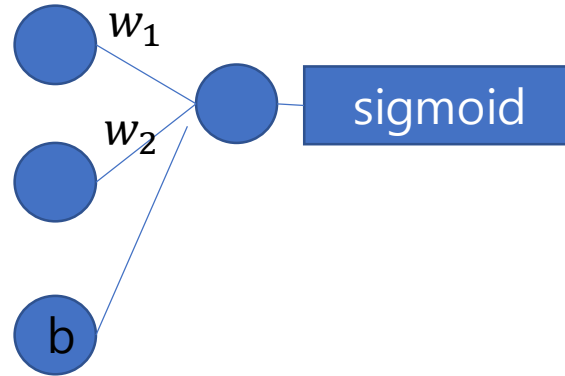


# Logistic Regression Problem

# Experimental 1 – OR Network (2)

## • Question 1

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?

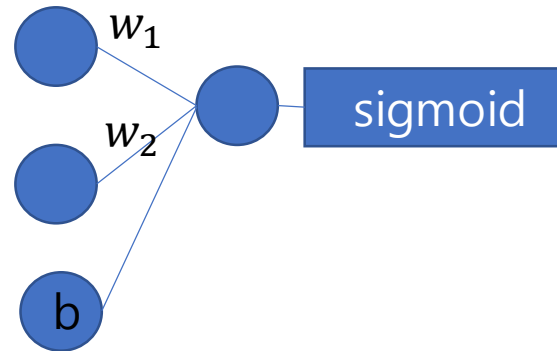


Input	Output
(0, 0)	0
(1, 0)	1
(0, 1)	1
(1, 1)	1

# Experimental 1 – XOR Network (2)

## • Question 2 (layer-(2,1)일 때)

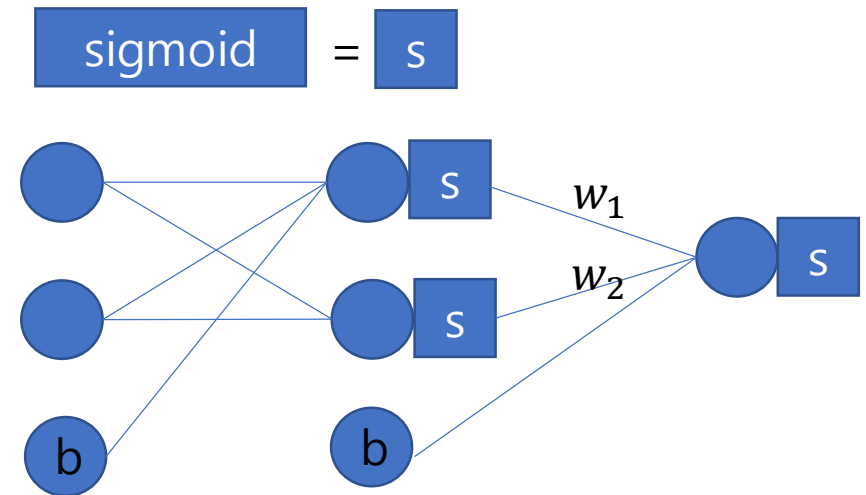
- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도 는?
- 정확도가 낮게 나오는 이유는?



Input	Output
(0, 0)	0
(1, 0)	1
(0, 1)	1
(1, 1)	0

## • Question 3 (layer-(2,2,1)일 때)

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?

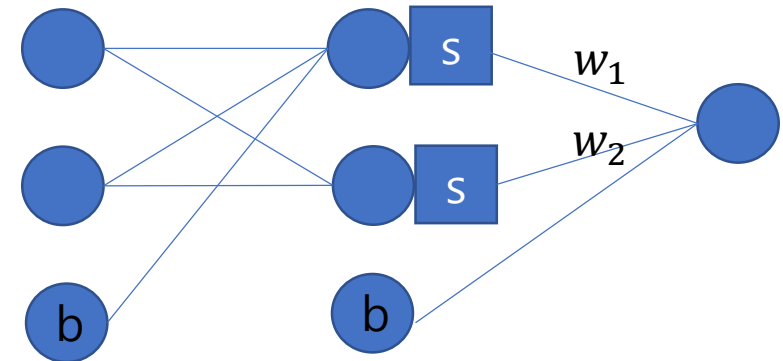


# Experimental 1 – XOR Network (2)

- **Question 4 (layer-(2,2,1)일 때, 맨 마지막에 sigmoid빼기)**

- 학습 시 문제가 있다면 그 이유는?

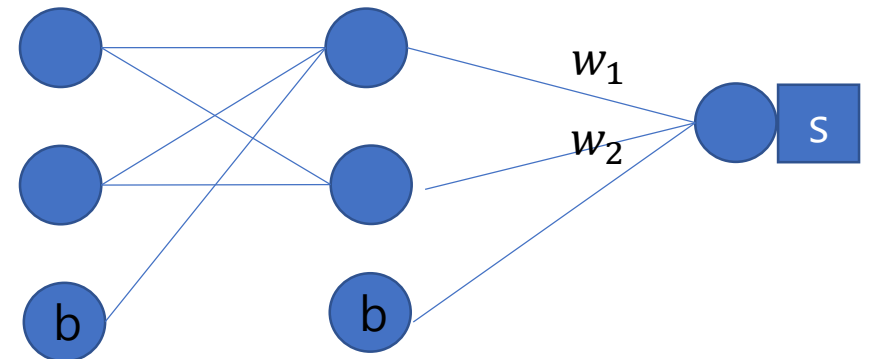
$$\text{sigmoid} = s$$



- **Question 5 (layer-(2,2,1)일 때, 중간에 sigmoid빼기)**

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?

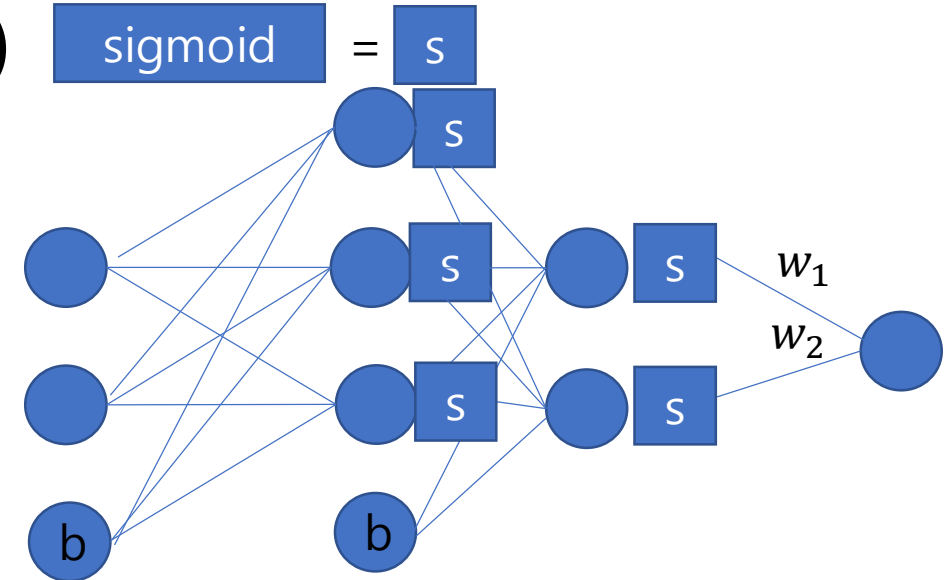
$$\text{sigmoid} = s$$



# Experimental 1 – XOR Network (2)

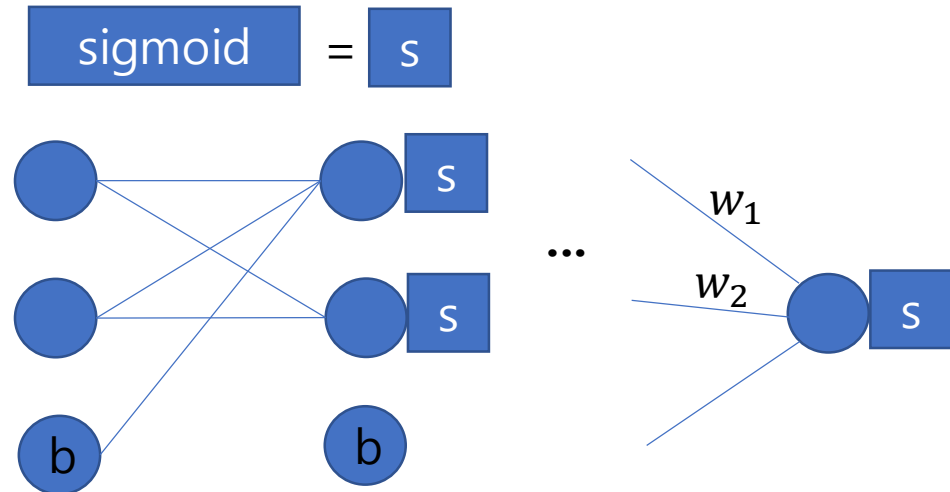
## • Question 6 (layer-(2,3,2,1)일 때)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?



## • Question 7 (layer-(2,2,2,2,2,1)일 때)

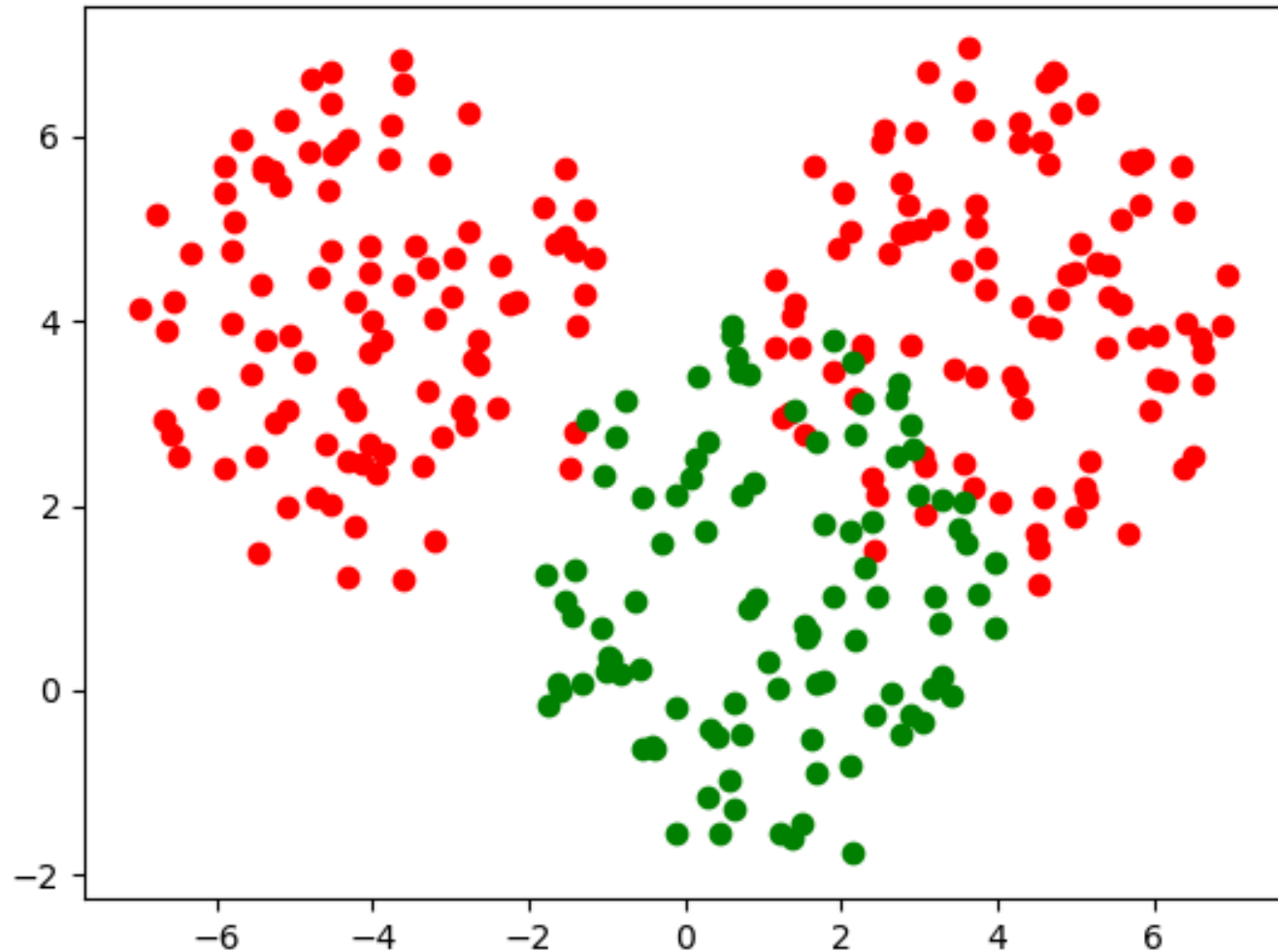
- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?



# Experimental 2

## General Logistic Classification

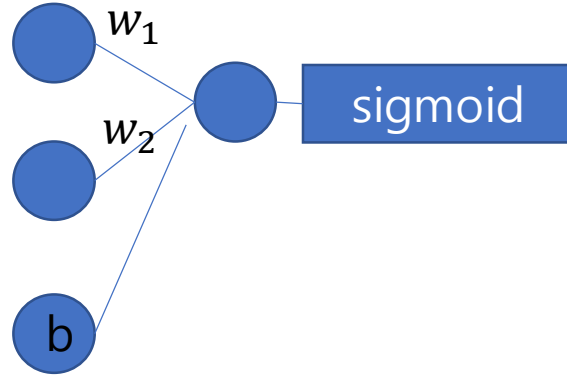
- **Question 8**
  - 직접 모델 세우기



# Logistic Regression Solution

# • Question 1

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?



Input	Output
(0, 0)	0
(1, 0)	1
(0, 1)	1
(1, 1)	1

1. W1, W2 구하기

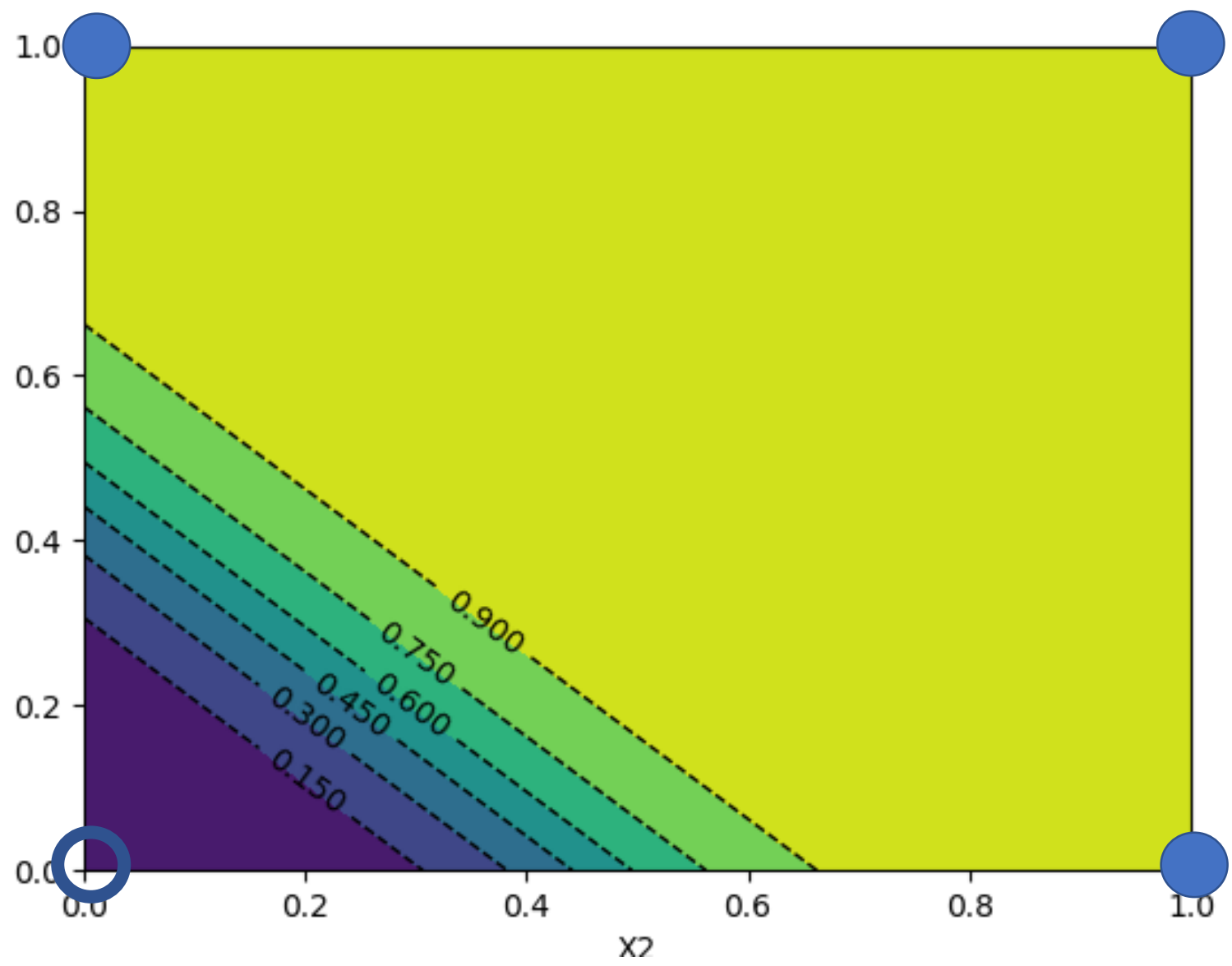
```
tensor([[11.9328, 11.9328]])  
tensor([-5.5069])
```

2~4. 각 값 구하기

```
[0, 0] : [0.00404235]  
[1, 0] : [0.9983835]  
[0.5, 0.5] : [0.9983835]
```



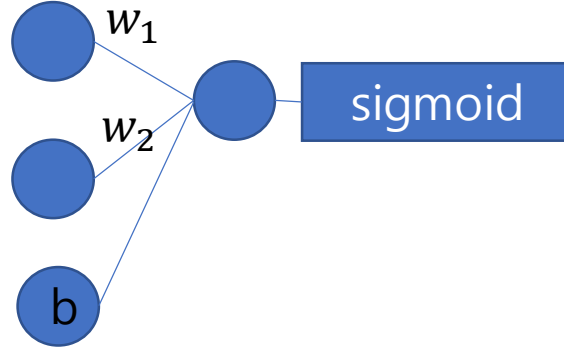
• Question 1



Input	Output
(0, 0)	0
(1, 0)	1
(0, 1)	1
(1, 1)	1

## • Question 2 (layer-(2,1)일 때)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도 는?
- 정확도가 낮게 나오는 이유는?



Input	Output
(0, 0)	0
(1, 0)	1
(0, 1)	1
(1, 1)	0

1. W1, W2 구하기

```
tensor([[1.1921e-07, 1.1921e-07]])  
tensor([-1.6391e-07])
```

2~4. 각 값 구하기

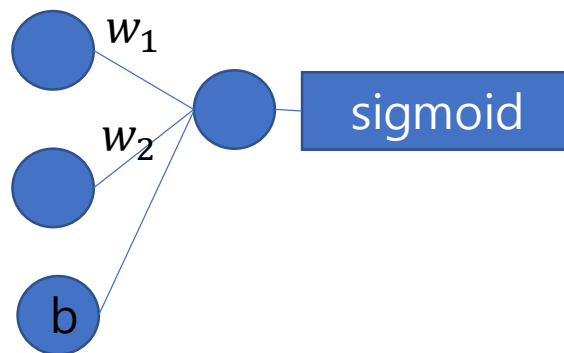
```
[0, 0] : [0.5]  
[1, 0] : [0.5]  
[0.5, 0.5] : [0.5]
```

5. 정확도는?

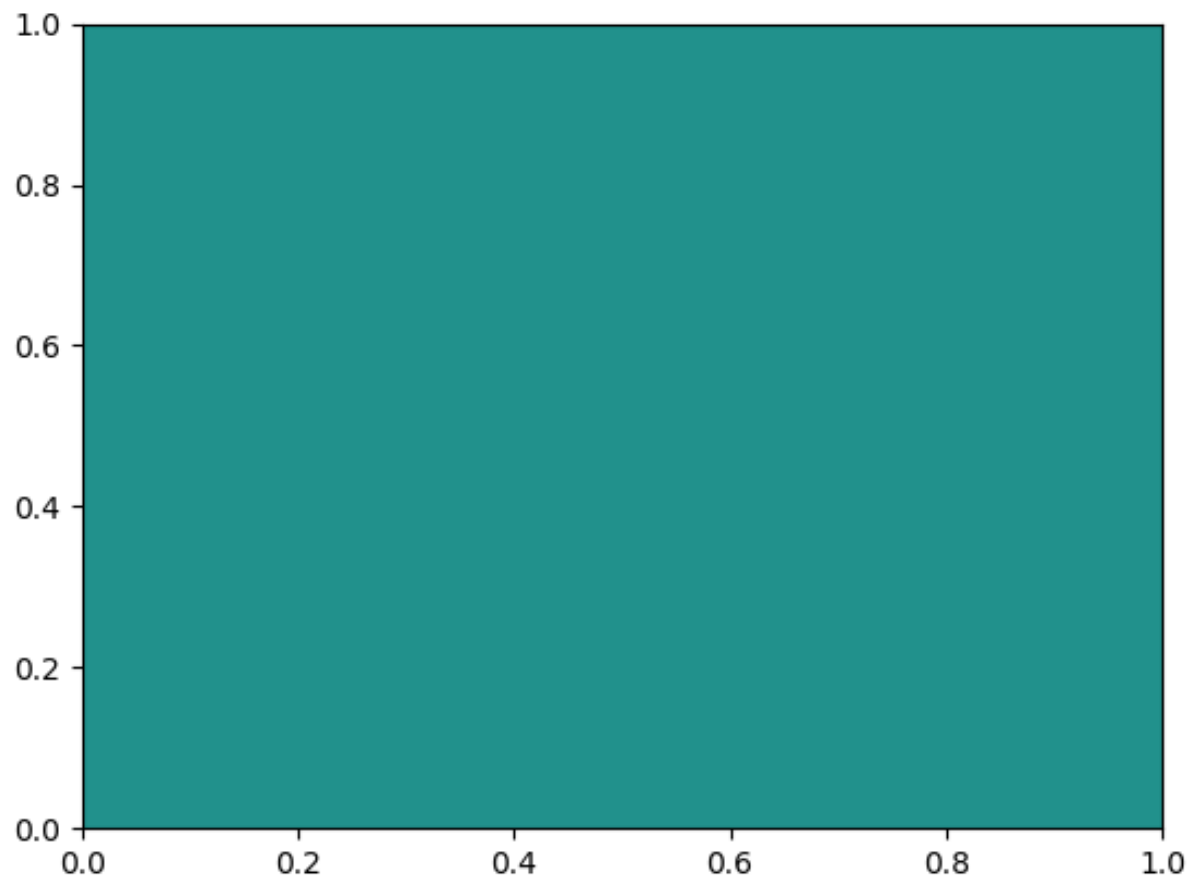
```
Correct:  [[0.]  
 [0.]  
 [0.]  
 [0.]]  
Accuracy: 0.5
```

## • Question 2 (layer-(2,1)일 때)

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도 는?
- 정확도가 낮게 나오는 이유는?

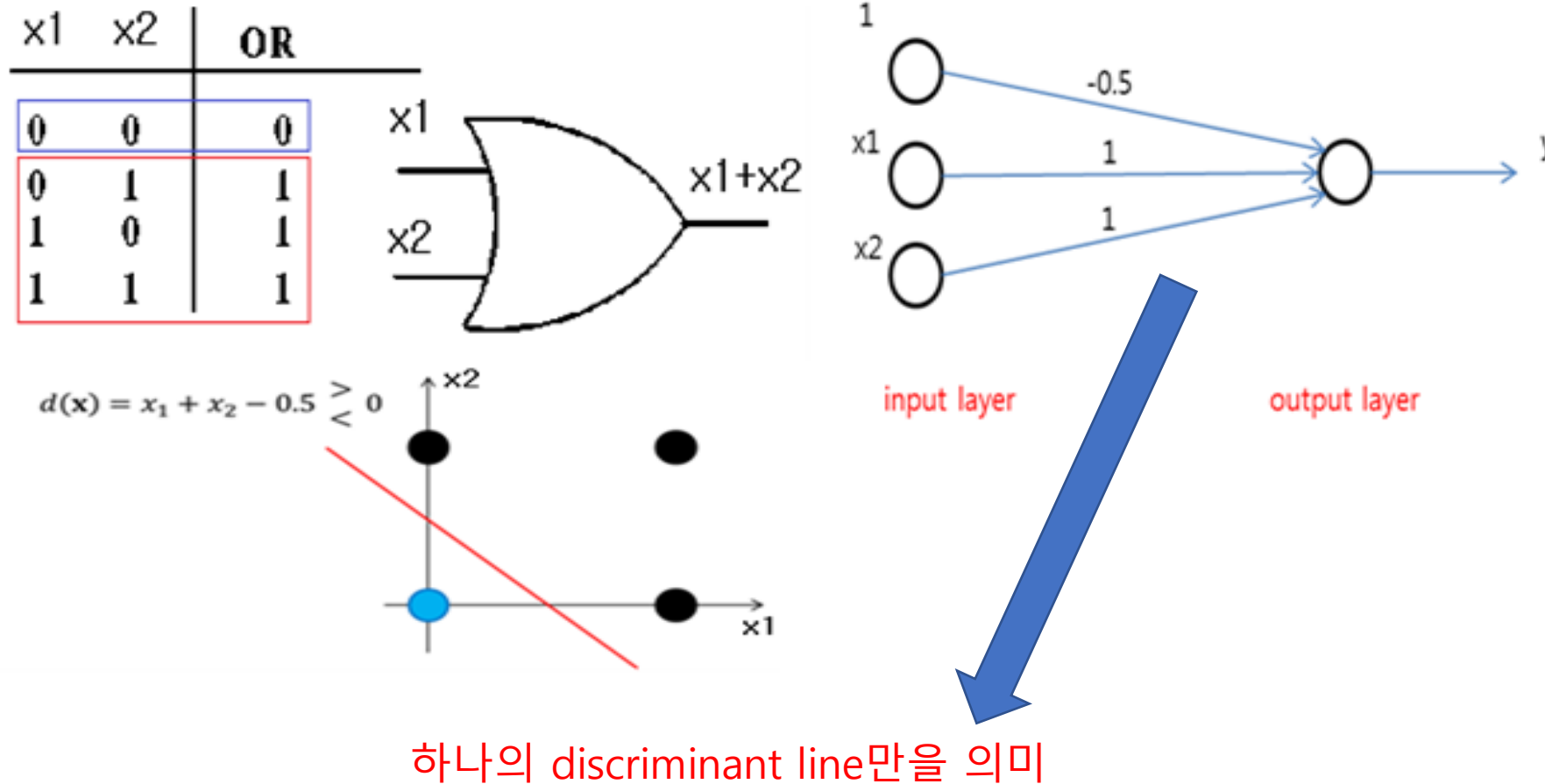


Input	Output
(0, 0)	0
(1, 0)	1
(0, 1)	1
(1, 1)	0



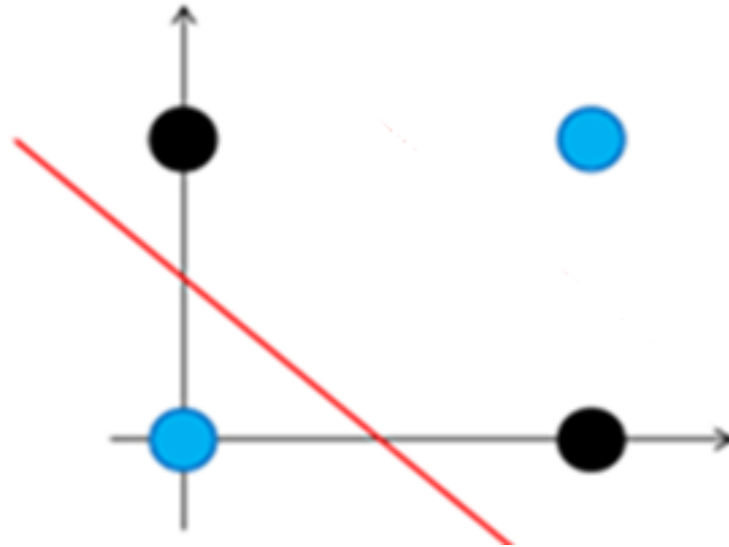
# 01 Deep Learning Remind

## • Neural Networks Example 1



# 01 Deep Learning Remind

- **Single Layer Neural Network Problem**
  - ⇒ Single layer perceptron으로는 풀 수 없는 문제
  - ⇒ Single layer는 one discriminant만을 가지기 때문
  - ⇒ Neural Networks => linear  $v_k = \sum_{j=1}^m w_{kj}x_j + b_k$



### • Question 3 (layer-(2,2,1)일 때)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?

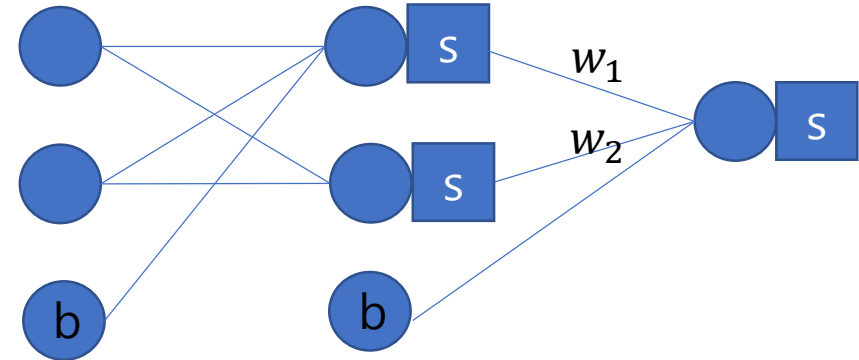
1. W1, W2 구하기

```
tensor<[[ 7.9436, -7.7558],  
         [ 7.0988, -7.3896]]>  
tensor<[ 3.8879, -3.7354]>  
tensor<[[ -14.3857, 14.9850]]>  
tensor<[6.8587]>
```

5. 정확도는?

```
[0.5, 0.5] : [0.0009476]
```

sigmoid = s

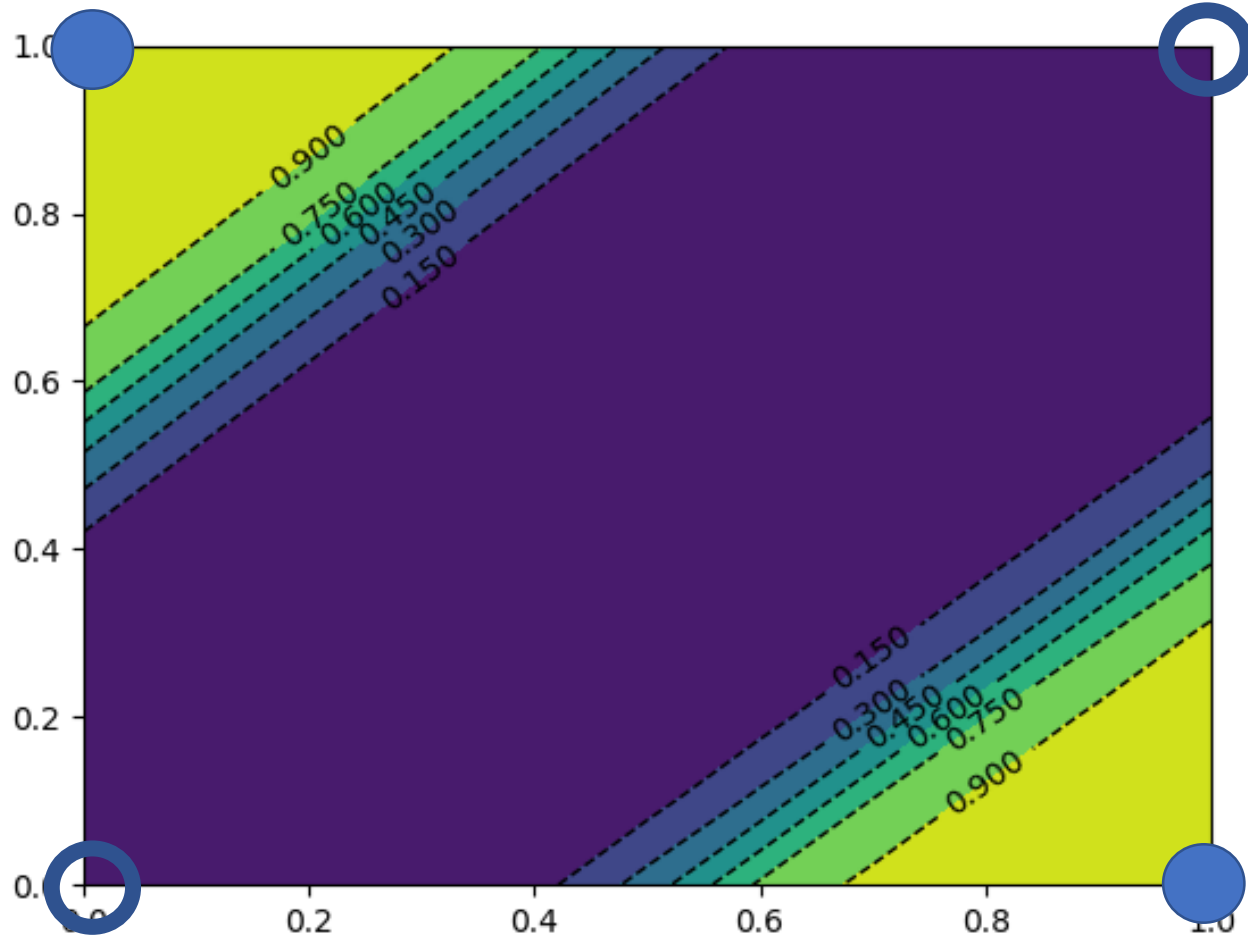


2~4. 각 값 구하기

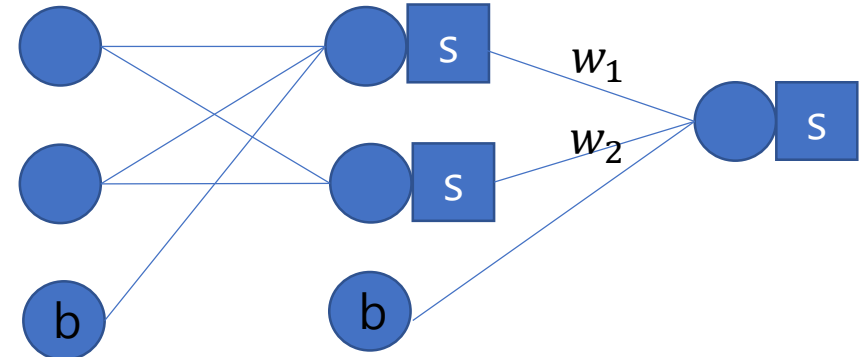
```
[0, 0] : [0.001018]  
[1, 0] : [0.99904877]  
[0.5, 0.5] : [0.0009476]
```

### • Question 3 (layer-(2,2,1)일 때)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?



sigmoid = s

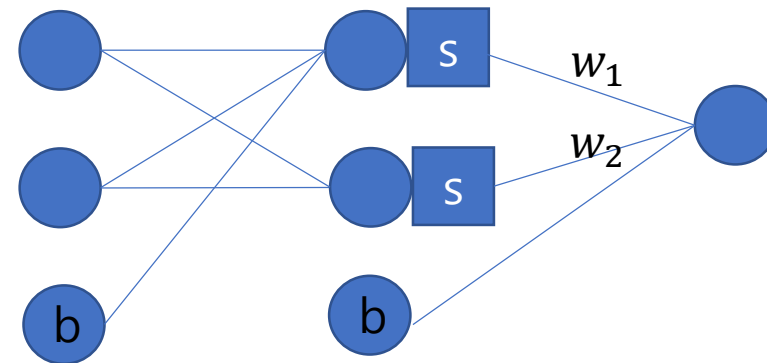


# • Question 4 (layer-(2,2,1)일 때, 맨 마지막에 sigmoid빼기)

- 학습 시 문제가 있다면 그 이유는?

마지막에 Sigmoid가 없어 값이  
제한이 안되고 W가 발산됨

$$\text{sigmoid} = s$$

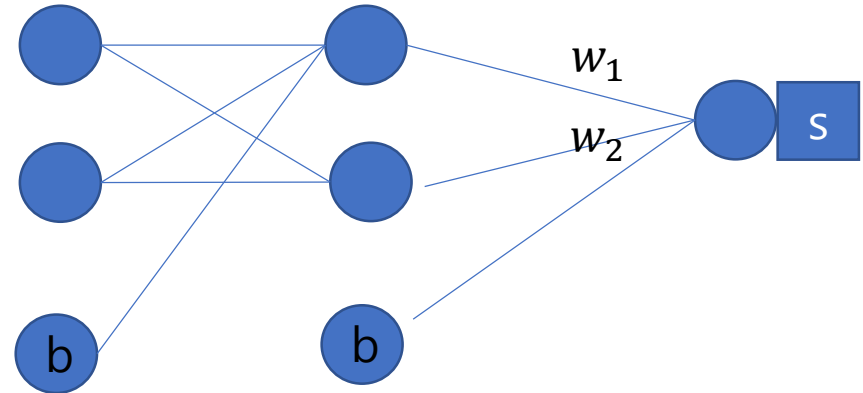




# • Question 5 (layer-(2,2,1)일 때, 중간에 sigmoid빼기)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?

$$\text{sigmoid} = s$$



## 1. W1, W2 구하기

```
tensor([[ -0.4709,  0.3110],  
        [ 0.4935, -0.3259]])  
tensor([ -0.3862,  0.1322])  
tensor([ -0.3829, -0.3654])  
tensor([ -0.0996])
```

## 2~4. 각 값 구하기

```
[0, 0] : [0.49999988]  
[1, 0] : [0.5]  
[0.5, 0.5] : [0.5]
```

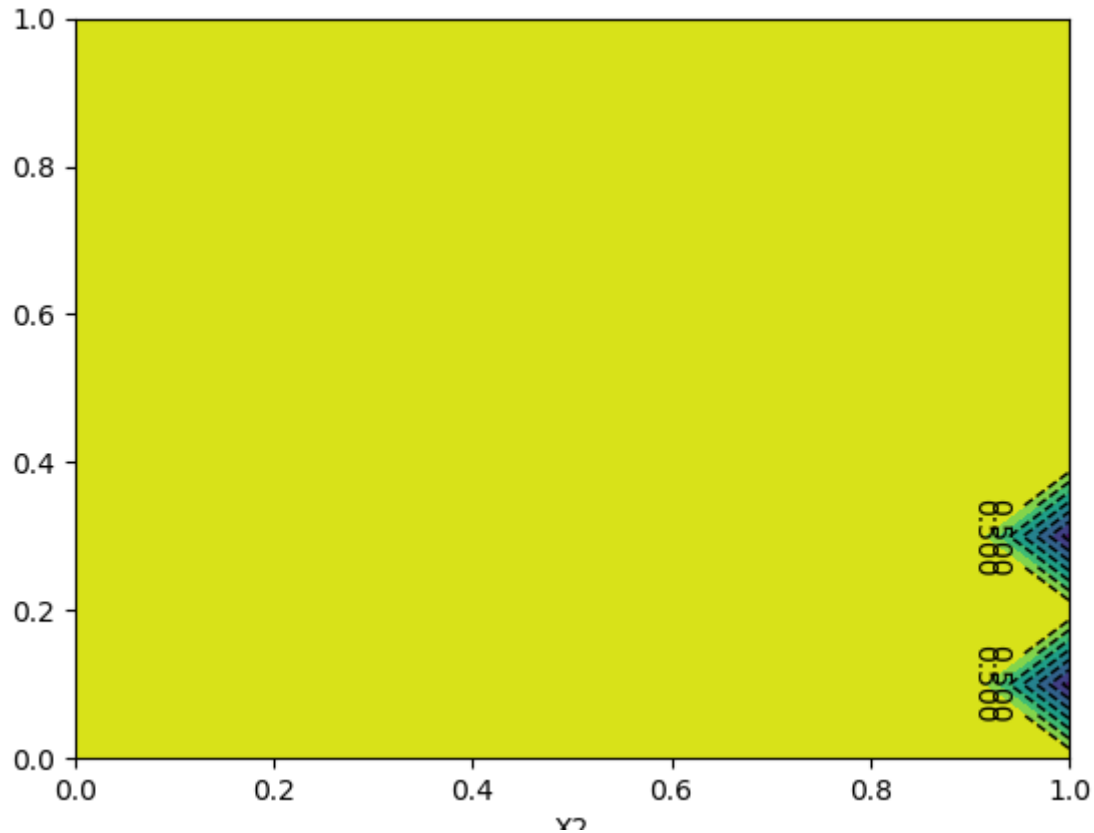
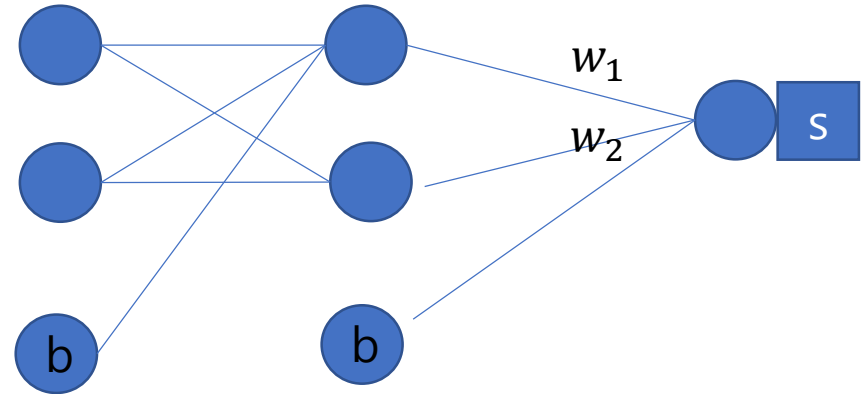
## 5. 정확도는?

```
Correct:  [[0.]  
           [0.]  
           [0.]  
           [1.]]  
Accuracy: 0.25
```

# • Question 5 (layer-(2,2,1)일 때, 중간에 sigmoid빼기)

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?

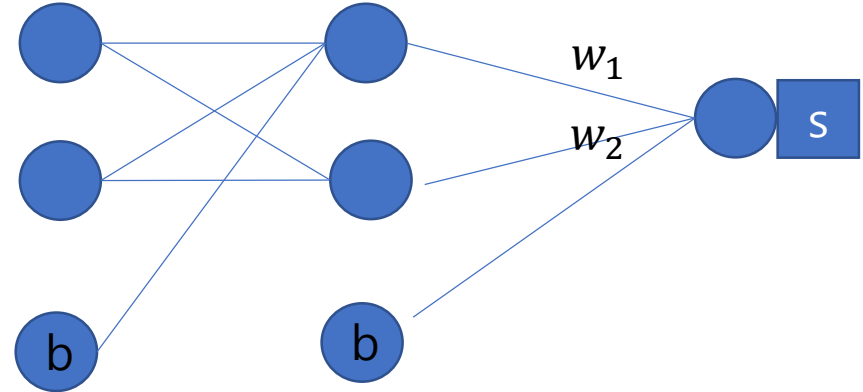
$$\text{sigmoid} = s$$



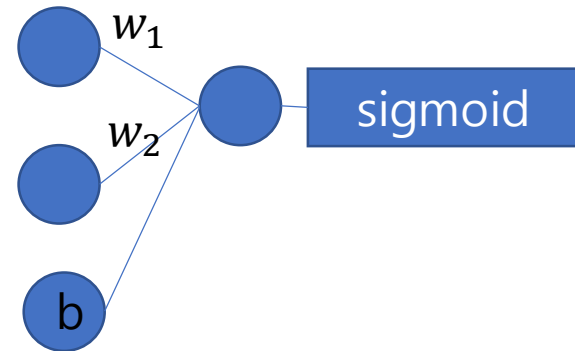
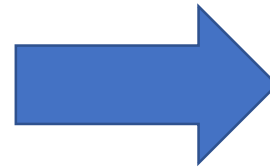
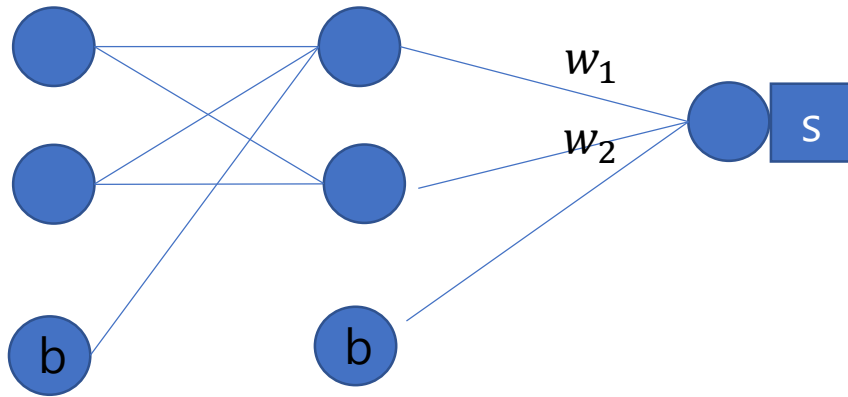
# • Question 5 (layer-(2,2,1)일 때, 중간에 sigmoid빼기)

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?

$$\text{sigmoid} = s$$



$$\text{sigmoid} = s$$



## • Question 6 (layer-(2,3,2,1)일 때)

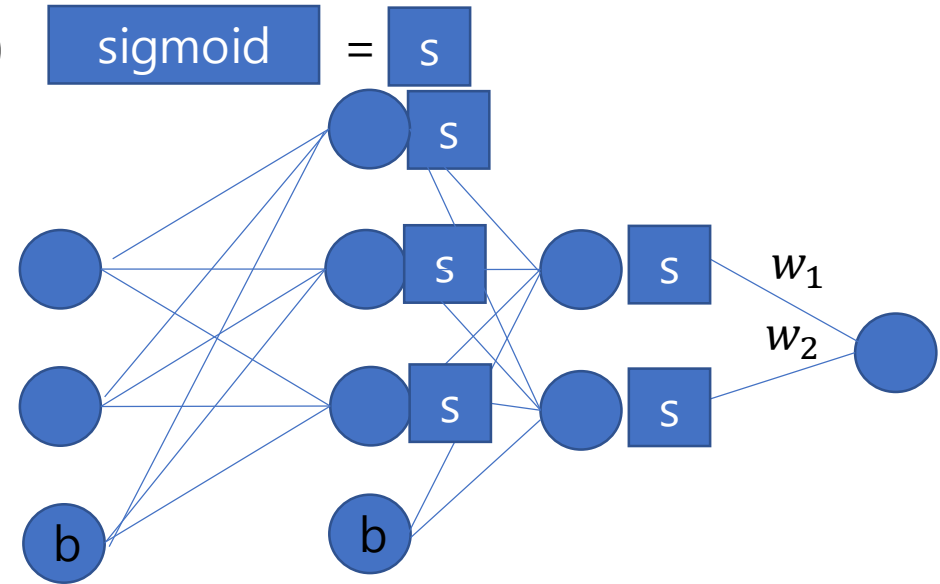
- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?

### 1. W1, W2 구하기

```
tensor([[ 2.8518, -2.1310],
        [-4.4986,  4.9250],
        [ 4.5663, -4.6553]])
tensor([0.0225, 1.6972, 1.7653])
tensor([[ 3.4083, -3.3699,  8.3578],
        [ 1.9425, -9.0967,  3.7482]])
tensor([-1.5596, -1.0949])
tensor([-14.1357, 14.5765])
tensor([6.8460])
```

### 5. 정확도는?

```
Hypothesis: [[9.2766731e-04]
              [9.9866831e-01]
              [9.9910337e-01]
              [8.6957408e-04]]
Correct:     [[0.]
              [1.]
              [1.]
              [0.]]
Accuracy:    1.0
```

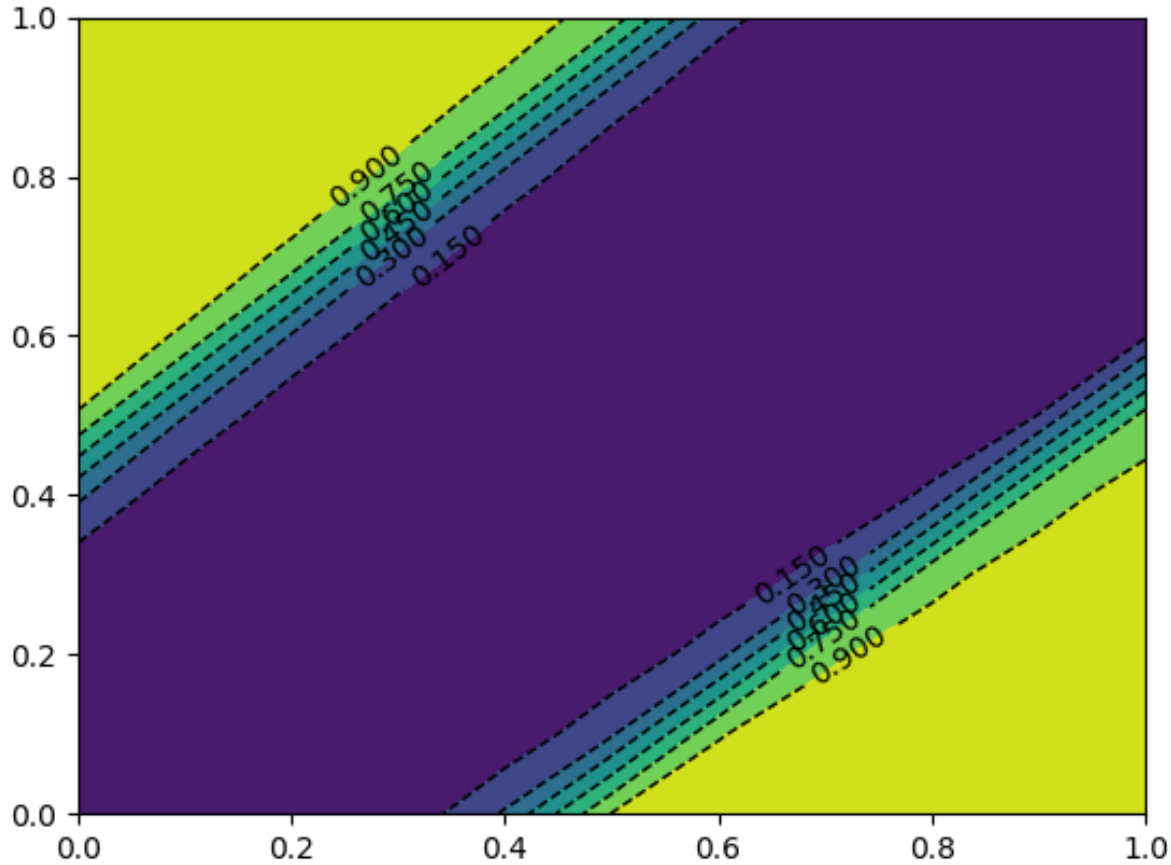
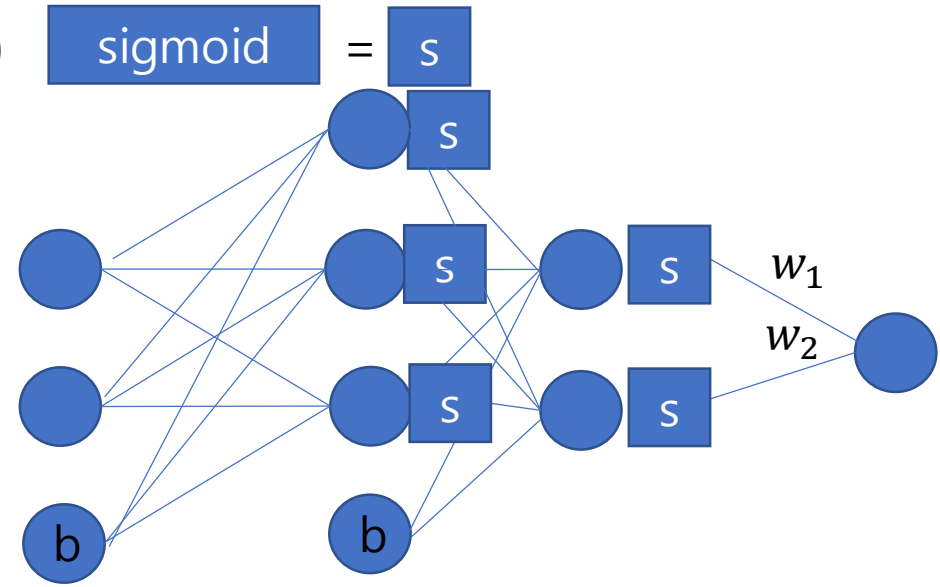


### 2~4. 각 값 구하기

```
[0, 0] : [0.00092767]
[1, 0] : [0.99910337]
[0.5, 0.5] : [0.00089435]
```

## • Question 6 (layer-(2,3,2,1)일 때)

- $W_1, W_2$  구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?



## • Question 6 (layer-(2,3,2,1)일 때)

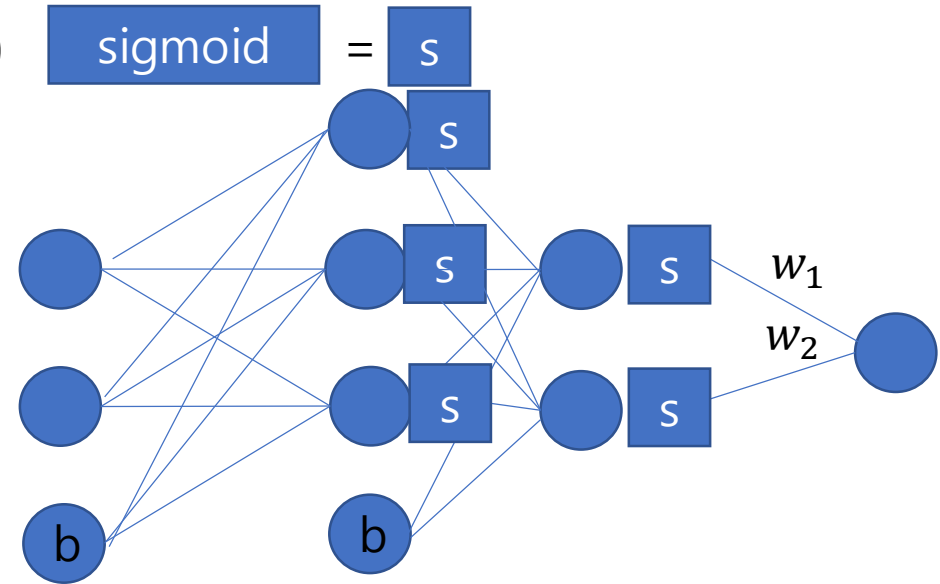
- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?

### 1. W1, W2 구하기

```
tensor([[ 2.8518, -2.1310],  
        [-4.4986,  4.9250],  
        [ 4.5663, -4.6553]])  
tensor([0.0225, 1.6972, 1.7653])  
tensor([[ 3.4083, -3.3699,  8.3578],  
        [ 1.9425, -9.0967,  3.7482]])  
tensor([-1.5596, -1.0949])  
tensor([-14.1357, 14.5765])  
tensor([6.8460])
```

### 5. 정확도는?

```
Hypothesis: [[9.2766731e-04]  
             [9.9866831e-01]  
             [9.9910337e-01]  
             [8.6957408e-04]]  
Correct:    [[0.]  
             [1.]  
             [1.]  
             [0.]]  
Accuracy:   1.0
```



### 2~4. 각 값 구하기

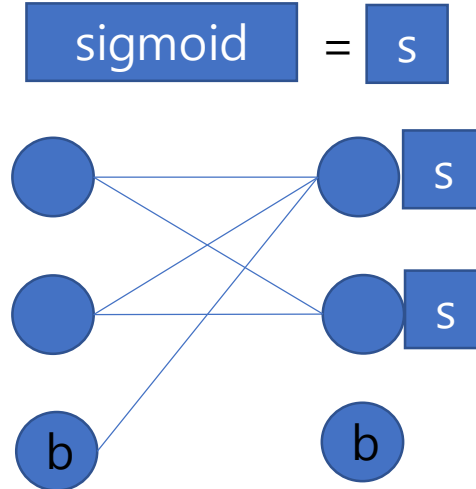
```
[0, 0] : [0.00092767]  
[1, 0] : [0.99910337]  
[0.5, 0.5] : [0.00089435]
```

# • Question 7 (layer-(2,2,2,2,2,1)일 때)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?

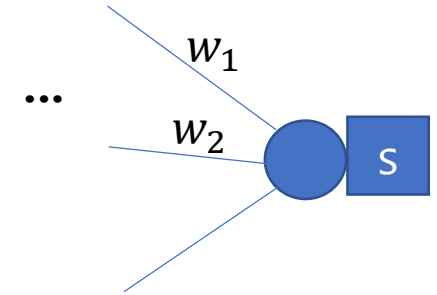
1. W1, W2 구하기

```
tensor([-0.2627, -0.6217])
tensor([[ -0.4672,  0.5341],
        [-0.2168,  0.6861]])
tensor([-0.3652, -0.1507])
tensor([[ -0.1716,  0.0804],
        [ 0.2997,  0.4915]])
tensor([-0.3333,  0.0465])
tensor([[ 0.3500, -0.5025],
        [ 0.4914, -0.5178]])
tensor([-0.3503, -0.3280])
tensor([[ 0.1327, -0.2583]])
tensor([0.0515])
```



2~4. 각 값 구하기

```
[0, 0] : [0.49999928]
[1, 0] : [0.50000027]
[0.5, 0.5] : [0.49999923]
```

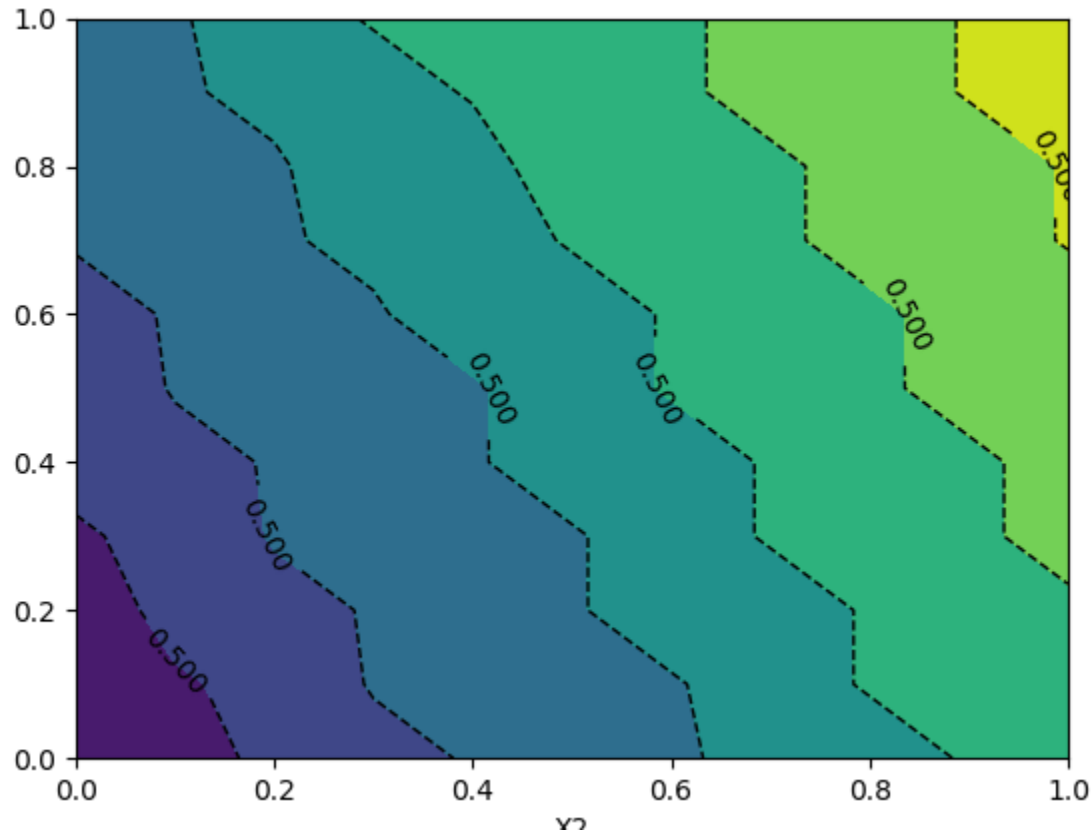


5. 정확도는?

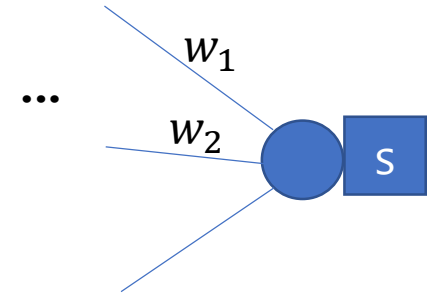
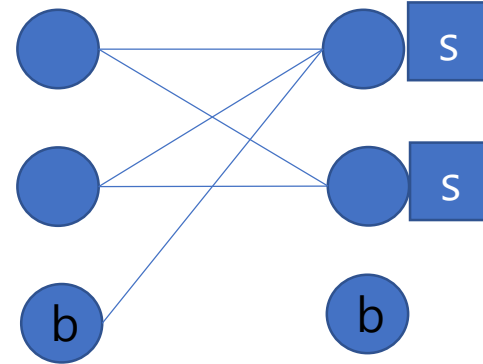
```
Hypothesis: [[0.49999928]
              [0.49999607]
              [0.50000027]
              [0.49999917]]
Correct: [[0.]
          [0.]
          [1.]
          [0.]]
Accuracy: 0.75
```

## • Question 7 (layer-(2,2,2,2,2,1)일 때)

- W1, W2 구하기
- Input=(0,0)일 때 출력 값?
- Input=(1,0)일 때 출력 값?
- Input=(0.5,0.5)일 때 출력 값?
- 정확도가 낮게 나오는 이유는?



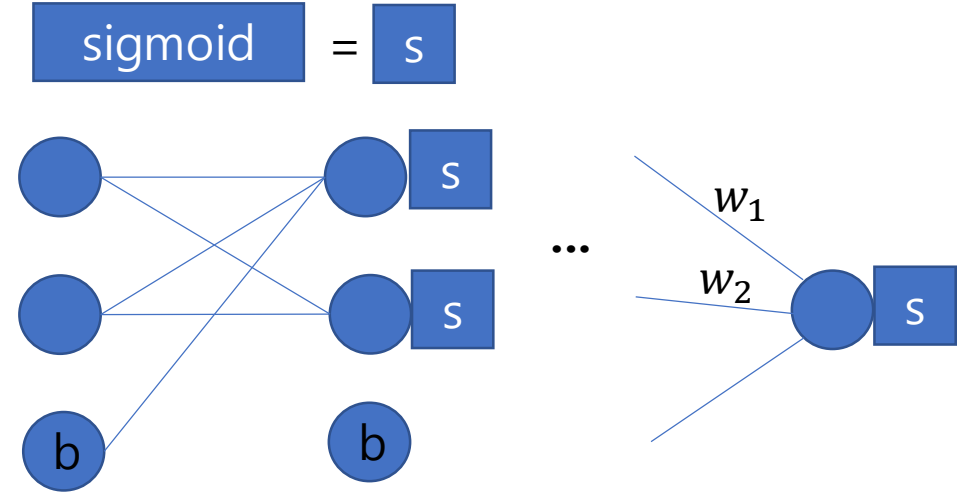
$$\text{sigmoid} = s$$





## • Question 7

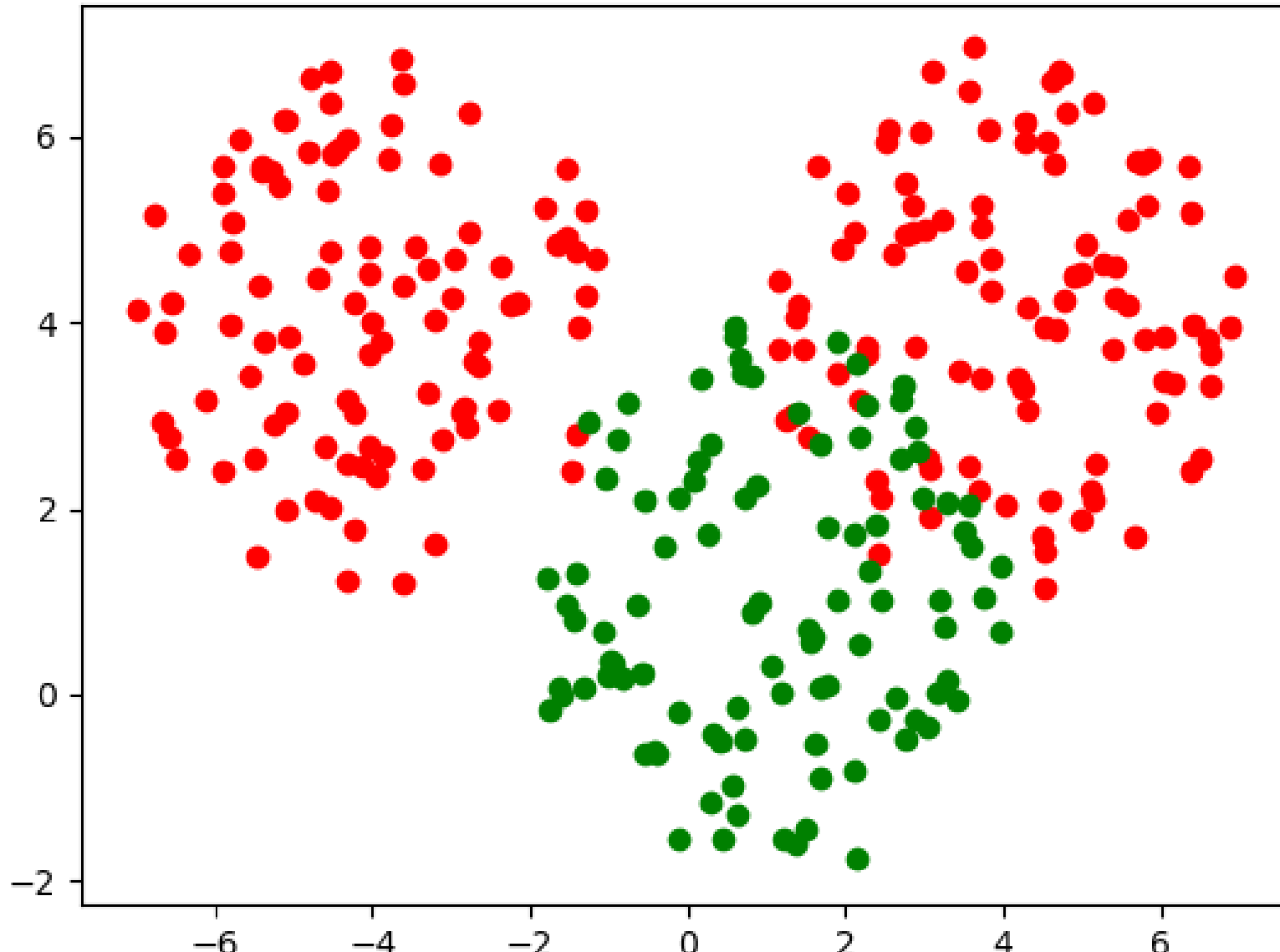
- W1, W2 구하기
  - Input=(0,0)일 때 출력 값?
  - Input=(1,0)일 때 출력 값?
  - Input=(0.5,0.5)일 때 출력 값?
  - 정확도가 낮게 나오는 이유는?



Vanishing Gradient 현상 때문!

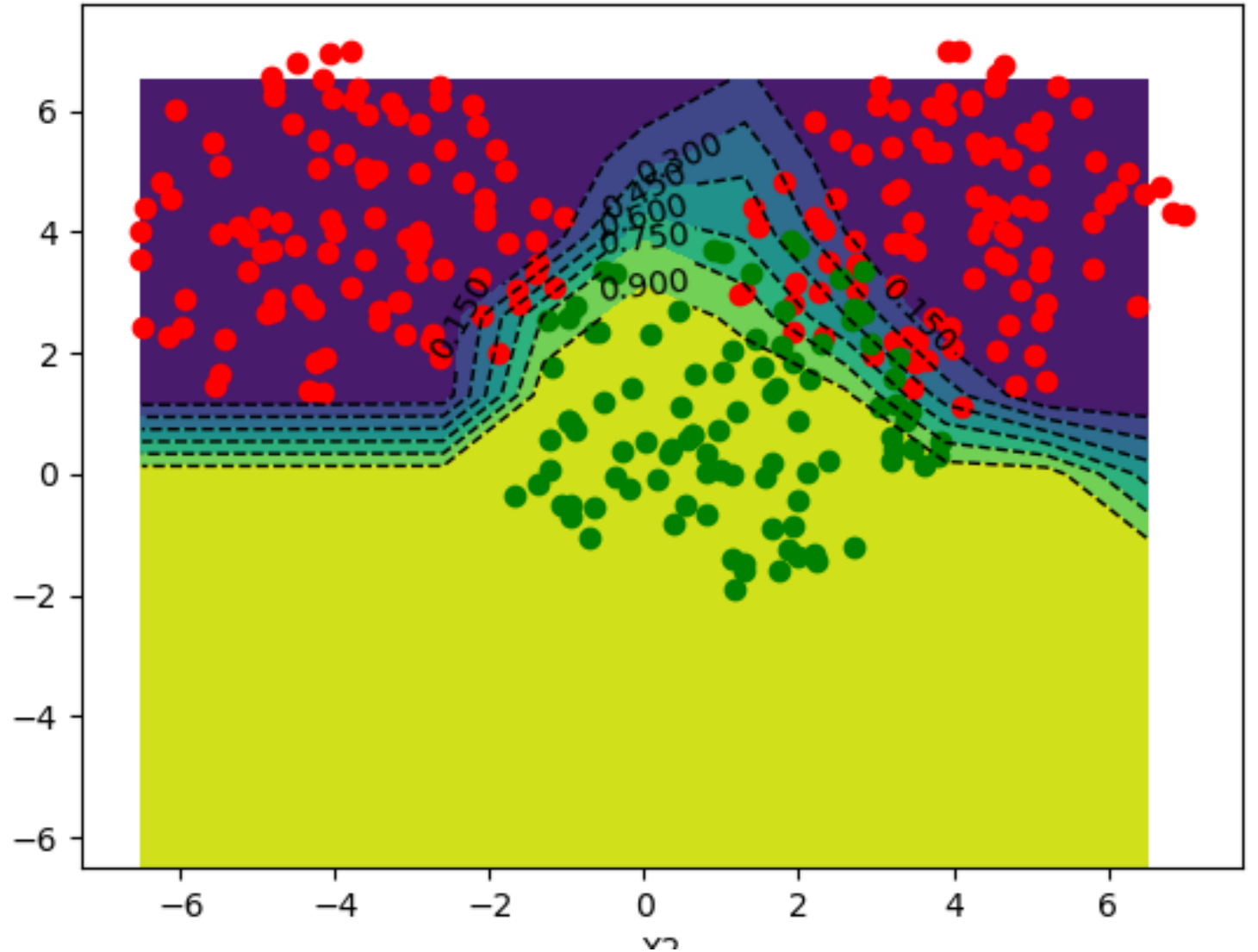
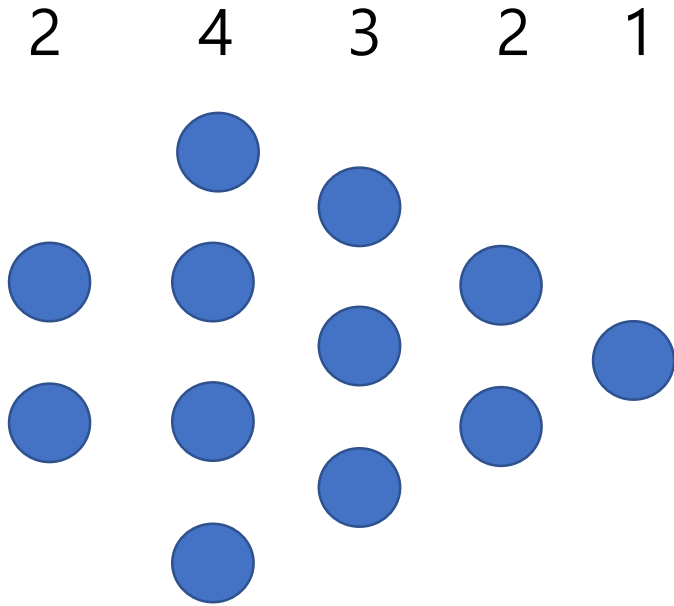
## • Question 8

- 직접 모델 세우기



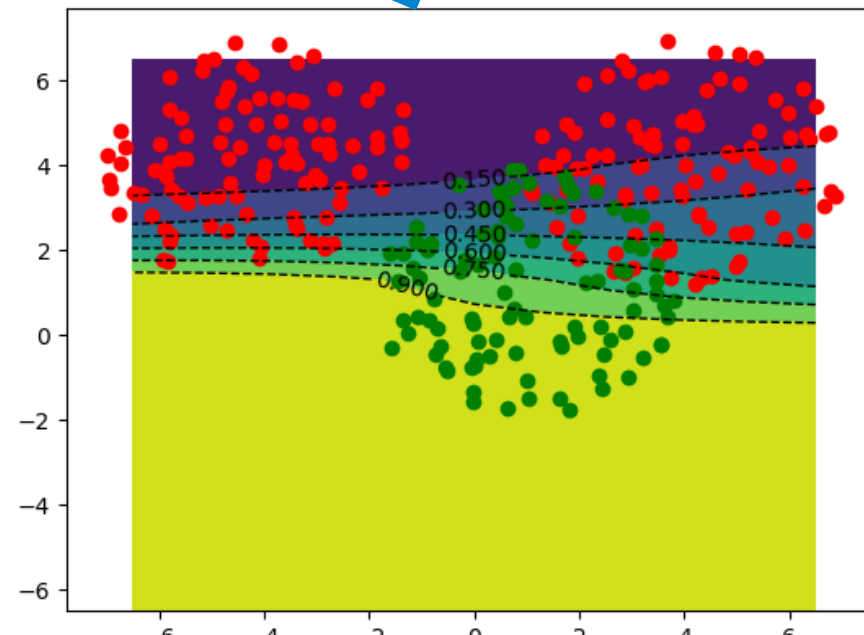
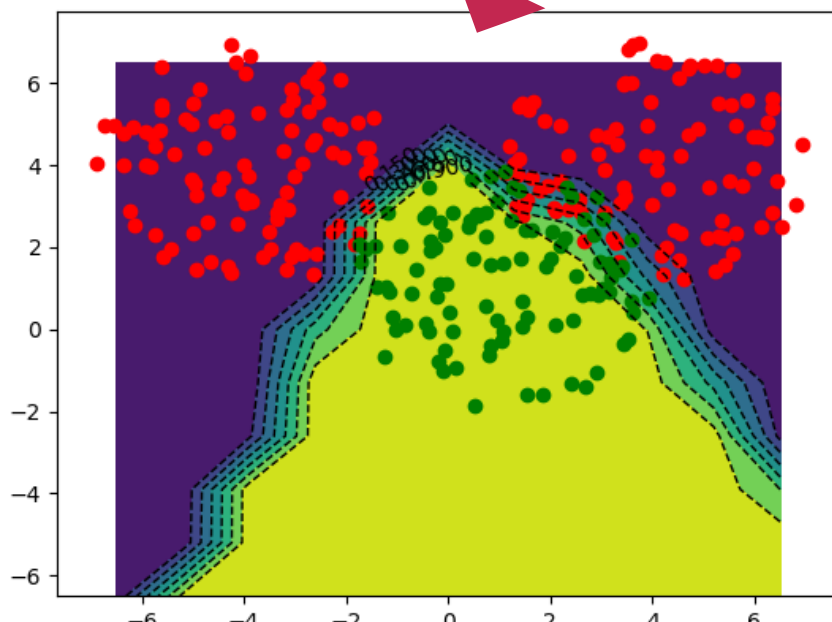
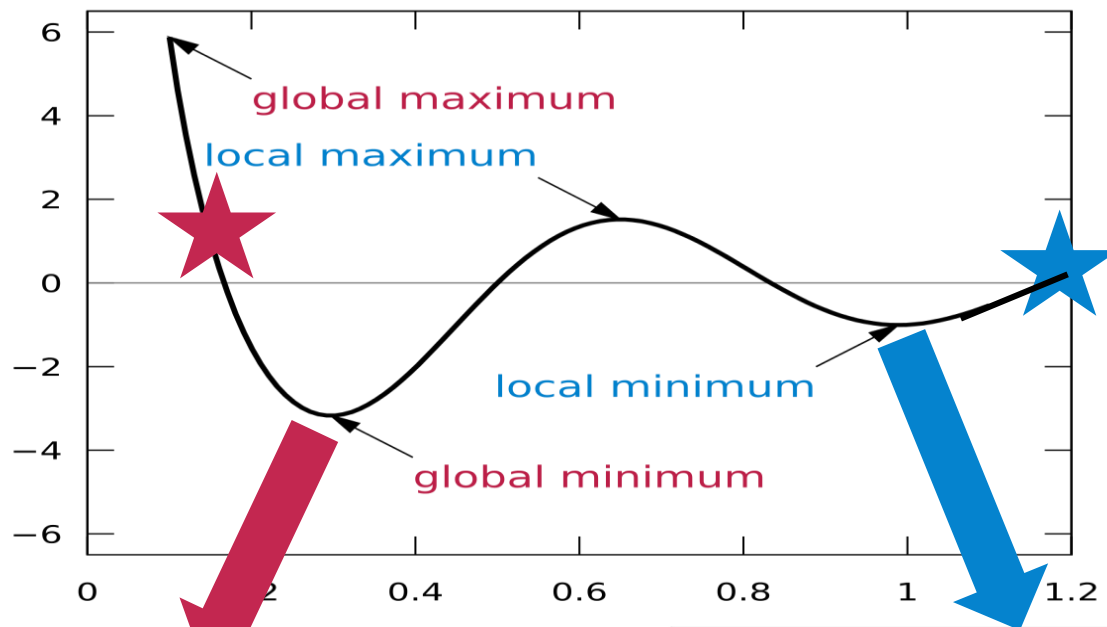
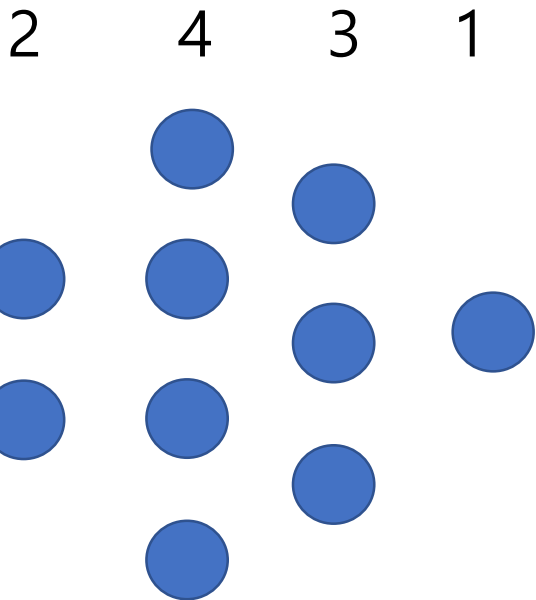
## • Question 8

- 직접 모델 세우기



# • Question 8

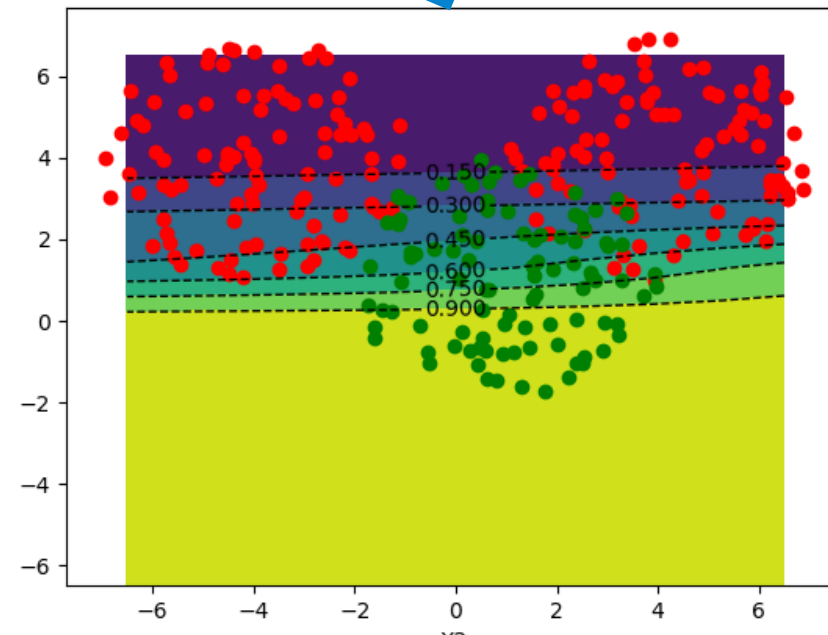
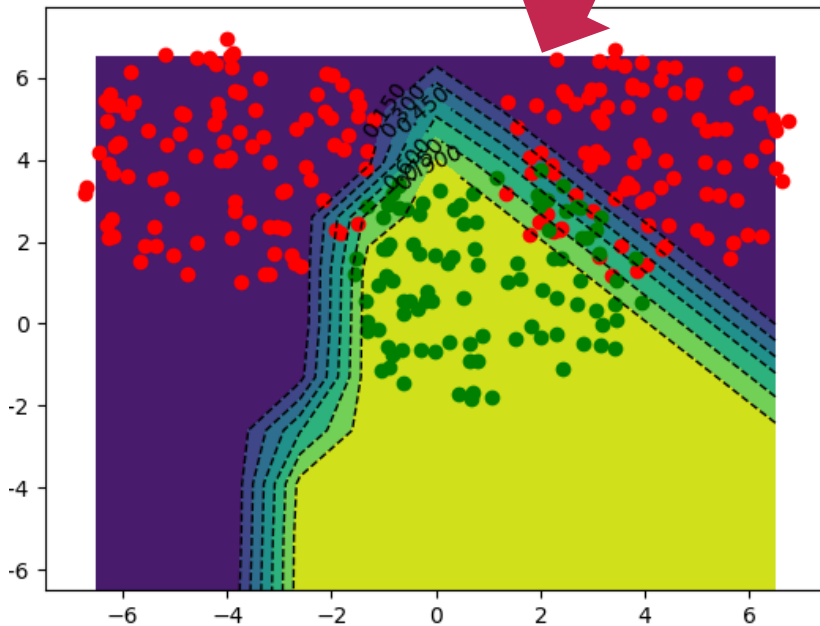
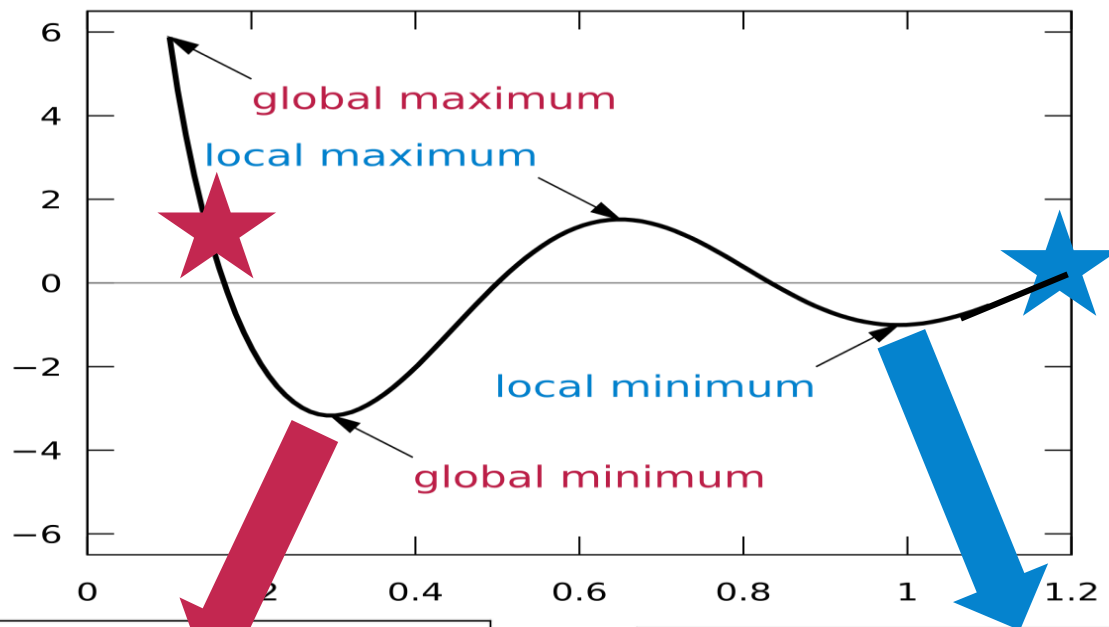
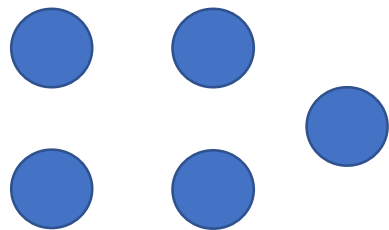
- 직접 모델 세우기



# • Question 8

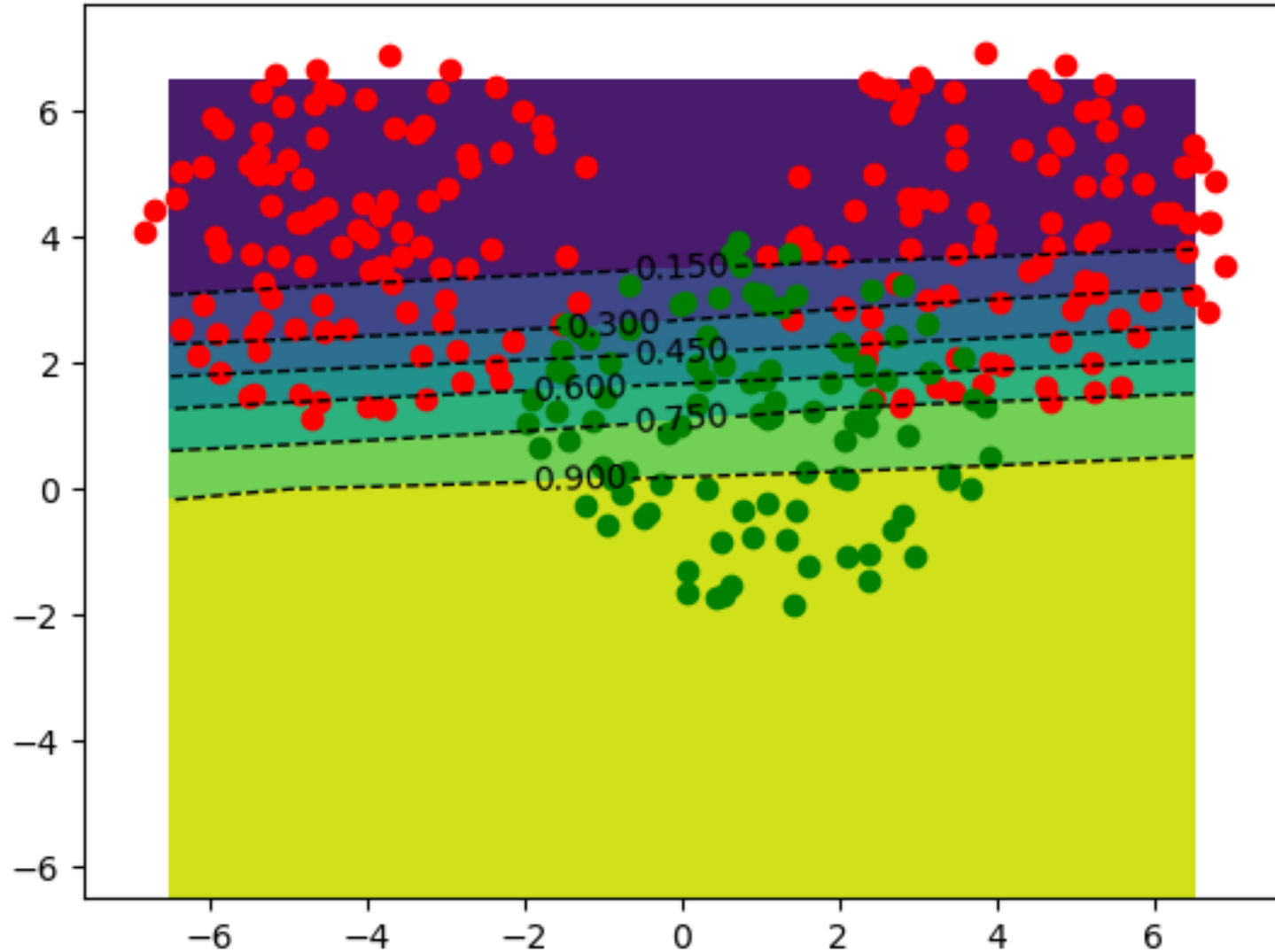
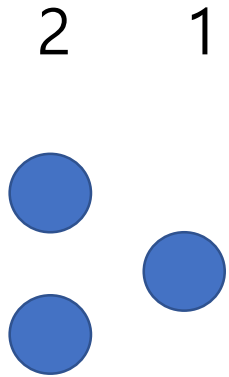
- 직접 모델 세우기

2      2      1



# • Question 8

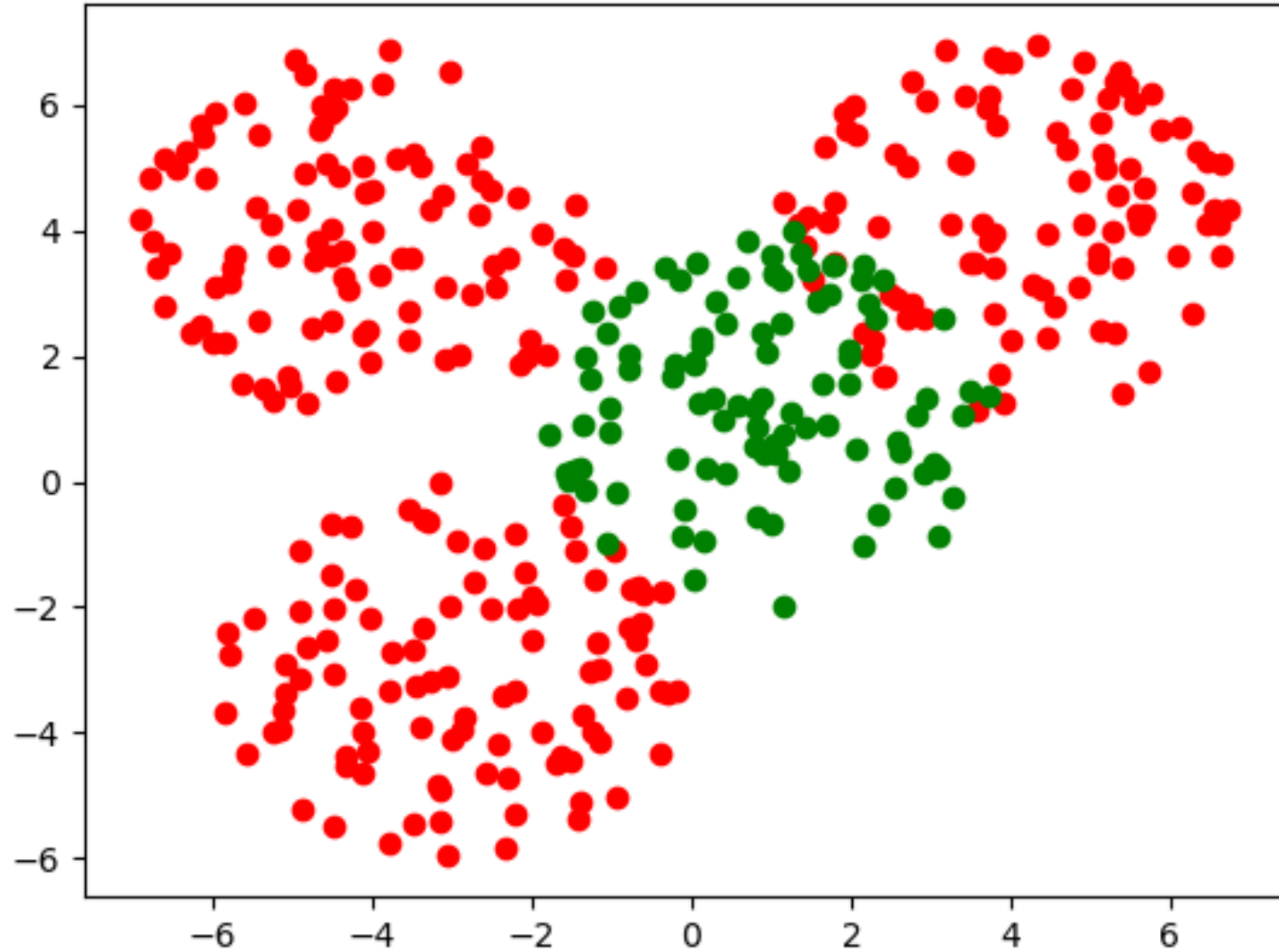
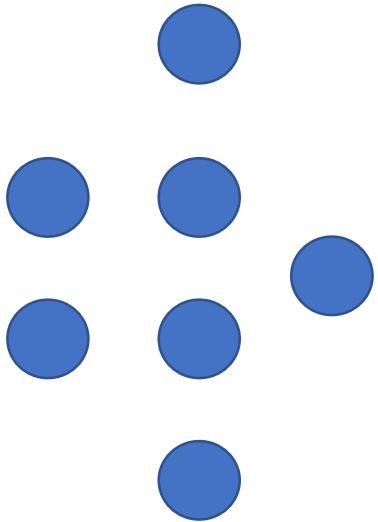
- 직접 모델 세우기



# • Question 9

- 직접 모델 세우기

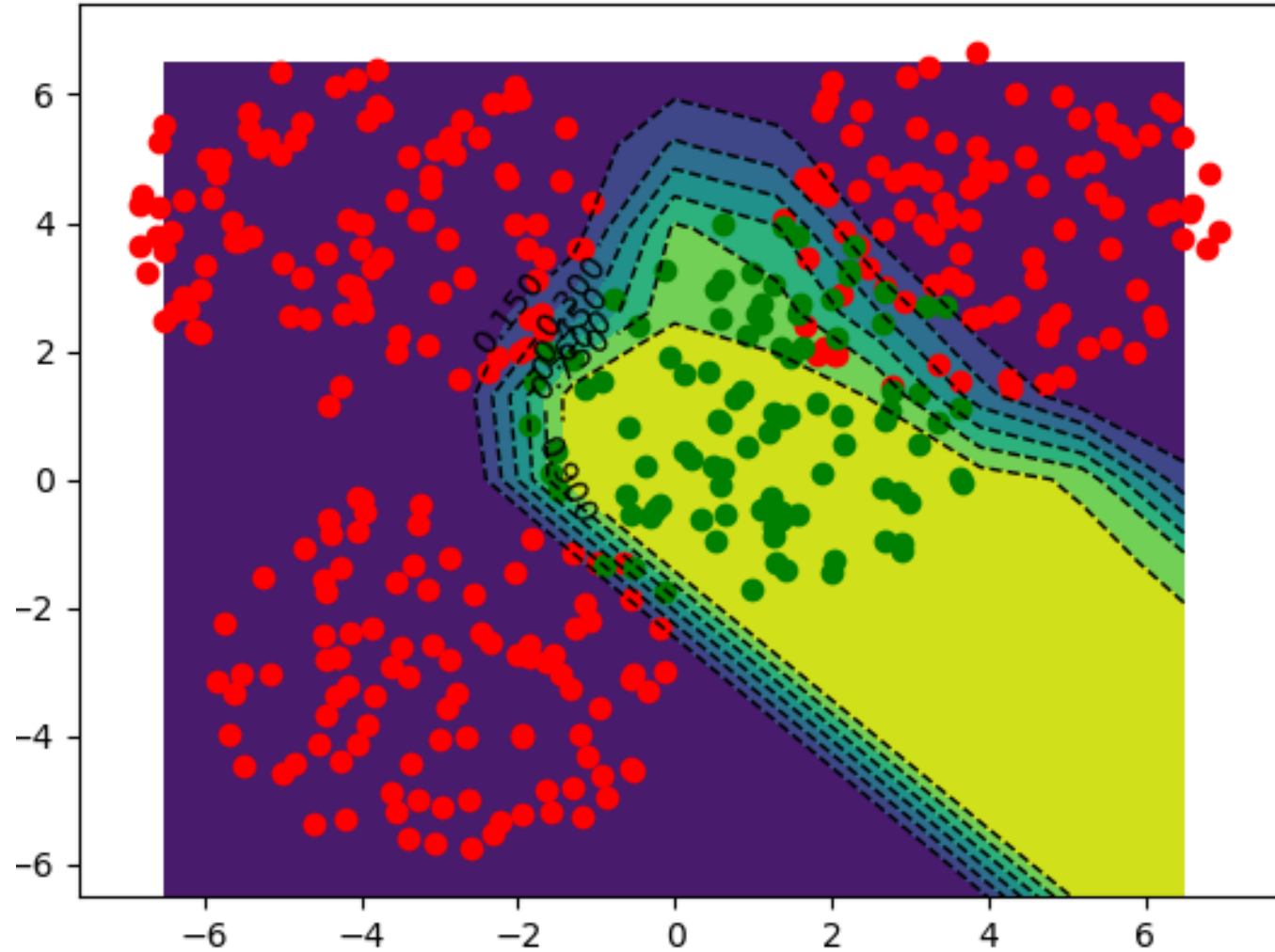
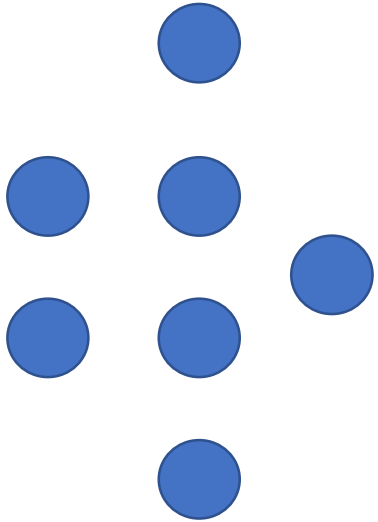
2      4      1



# • Question 9

- 직접 모델 세우기

2      4      1

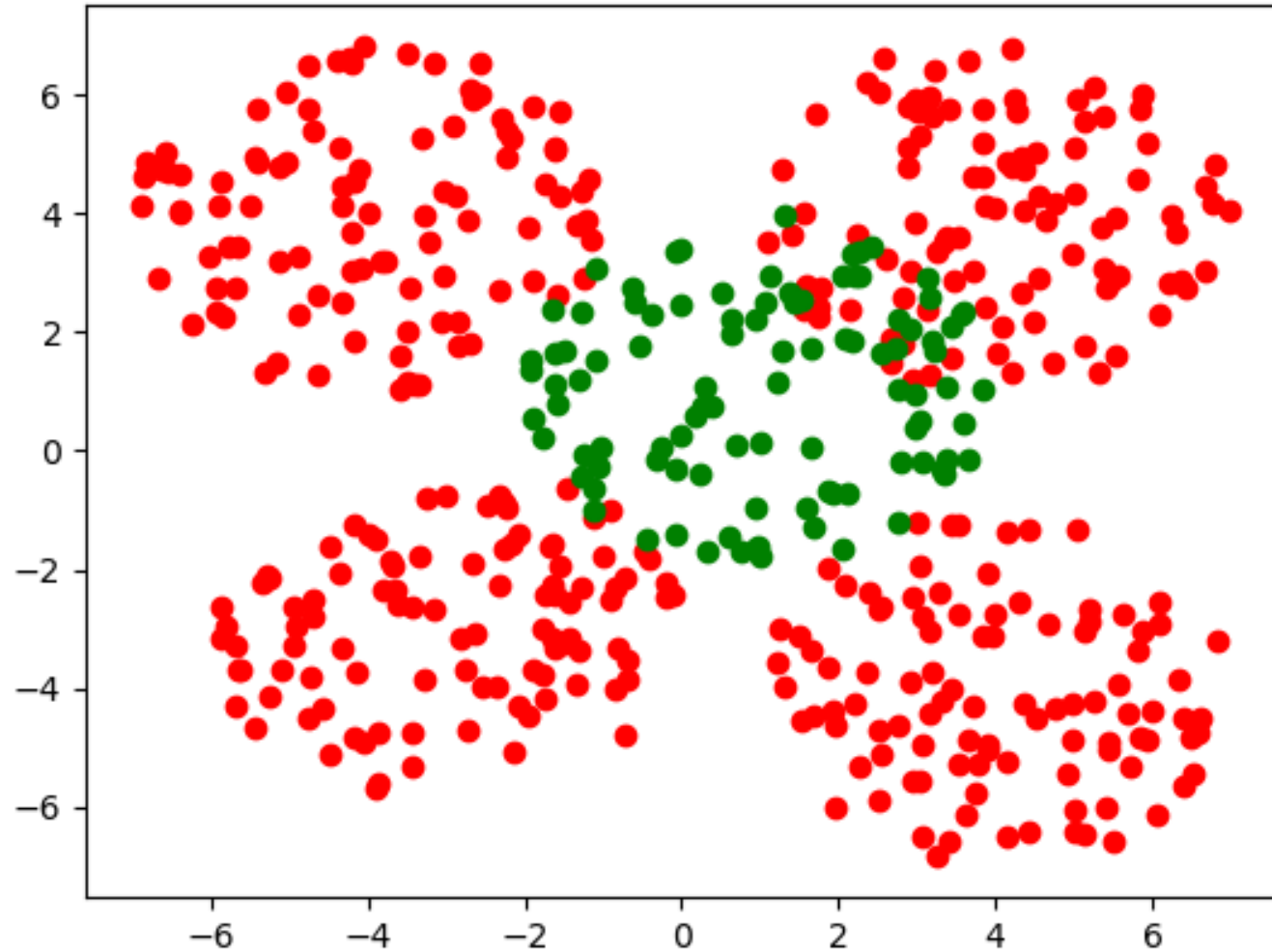
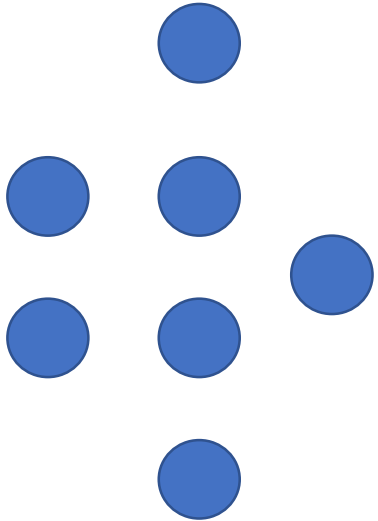




# • Question 10

- 직접 모델 세우기

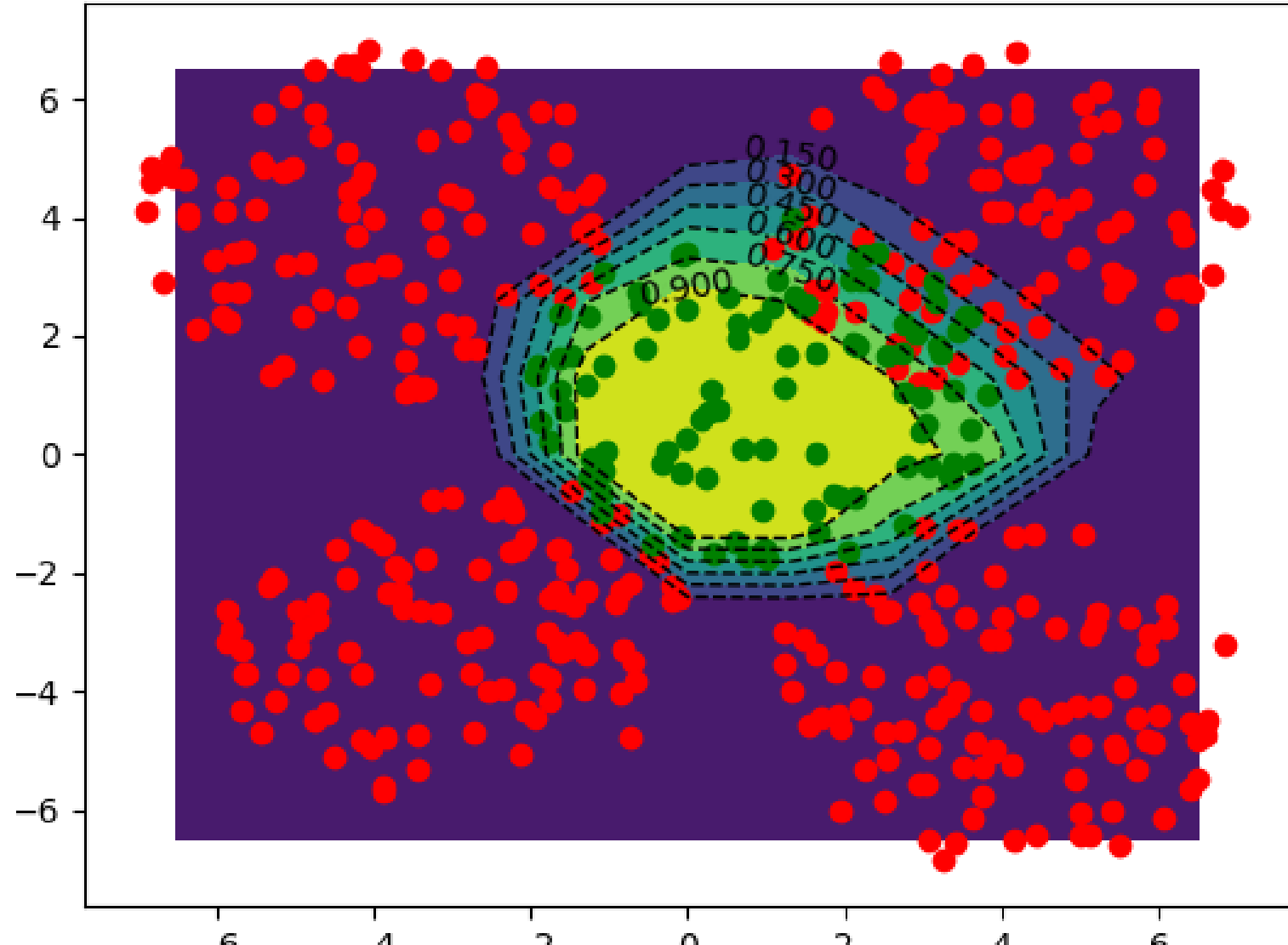
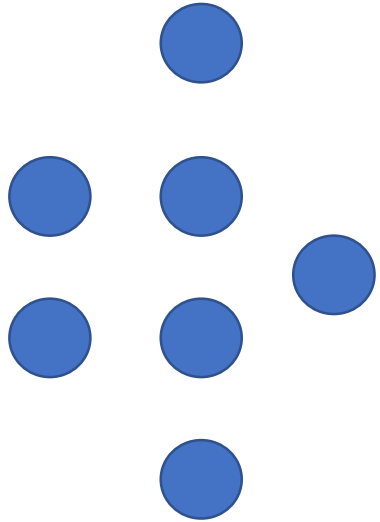
2      4      1



# • Question 10

- 직접 모델 세우기

2      4      1

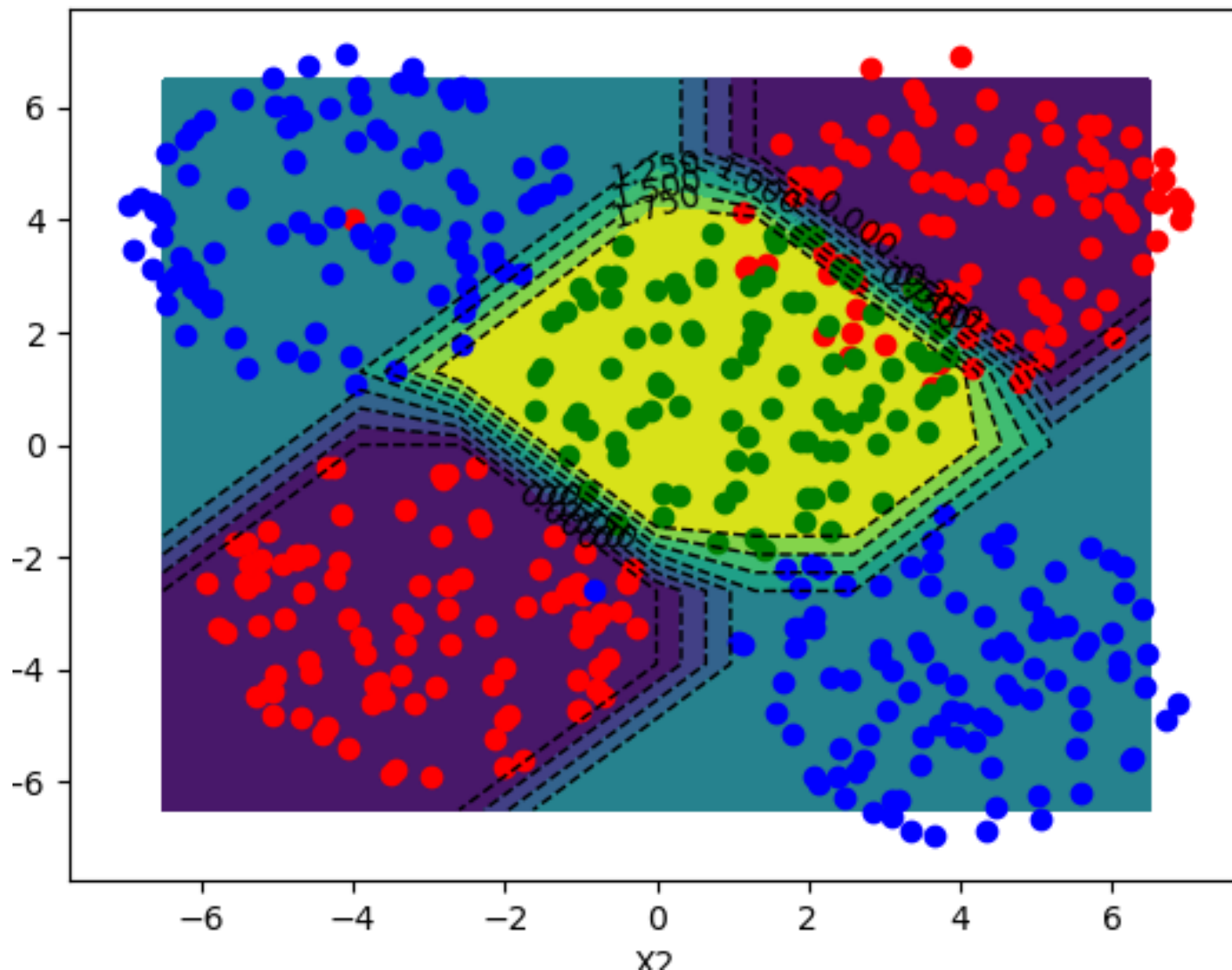
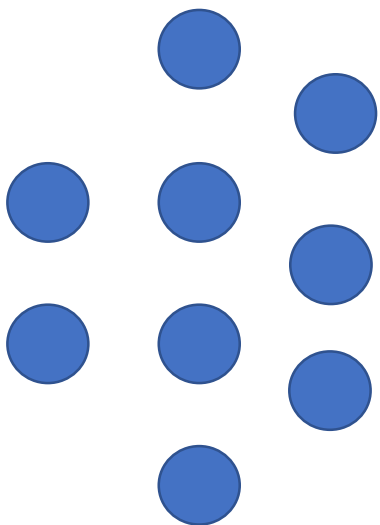


# • Question 11

• 클래스 3개에 대해

• F.cross\_entropy 사용법에 대해

2      4      3



# • Other Example

