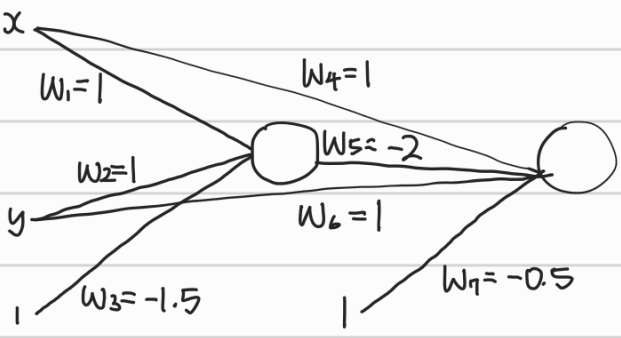
2020314482 인공지능융합전공 홍선우

Homework #2

1.




① $x=1, y=1$ 일 때,

첫번째 노드 ┌ input : $1+1-1.5=0.5>0$
└ output : step function $(0.5)=1$

두번째 노드 ┌ input : $1-2+1-0.5=-0.5<0$
└ output : step function $(-0.5)=0$

∴ 최종 output = 0

② $x=1, y=0$ 일 때,

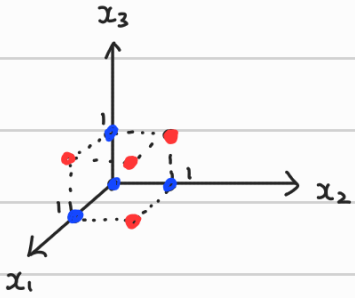
첫번째 노드 ┌ input: $1-1.5=-0.5<0$
└ output: step function $(-0.5)=0$

두번째 노드 ┌ input : $1-0.5=0.5>0$
└ output : step function $(0.5)=1$

∴ 최종 output = 1

2.

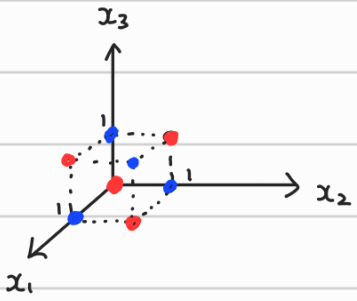
| $x_1$ | $x_2$ | $x_3$ | $w_1x_1+w_2x_2+w_3x_3+w_4$ | y |
|---|---|---|---|---|
| 0 | 0 | 0 | $w_4<0$ | 0 |
| 0 | 0 | 1 | $w_3+w_4<0$ | 0 |
| 0 | 1 | 0 | $w_2+w_4<0$ | 0 |
| 0 | 1 | 1 | $w_2+w_3+w_4>0$ | 1 |
| 1 | 0 | 0 | $w_1+w_4<0$ | 0 |
| 1 | 0 | 1 | $w_1+w_3+w_4>0$ | 1 |
| 1 | 1 | 0 | $w_1+w_2+w_4>0$ | 1 |
| 1 | 1 | 1 | $w_1+w_2+w_3+w_4>0$ | 1 |




∴ $w_1=2$, $w_2=2$, $w_3=2$, $w_4=-3$

3.

| $x_1$ | $x_2$ | $x_3$ | $w_1x_1+w_2x_2+w_3x_3+w_4$ | $y$ |
|---|---|---|---|---|
| 0 | 0 | 0 | $w_4 > 0$ | 1 |
| 0 | 0 | 1 | $w_3+w_4 < 0$ | 0 |
| 0 | 1 | 0 | $w_2+w_4 < 0$ | 0 |
| 0 | 1 | 1 | $w_2+w_3+w_4 > 0$ | 1 |
| 1 | 0 | 0 | $w_1+w_4 < 0$ | 0 |
| 1 | 0 | 1 | $w_1+w_3+w_4 > 0$ | 1 |
| 1 | 1 | 0 | $w_1+w_2+w_4 > 0$ | 1 |
| 1 | 1 | 1 | $w_1+w_2+w_3+w_4 < 0$ | 0 |



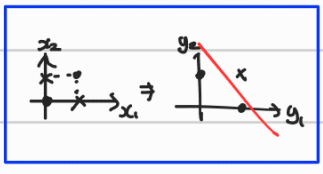

∴ 한 평면으로 output의 경계를 만들 수 없다.

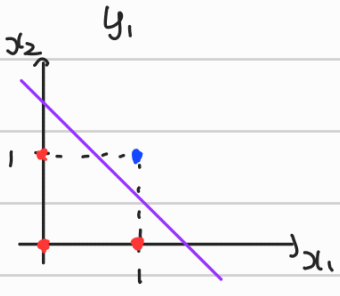
non-linearly seperable한 문제이므로, Perceptron으로 표현할 수 없는 함수이다.

4.

| $x_1$ | $x_2$ | $y_1$ | $y_2$ | $y$ |
|---|---|---|---|---|
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 |

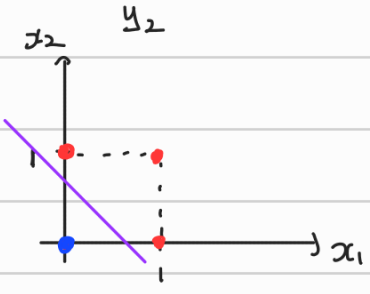
먼저 Perceptron을 이용하여 문제를 풀기 위해서는 각 단계가 linearly separable한 문제로 구성되어야 한다.



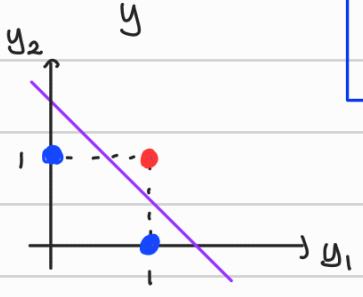

$w_{11}x_1+w_{12}x_2+w_{13}$

- $w_{13} > 0$
- $w_{11}+w_{13} > 0$
- $w_{12}+w_{13} > 0$
- $w_{11}+w_{12}+w_{13} < 0$




$w_{21}x_1+w_{22}x_2+w_{23}$

- $w_{23} < 0$
- $w_{21}+w_{23} > 0$
- $w_{22}+w_{23} > 0$
- $w_{21}+w_{22}+w_{23} > 0$




$w_{31}y_1+w_{32}y_2+w_{33}$

- $w_{31}+w_{33} < 0$
- $w_{32}+w_{33} < 0$
- $w_{31}+w_{32}+w_{33} > 0$

∴ $w_{11} = -2$, $w_{12} = -2$, $w_{13} = 3$

$w_{21} = 2$, $w_{22} = 2$, $w_{23} = -1$

$w_{31} = 2$, $w_{32} = 2$, $w_{33} = -3$