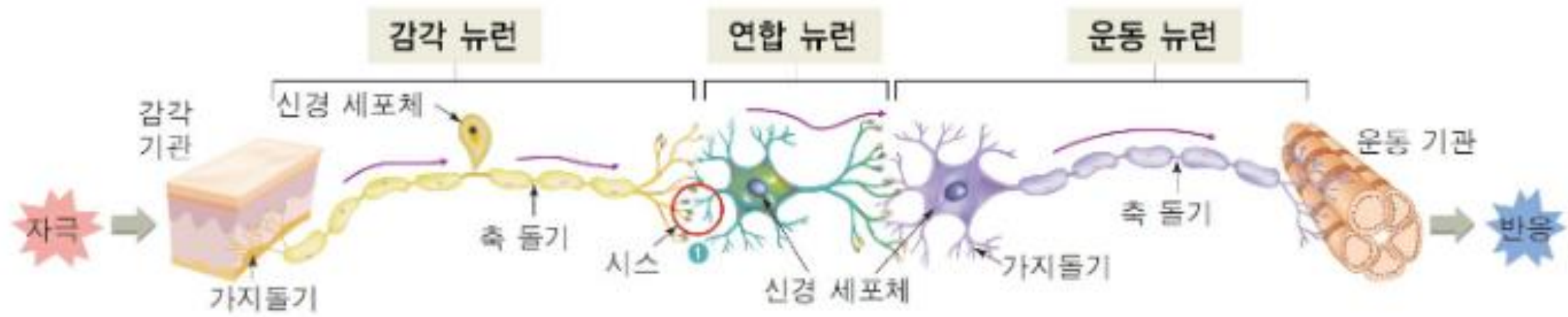


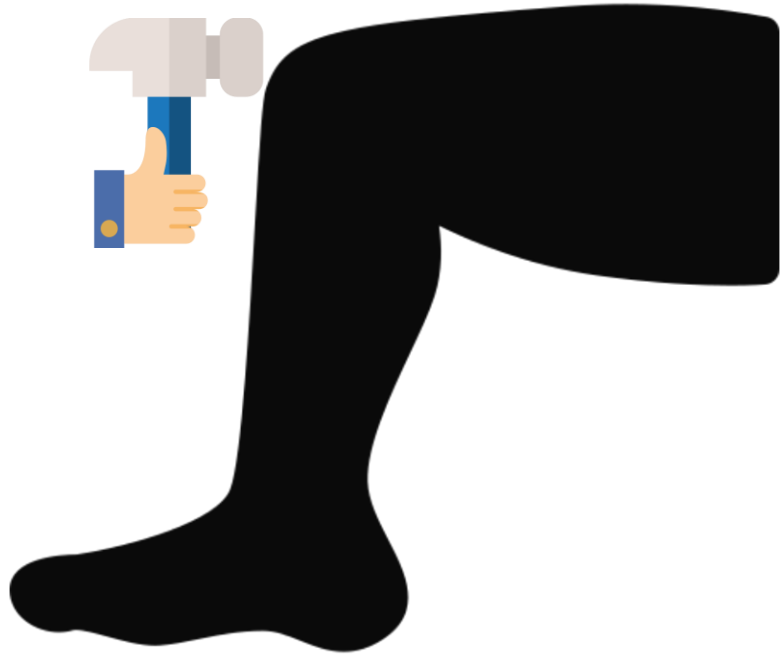
Deep Learning Start_(perceptron)

박범진

pbj00812@gmail.com

뉴런(1/2)





압력 > theta → 무릎 반사 압력 <= theta → 변화 없음

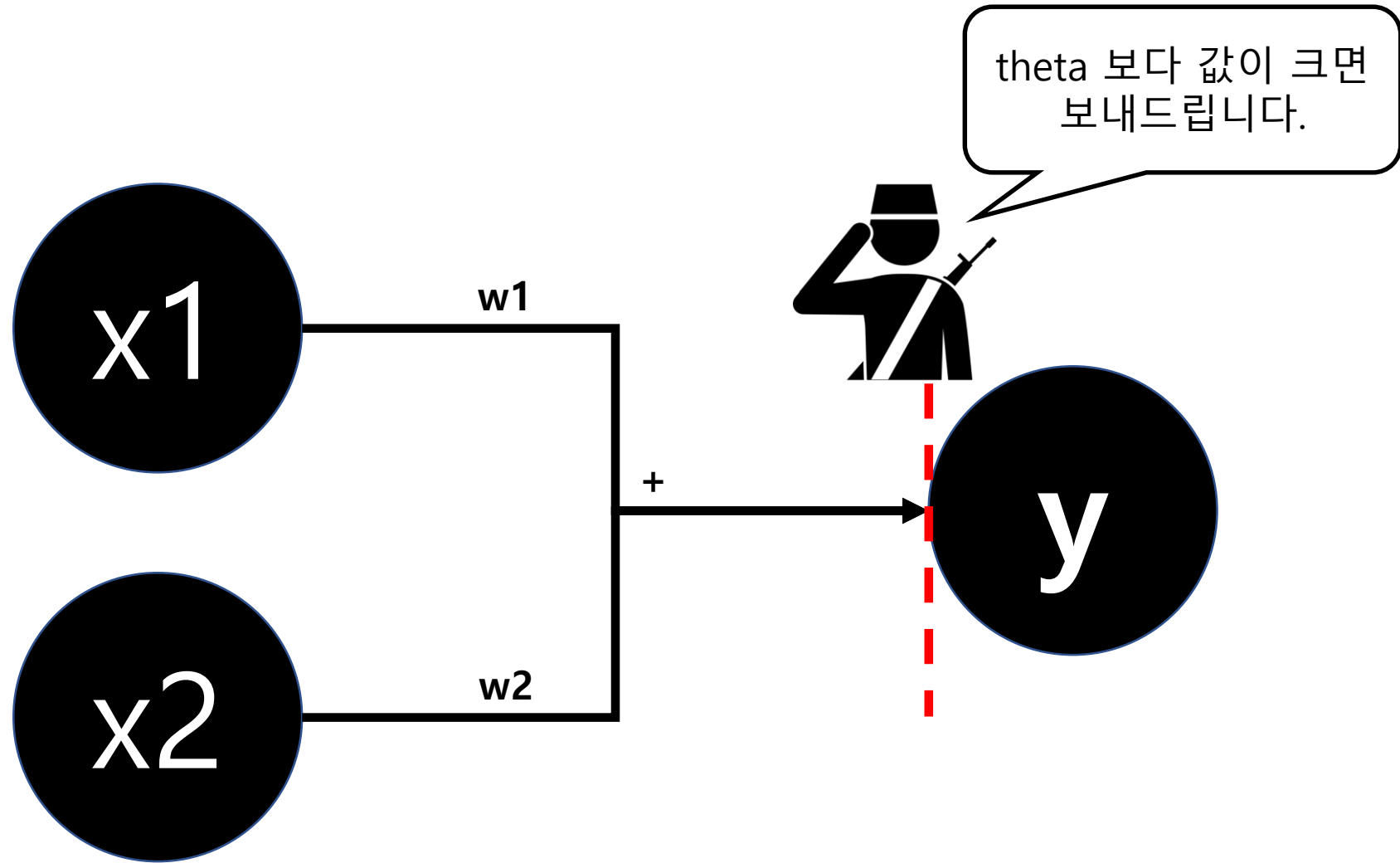


x



w

퍼셉트론(1/2)



$$y = \begin{cases} 0 & (w_1x_1 + w_2x_2 \leq \text{theta}) \\ 1 & (w_1x_1 + w_2x_2 > \text{theta}) \end{cases}$$

퍼셉트론(2/2)

0 ($w_1x_1 + w_2x_2 \leq \text{theta}$)

→ ($w_1x_1 + w_2x_2 - \text{theta} \leq 0$)

→ ($w_1x_1 + w_2x_2 + b \leq 0$)

$w_2x_2 > -w_1x_1 - b$

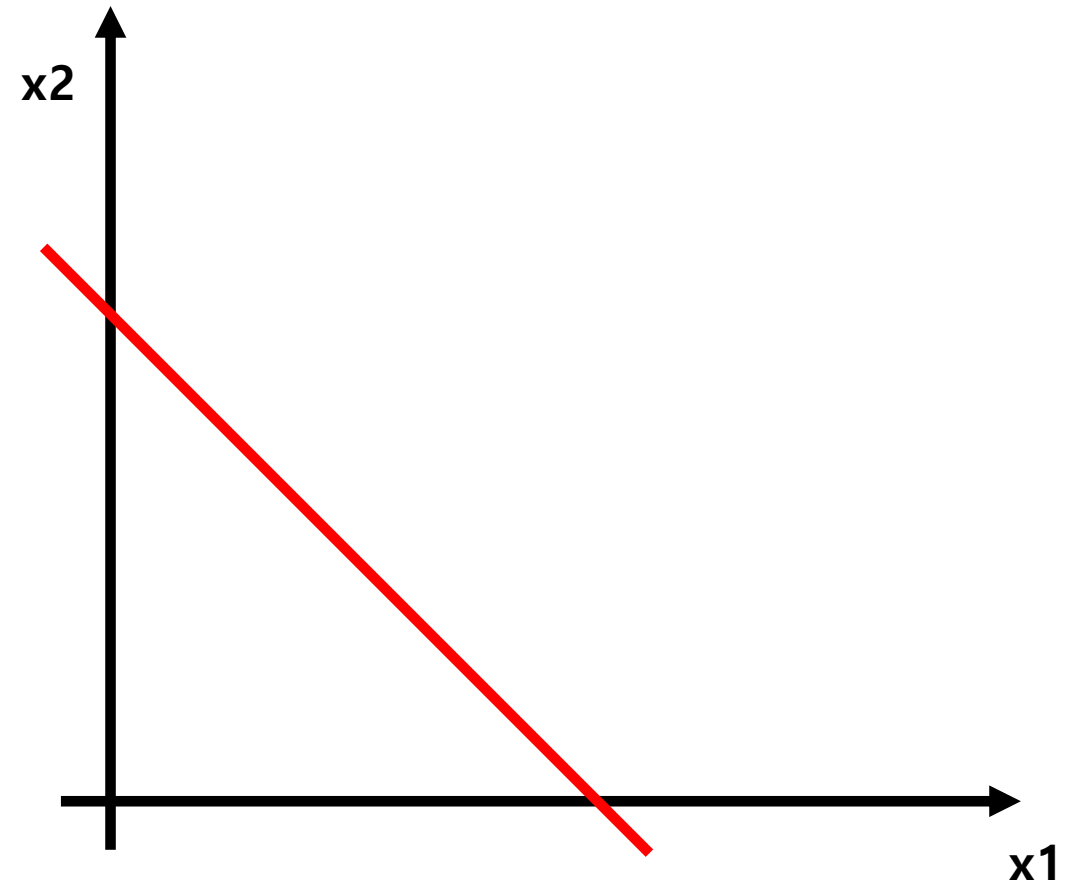
$x_2 > -(w_1/w_2)x_1 - (b/w_2)$

1 ($w_1x_1 + w_2x_2 > \text{theta}$)

→ ($w_1x_1 + w_2x_2 - \text{theta} > 0$)

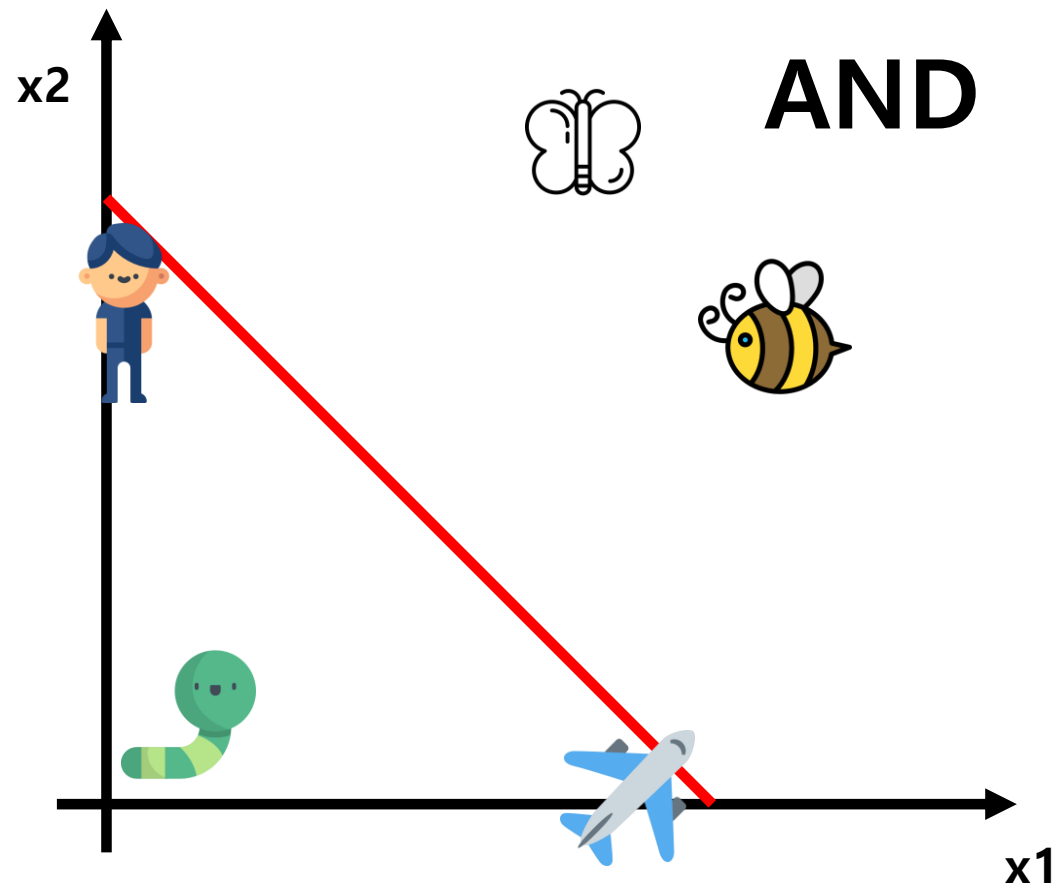
→ ($w_1x_1 + w_2x_2 + b > 0$)

* $b : -\text{theta}$



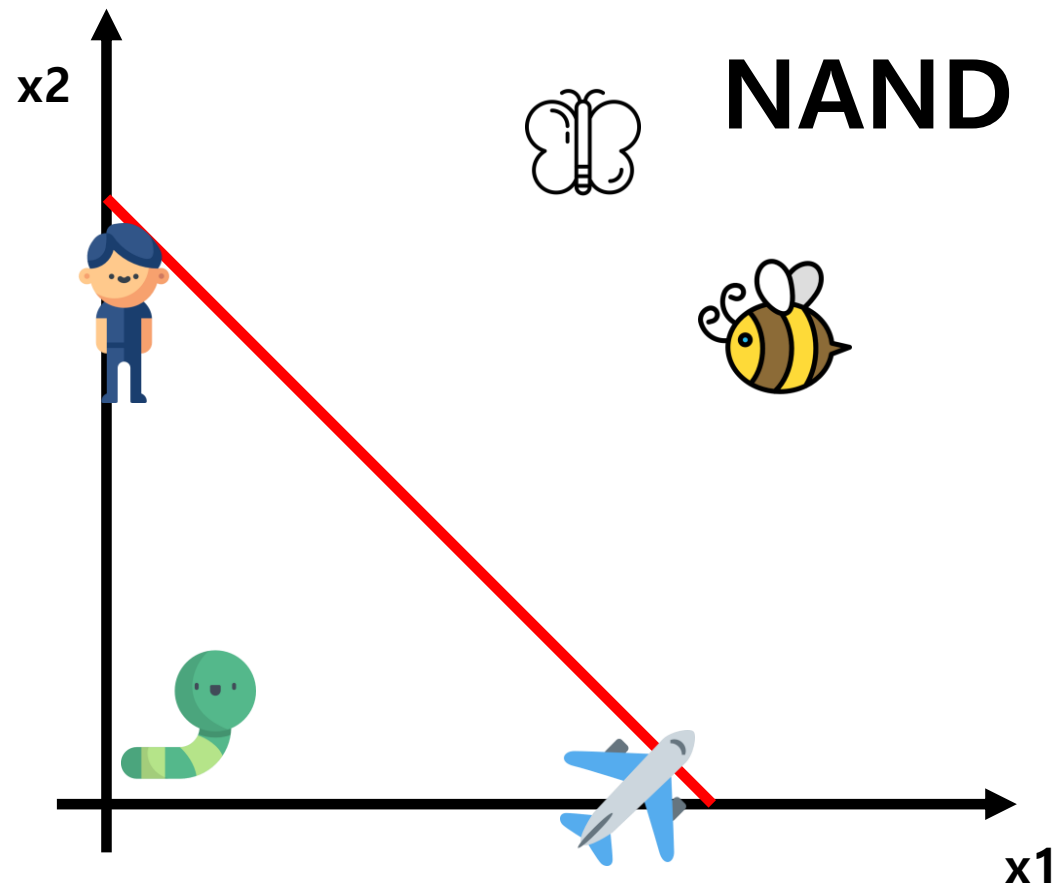
논리회로(1/5)

| 날개가 있느냐(x1) | 다리가 있느냐(x2) | 결과 | y |
|-------------|-------------|-------|---|
| ○ | ○ | 나비, 벌 | 1 |
| ○ | X | 비행기 | 0 |
| X | ○ | 사람 | 0 |
| X | X | 지렁이 | 0 |



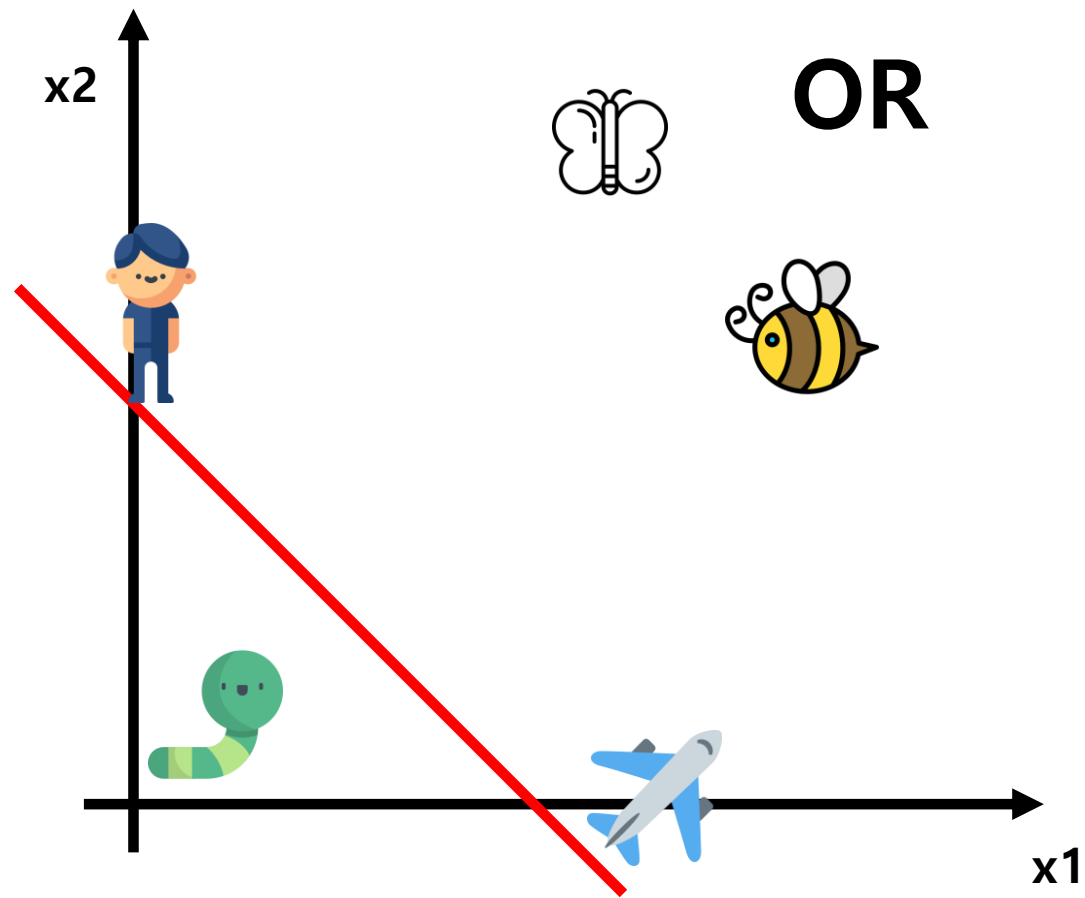
논리회로(2/5)

| 날개가 있느냐(x1) | 다리가 있느냐(x2) | 결과 | y |
|-------------|-------------|-------|---|
| ○ | ○ | 나비, 벌 | 0 |
| ○ | X | 비행기 | 1 |
| X | ○ | 사람 | 1 |
| X | X | 지렁이 | 1 |



논리회로(3/5)

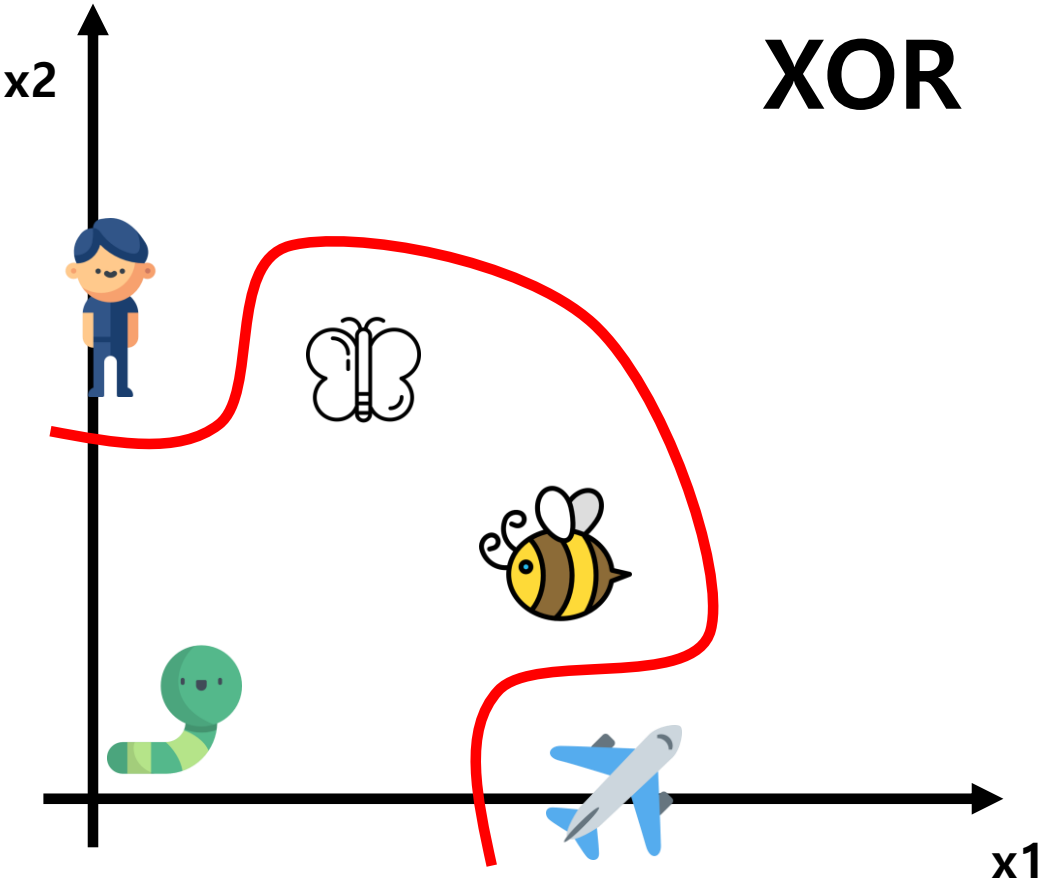
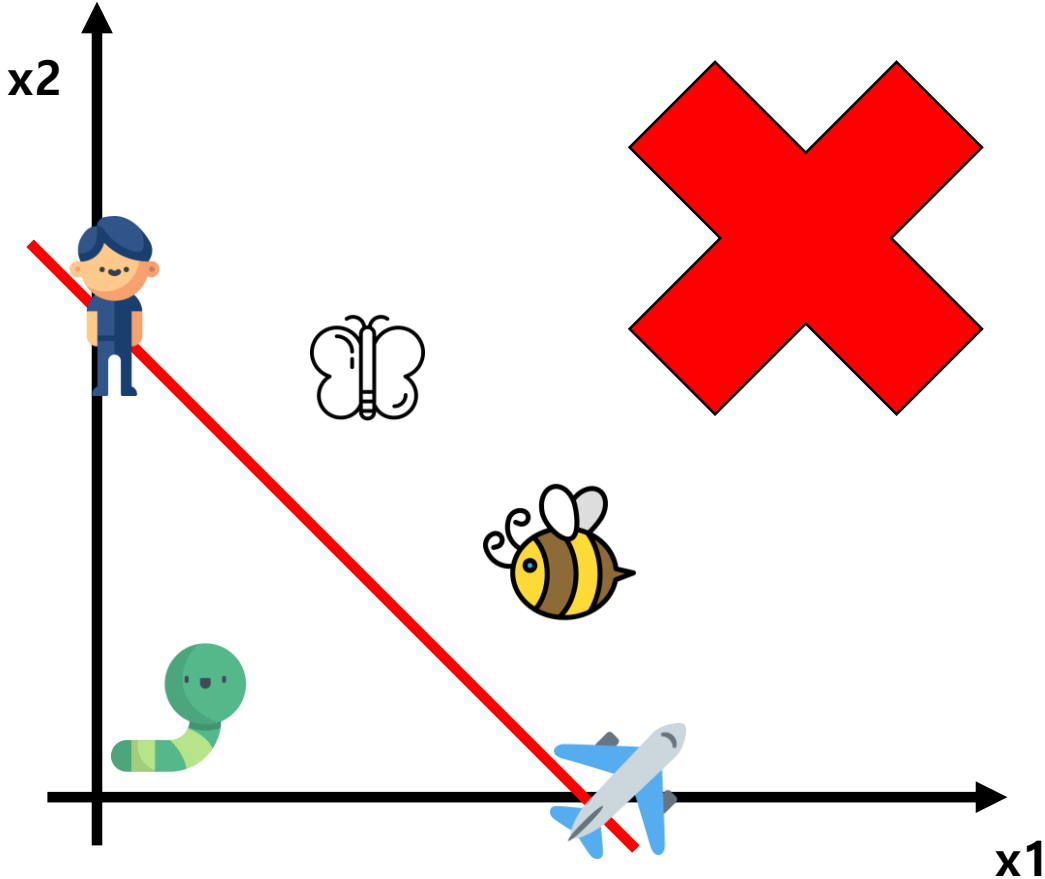
| 날개가 있느냐(x1) | 다리가 있느냐(x2) | 결과 | y |
|-------------|-------------|-------|---|
| ○ | ○ | 나비, 벌 | 1 |
| ○ | X | 비행기 | 1 |
| X | ○ | 사람 | 1 |
| X | X | 지렁이 | 0 |

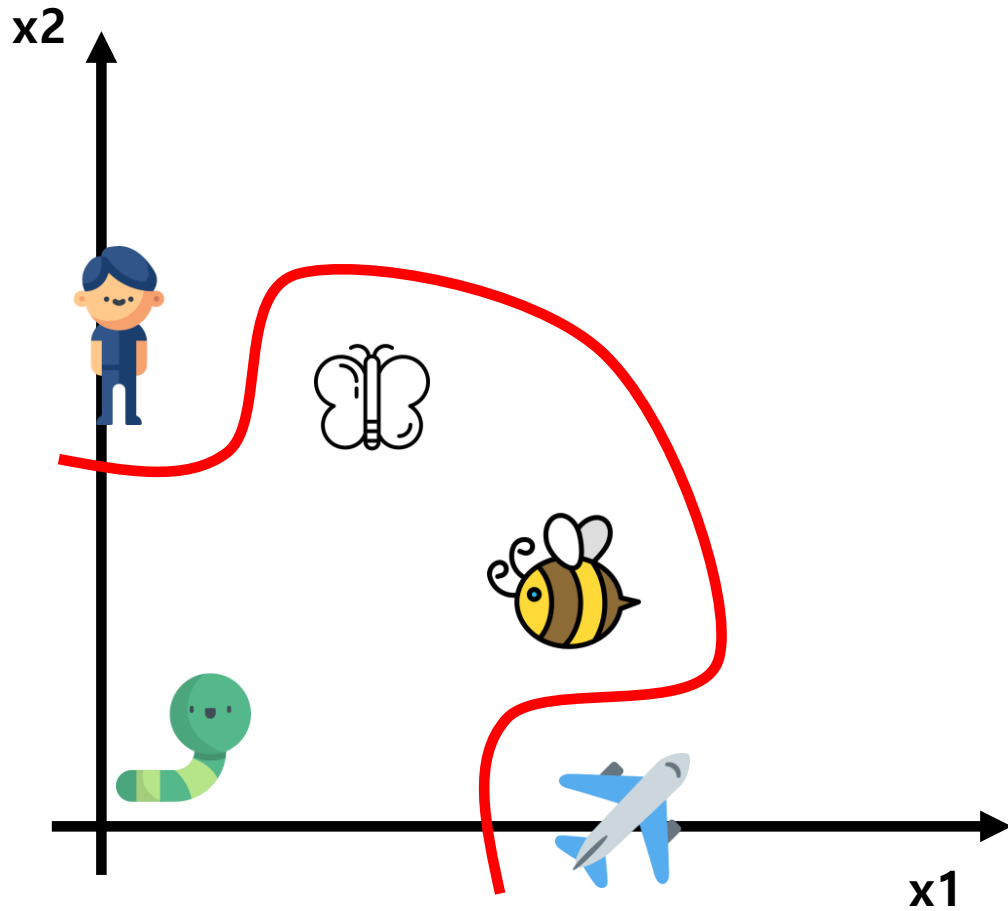


논리회로(4/5)

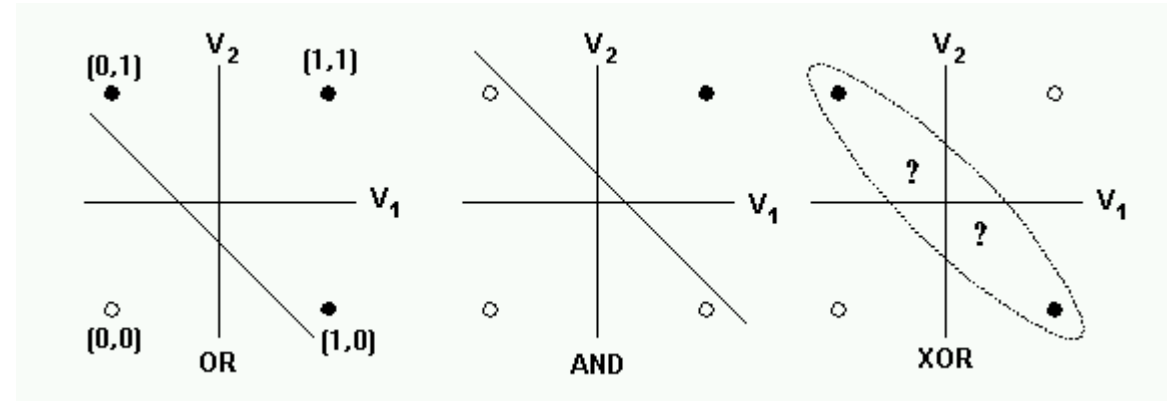
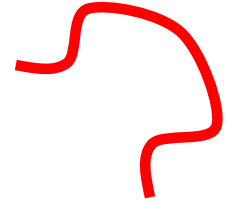
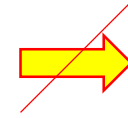
| 날개가 있느냐(x1) | 다리가 있느냐(x2) | 결과 | y |
|-------------|-------------|-------|---|
| ○ | ○ | 나비, 벌 | 0 |
| ○ | X | 비행기 | 1 |
| X | ○ | 사람 | 1 |
| X | X | 지렁이 | 0 |

XOR





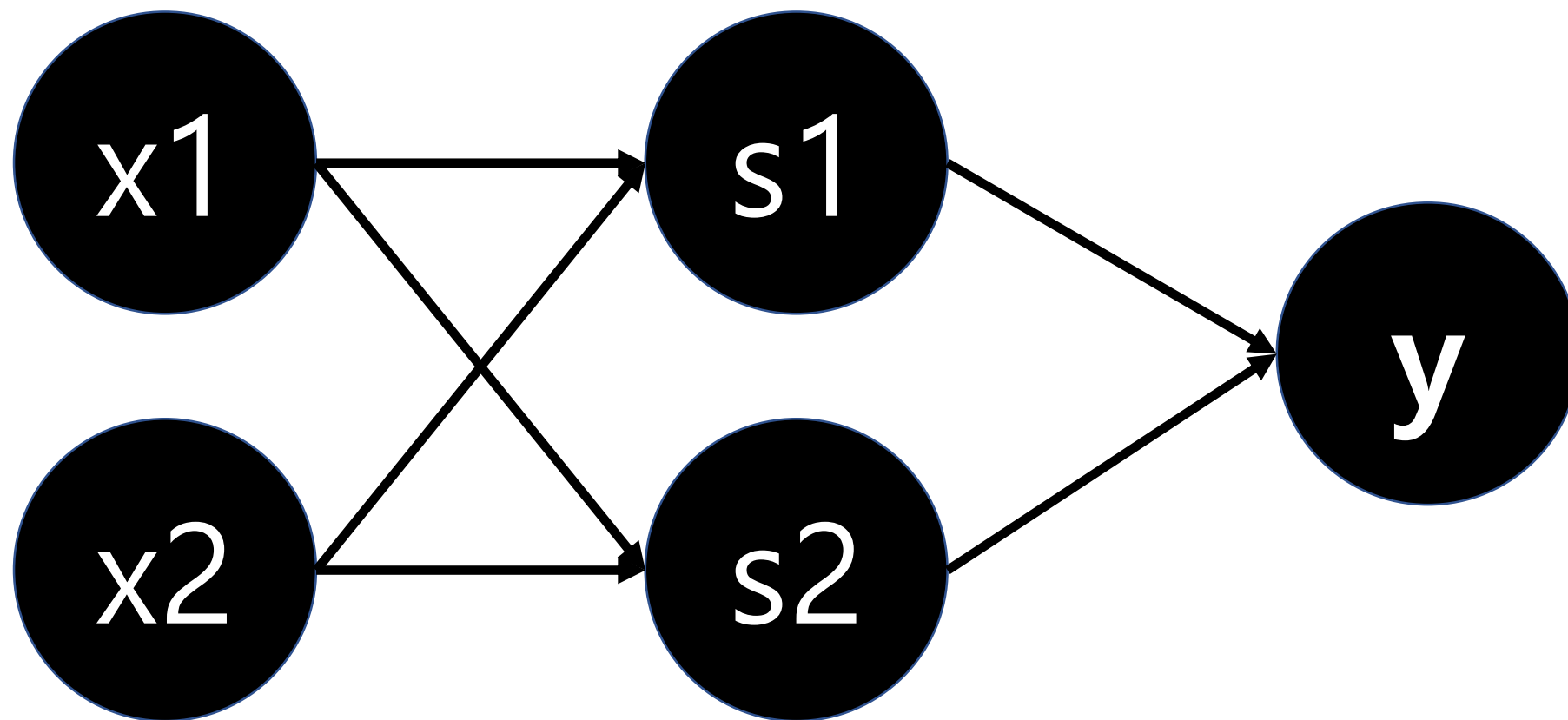
$$w_1x_1 + w_2x_2 + b$$



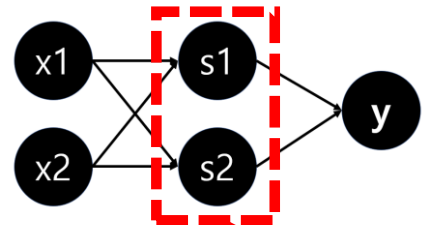
Perceptrons : an introduction to computational geometry
(Marvin Minsky, Seymour Papert; 1969)

➔ 퍼셉트론은 단순한 선형 분류기에 불과하며 간단한 XOR 분류조차 수행할 수 없다.

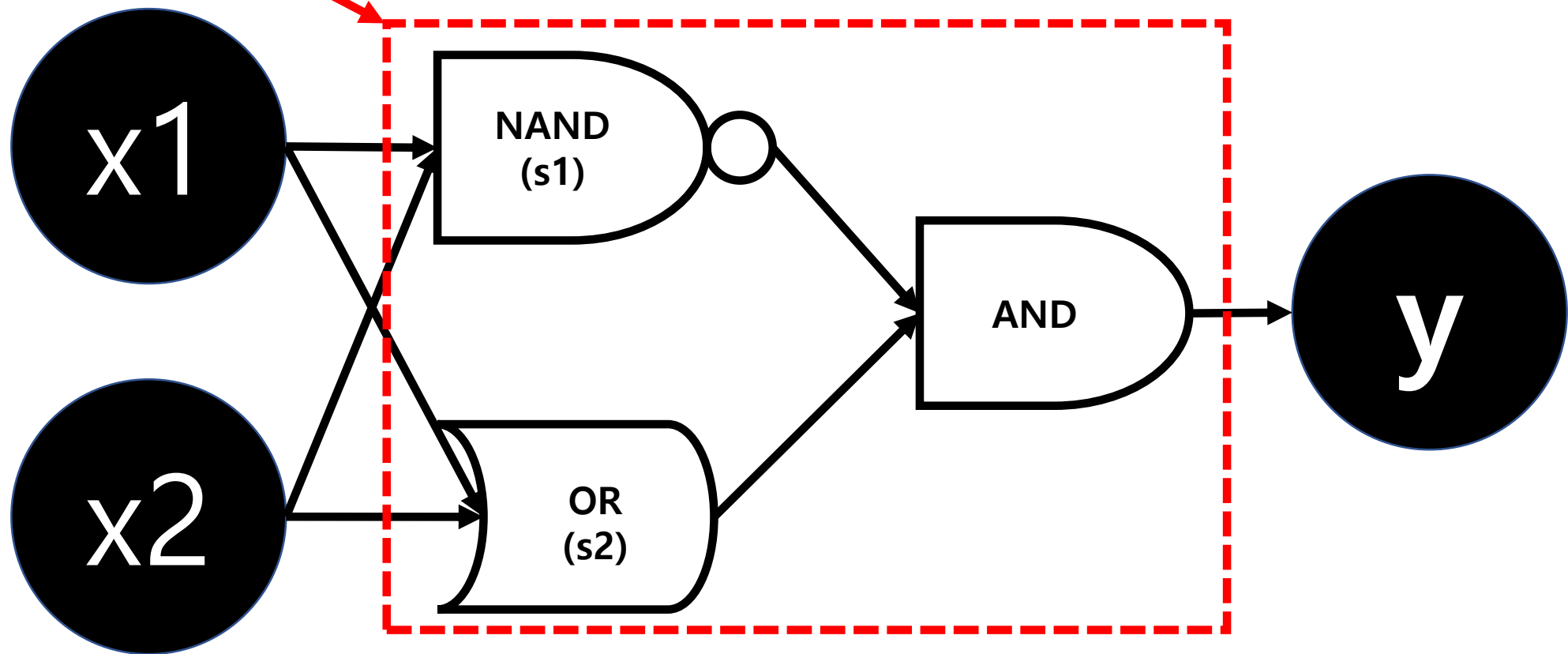
다층 퍼셉트론(1/3)



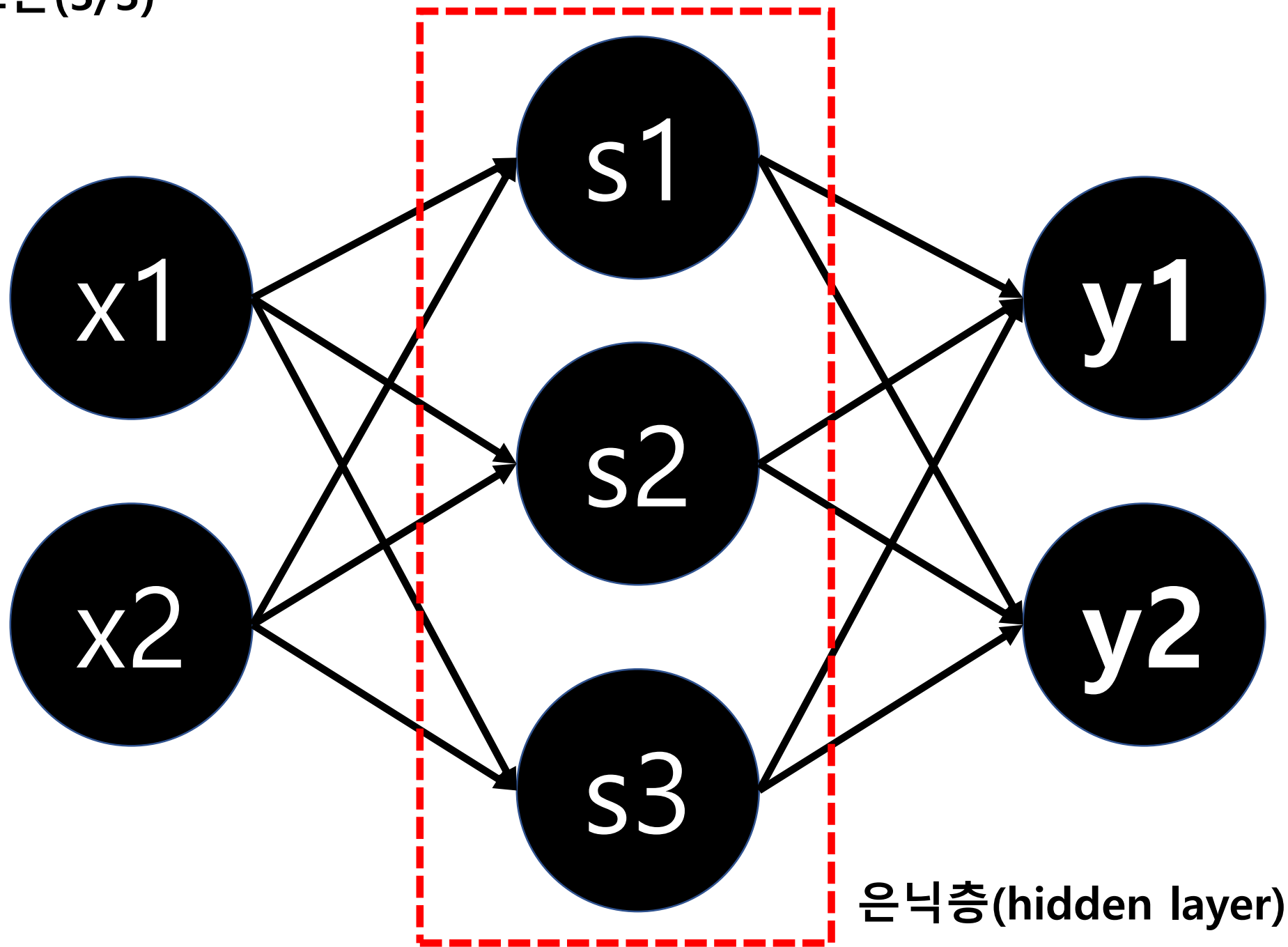
다층 퍼셉트론(2/3)

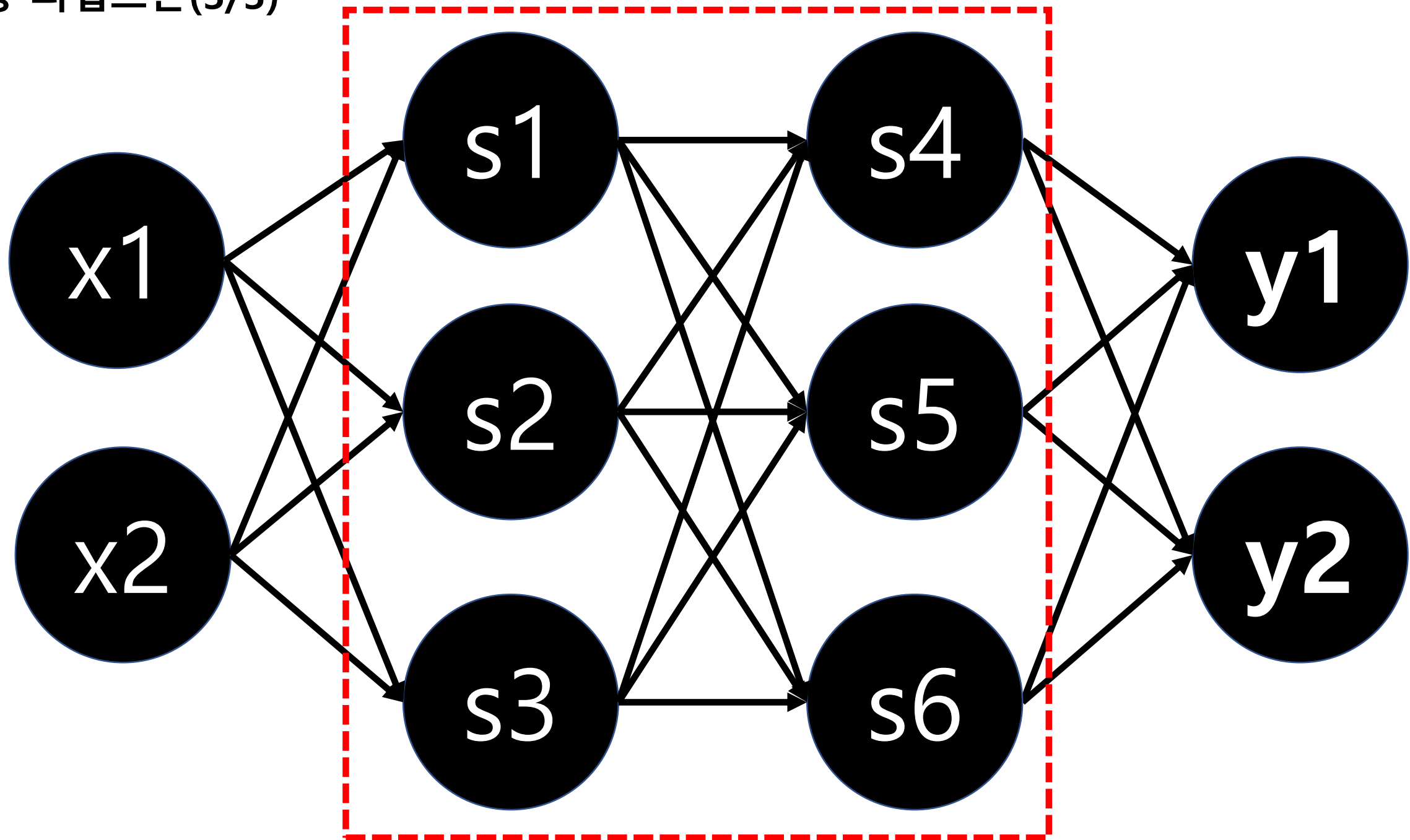


| 날개가 있느냐(x1) | 다리가 있느냐(x2) | NAND(s1) | OR(s2) | AND(Y) |
|-------------|-------------|----------|--------|--------|
| O(1) | O(1) | 0 | 1 | 0 |
| O(1) | X(0) | 1 | 1 | 1 |
| X(0) | O(1) | 1 | 1 | 1 |
| X(0) | X(0) | 1 | 0 | 0 |

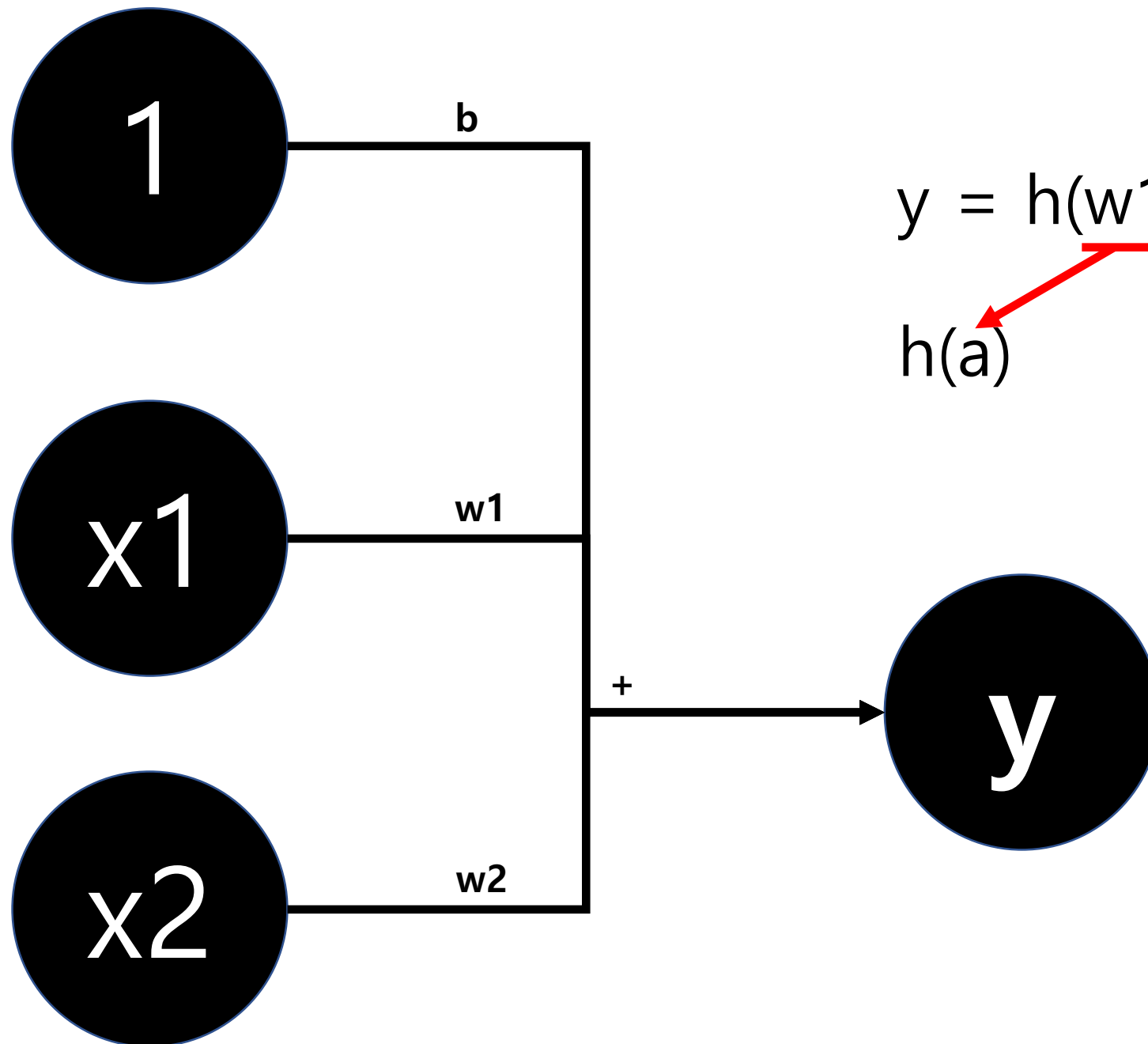


다층 퍼셉트론(3/3)





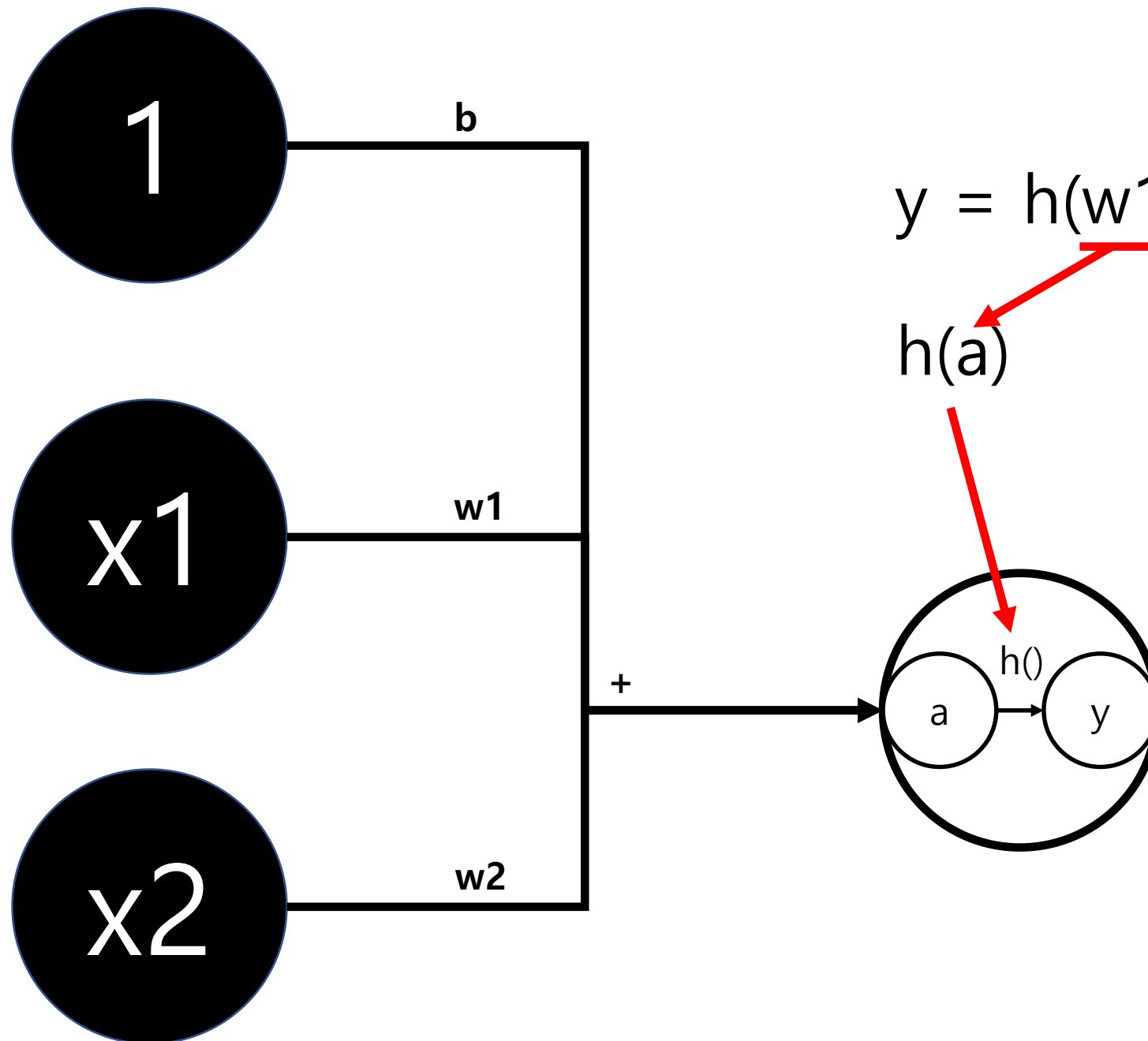
활성화 함수(1/3)



$$y = h(w_1x_1 + w_2x_2 + b)$$


$h(a)$

활성화 함수(2/3)

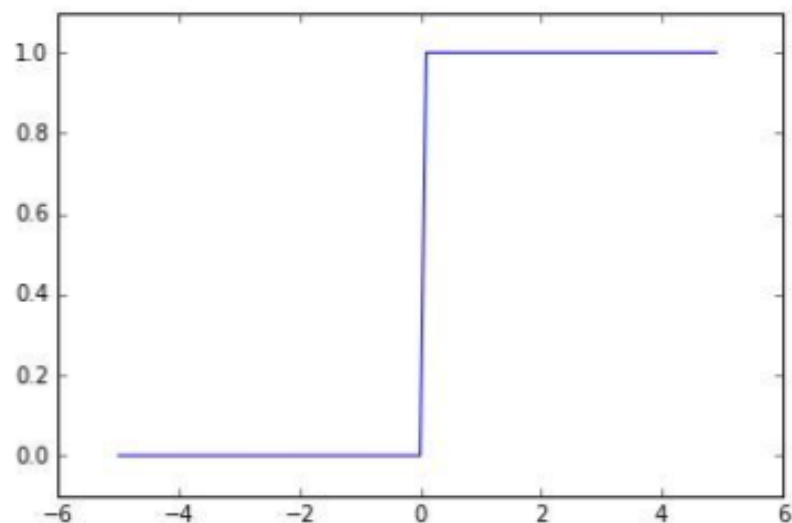


$$y = h(w1x1 + w2x2 + b)$$

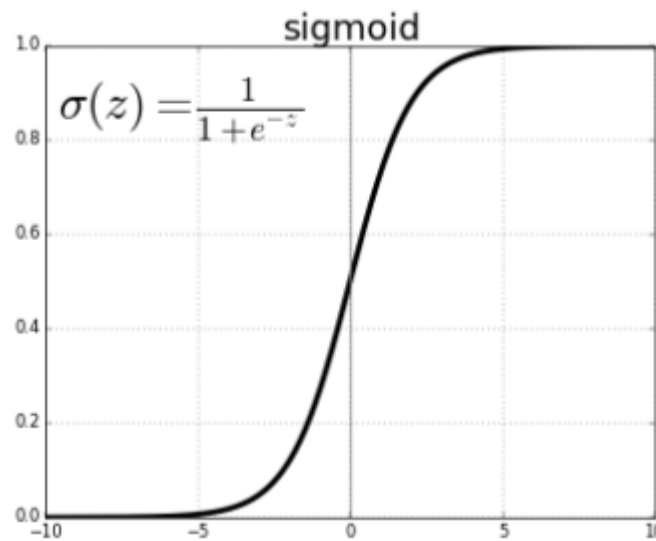
$h(a)$

- $h()$: 활성화 함수
-  : 뉴런

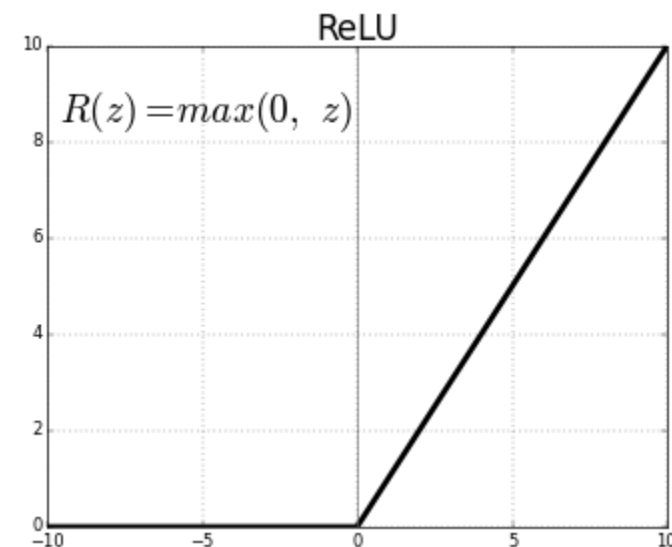
활성화 함수(3/3)



계단 함수

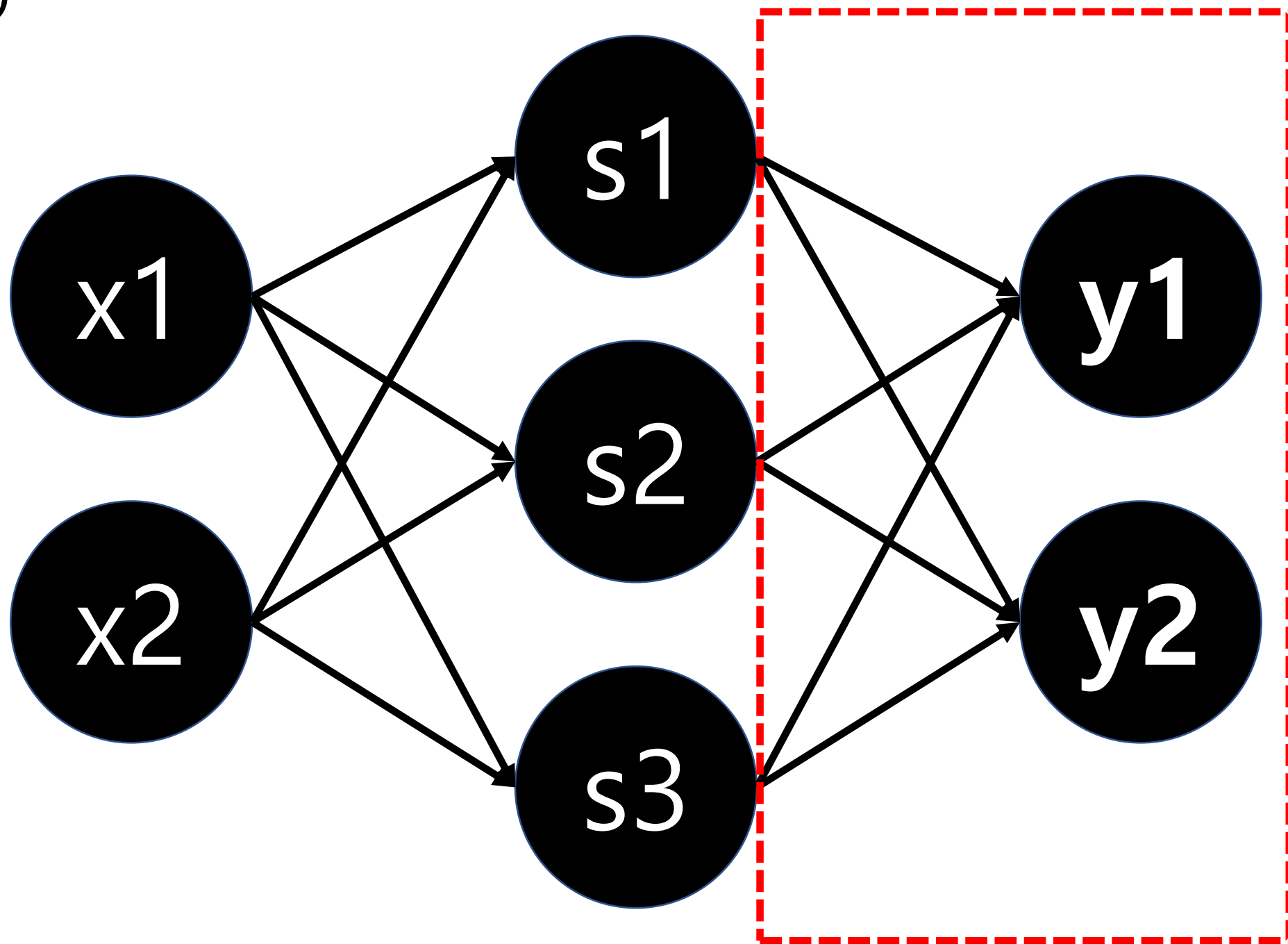


시그모이드 함수

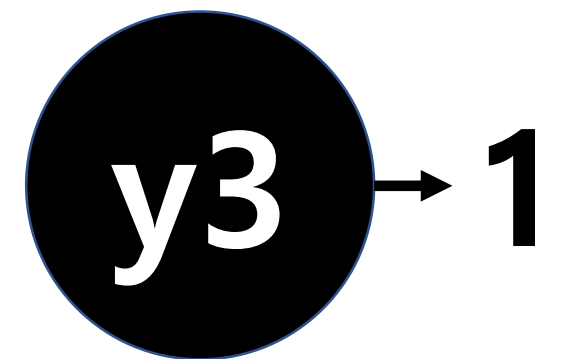
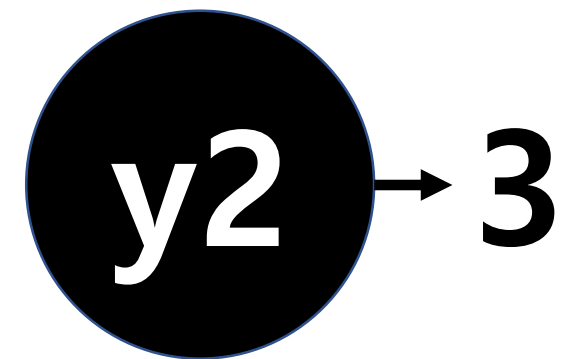
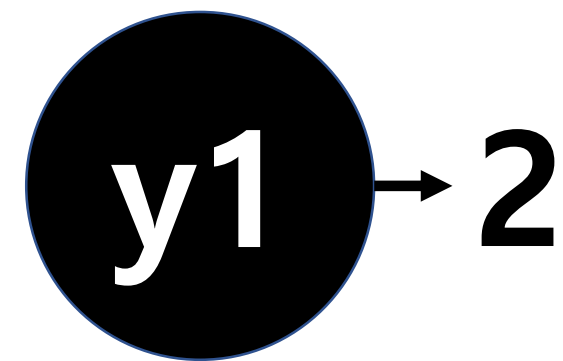


ReLU 함수

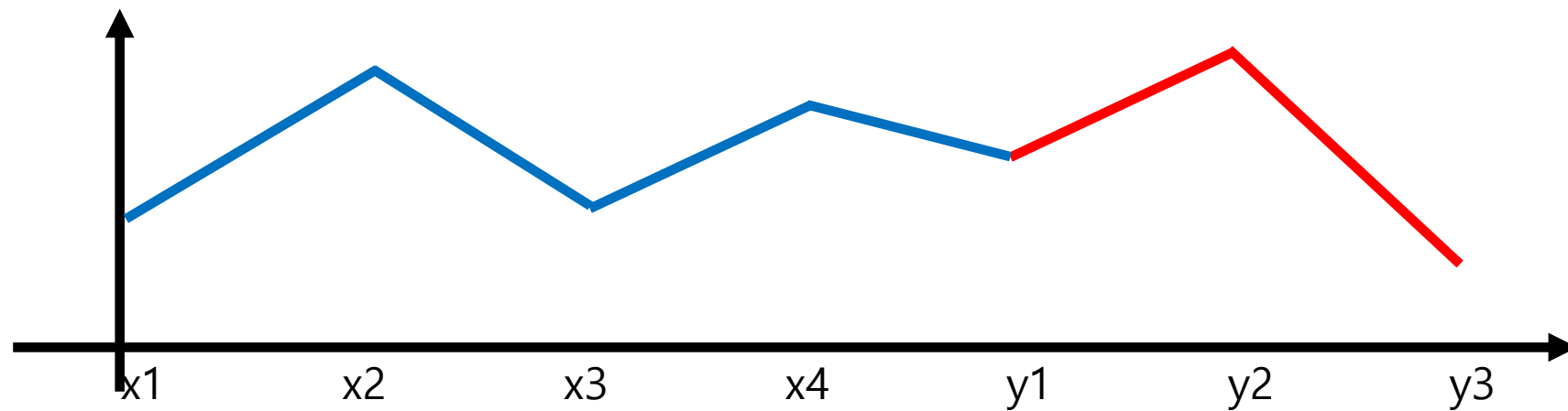
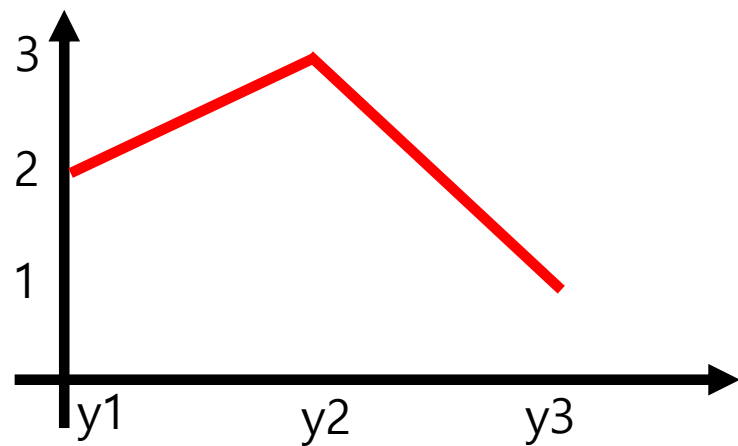
- 활성화 함수는 비선형 함수를 사용 → 선형 함수를 사용하면 신경망의 층을 깊게 하는 의미가 사라짐
- Ex) $h(x) = c \cdot x$ 를 사용하여 2층의 네트워크를 구성한다고 하면
 $y(x) = h(h(x)) = c \cdot c \cdot x = ax$
 $a = c \cdot c$



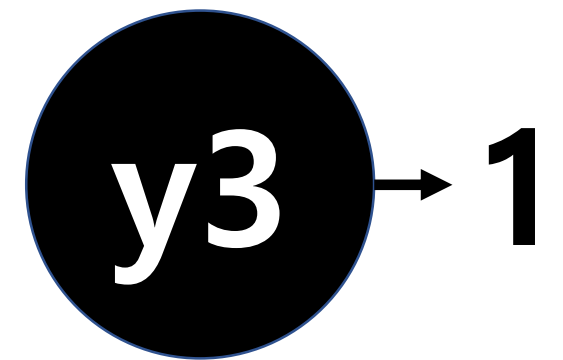
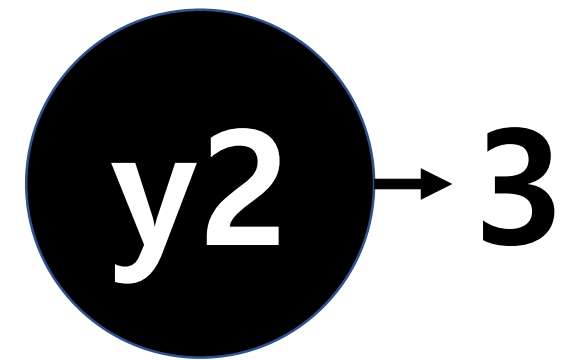
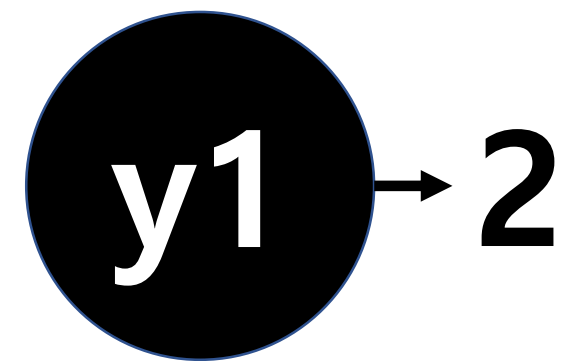
출력층 (2/3)



항등함수

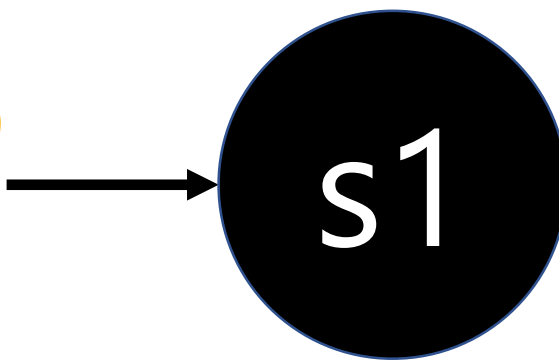
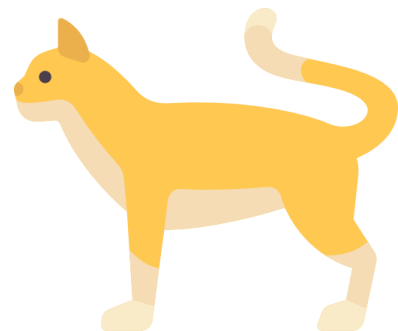


출력층 (3/3)



~~소프트맥스 함수~~ 순서 정하기

$$y_k = \frac{\exp(a_k)}{\sum_{i=1}^n \exp(a_i)}$$



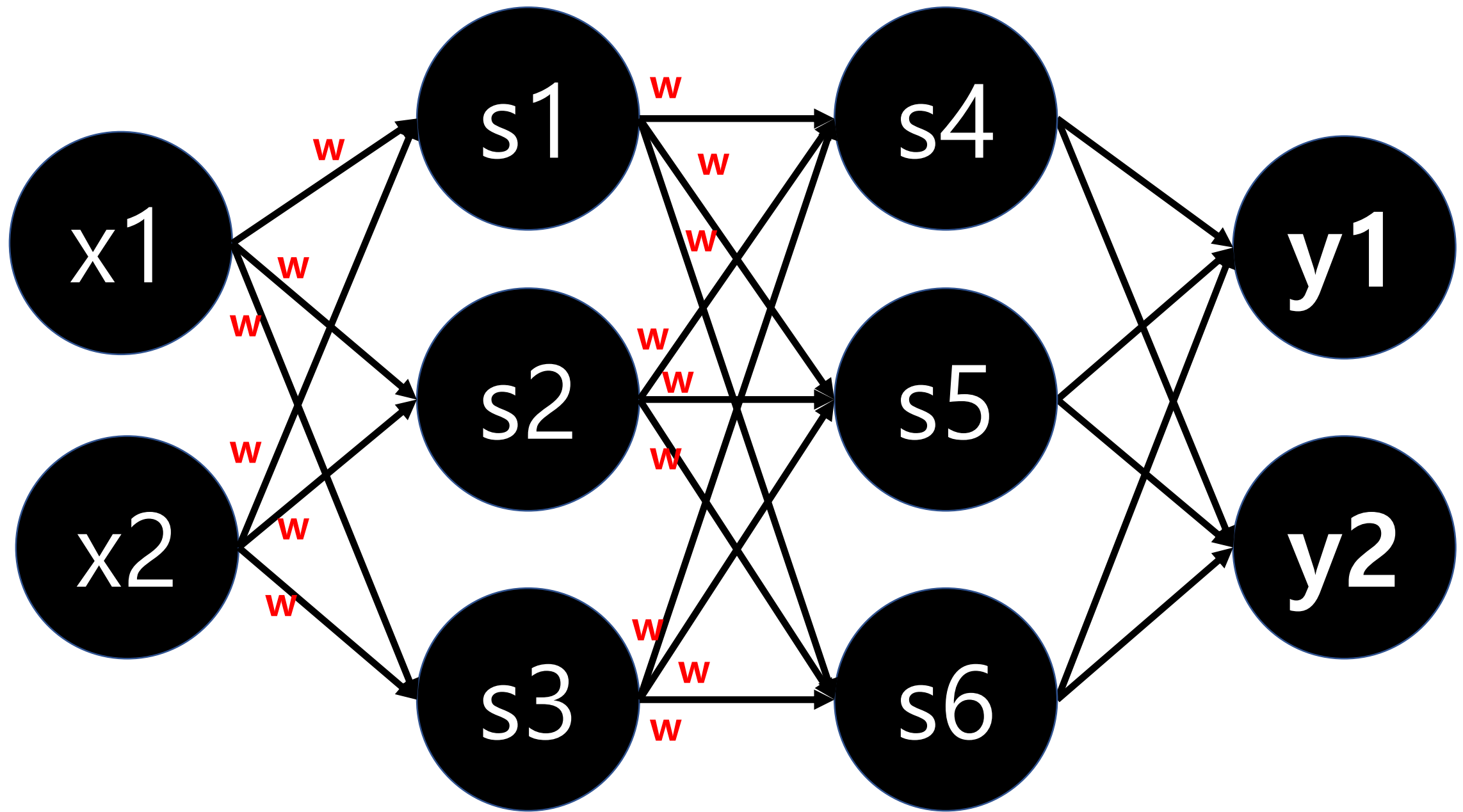
고양이일 확률 : 1등

사람일 확률 : 3등

| 출력 | 결과 |
|----|-----|
| y1 | 개 |
| y2 | 고양이 |
| y3 | 사람 |

개일 확률 : 2등

다음 시간에...



참고문헌

- 뉴런 : <http://study.zum.com/book/11779>
- 무조건반사 : <https://www.scienceall.com/%EB%AC%B4%EB%A6%8E-%EB%B0%98%EC%82%ACknee-jerk-reflex/>
- xor 쓰임새 : <https://ko.khanacademy.org/computing/computer-science/cryptography/ciphers/a/xor-bitwise-operation>
- 퍼셉트론의 한계 : <http://solarisailab.com/archives/1206>
- 은닉층 : <http://blog.naver.com/PostView.nhn?blogId=samsjang&logNo=221030487369&parentCategoryNo=&categoryNo=58&viewDate=&isShowPopularPosts=true&from=search>
- 밑바닥부터 시작하는 딥러닝(사이토 고키, 한빛미디어)
- 처음 배우는 딥러닝 수학(와쿠이 요시유키, 와쿠이 사다미, 한빛미디어)