딥러닝 기초, 실습 강의

CONTENTS

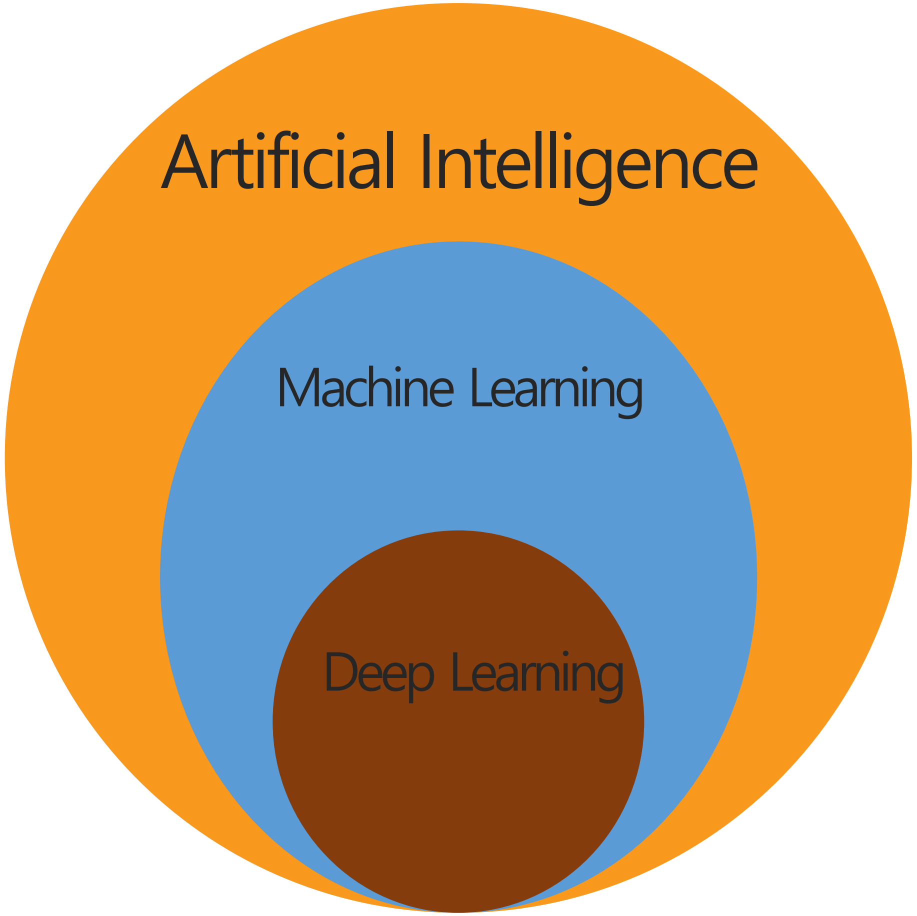
CONTENTS

Recommended Video, Lecture

Kocw – 수리통계학(부산대 김충락 교수님)
기계학습과 인공신경망
데이터 마이닝(SW융합)
딥러닝 홀로서기(Kaist)
선형대수
신호 및 시스템 1,2
공학수학 1, 2
….

필수는 아닙니다.

Machine Learning



Machine Learning

Classification	Clustering
Regression	Dimensionality Reduction

강화학습이 제외되어 있습니다.

Supervised Learning

Classification
Regression

Basic Regression Notion

$X=Y$

X=Y

Sample X
[1,1]
[2,2]
[3,3]
[4,4]

X=Y

If) X=5, Y=?

가지고 있는 Data로 회귀모형을 만들어
새로운 데이터를 예측한다.

HOW TO MAKE

어떻게 만들 것인가?

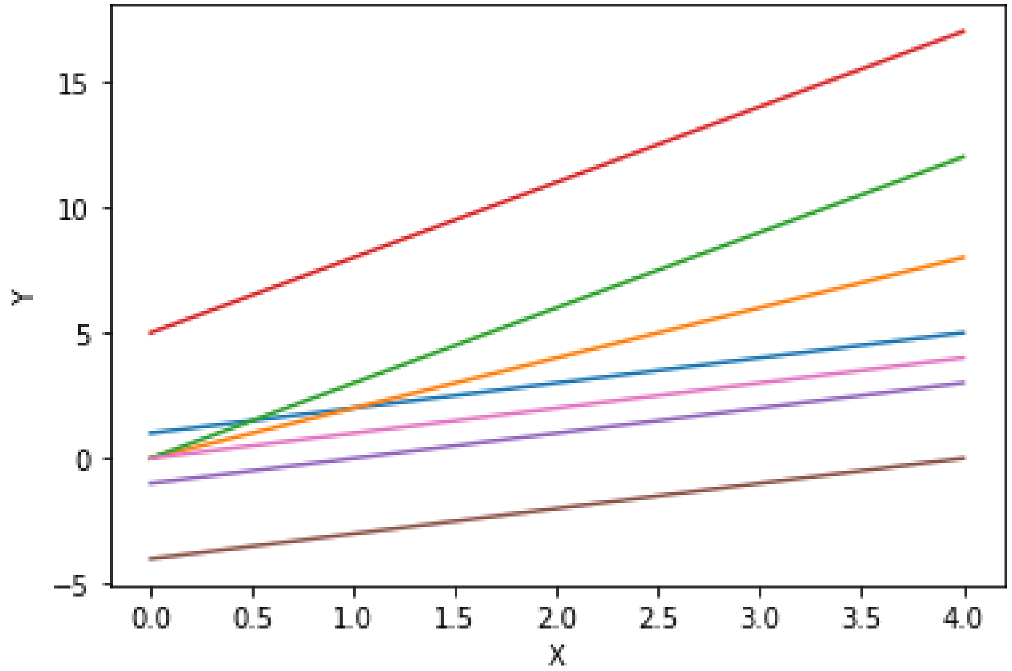
Hypothesis

Hypothesis 란?

쉽게 생각하면 가설 WX+B=Y안에
모든 (W,B) 를 생각하여 풀이하는 방식이다.

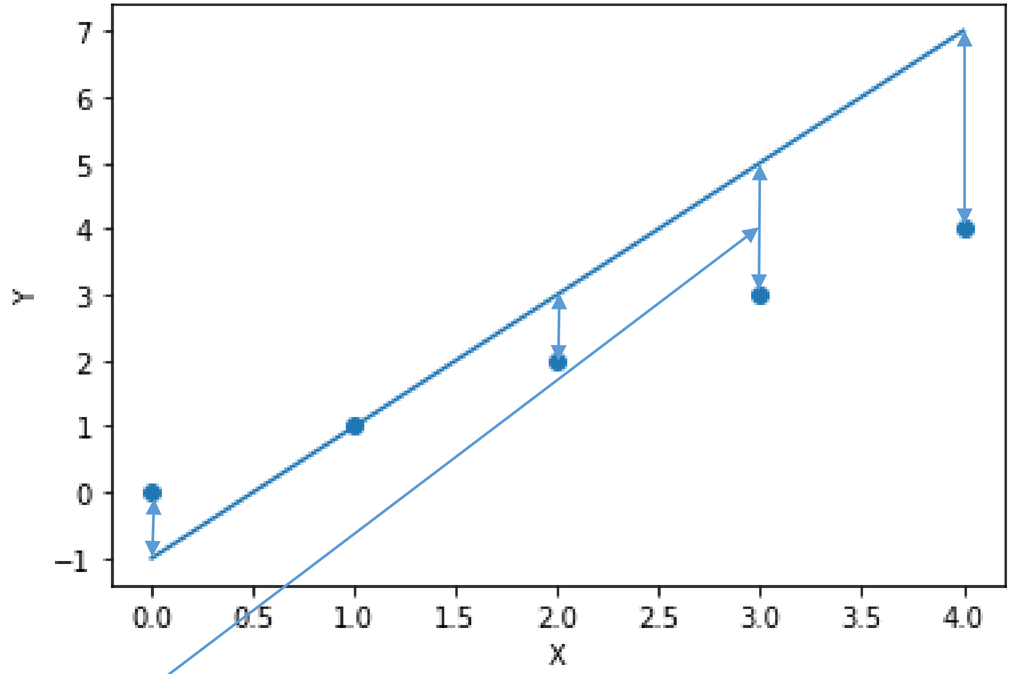
Hypothesis

X	Y
1	1
2	2
3	3
4	4



$H(x) = ?$

Hypothesis



H(x)-y

Cost function

What is?

Cost Function

X	Y
0	0
1	1
2	2
3	3
4	4

Cost Function

MSE, Cross Entropy

Cost Function은 간단히 2가지를 고려 가능하다.

Y => Countinuos, Discrete

Cost Function

MSE(Mean Square Error)

Y => Countinuos

Ex)

$$\frac{(H(x^{(1)})-y^{(1)})^2+(H(x^{(2)})-y^{(2)})^2+(H(x^{(3)})-y^{(3)})^2}{3}$$

$$\text{cost}=\frac{1}{m}\sum_{i=1}^{m}(H(x^{(i)})-y^{(i)})^2$$

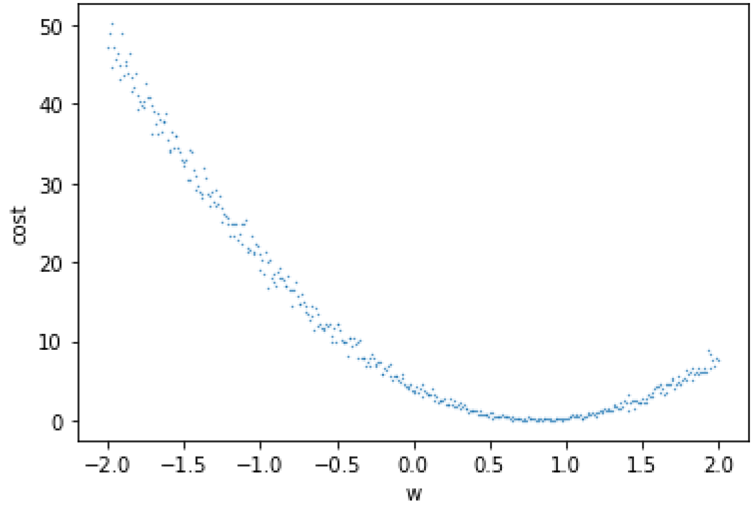
Minimize cost(W, b) **W, b ->Minimize**

How to Minimize

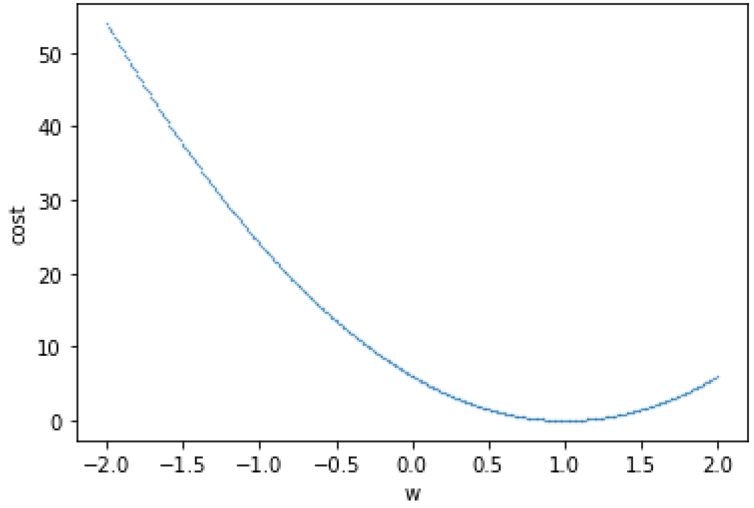
Cost Function

Gradient Descent

$$cost = \frac{1}{m}\sum_{i=1}^{m}(H(x^{(i)}) - y^{(i)})^2$$

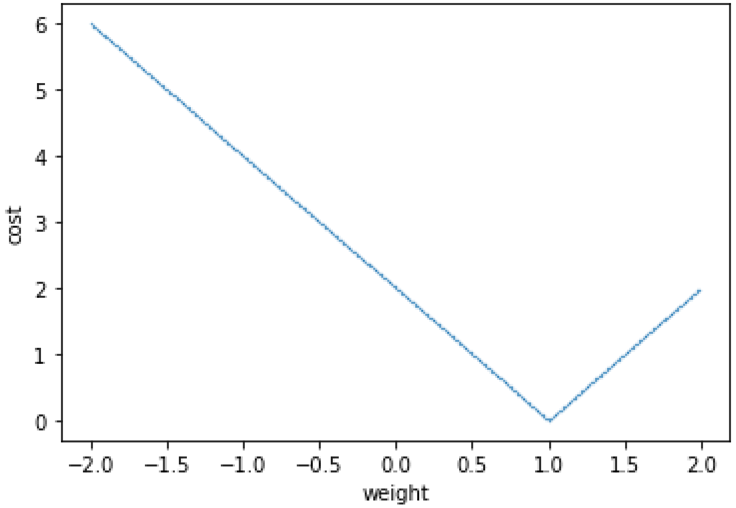


Bias Existence O

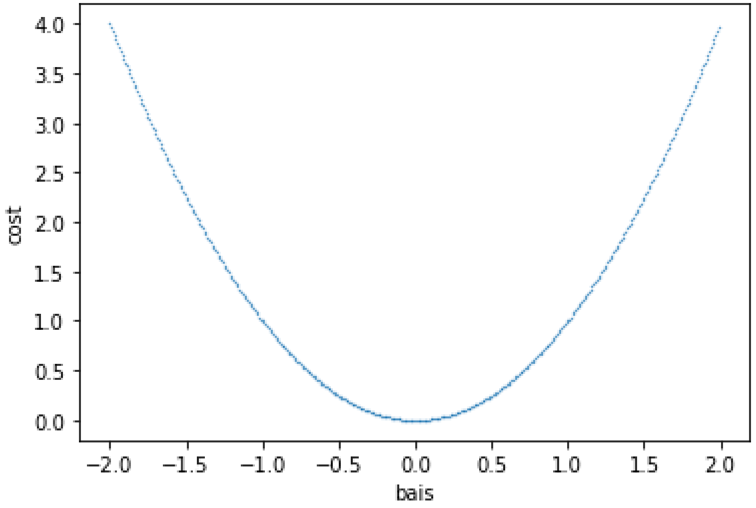


Bias Existence X

Gradient Descent

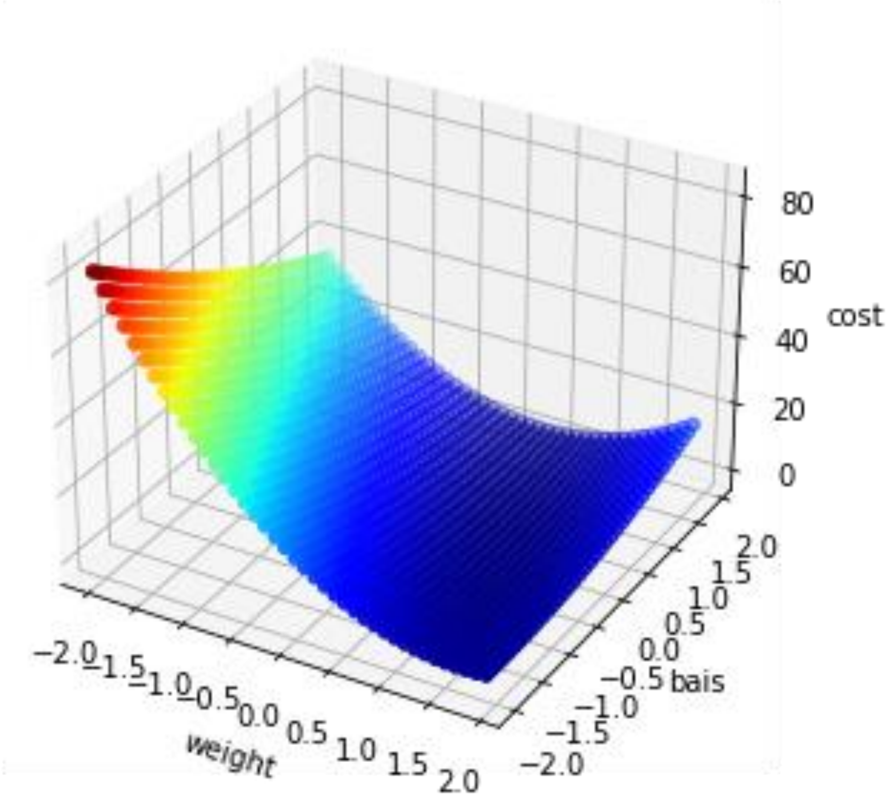


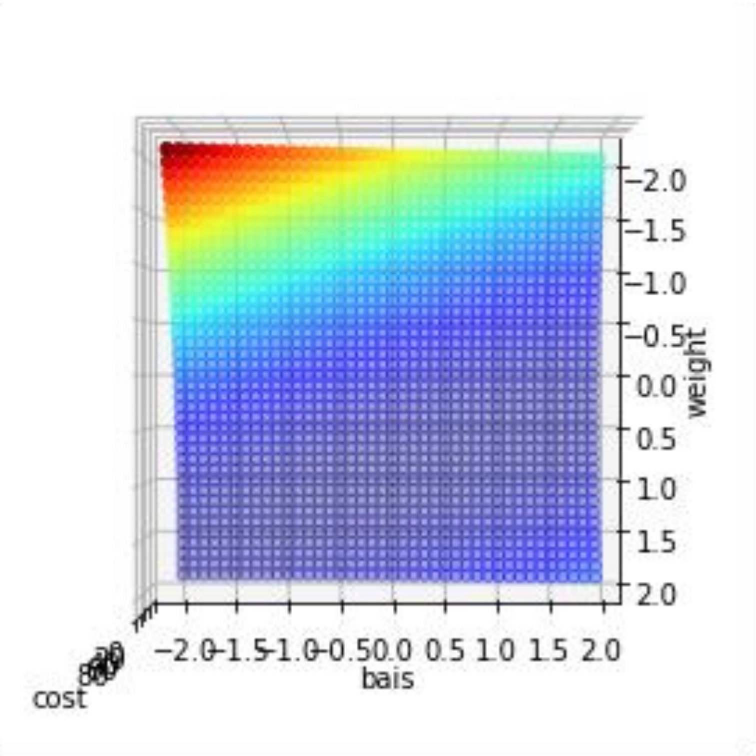
absolute



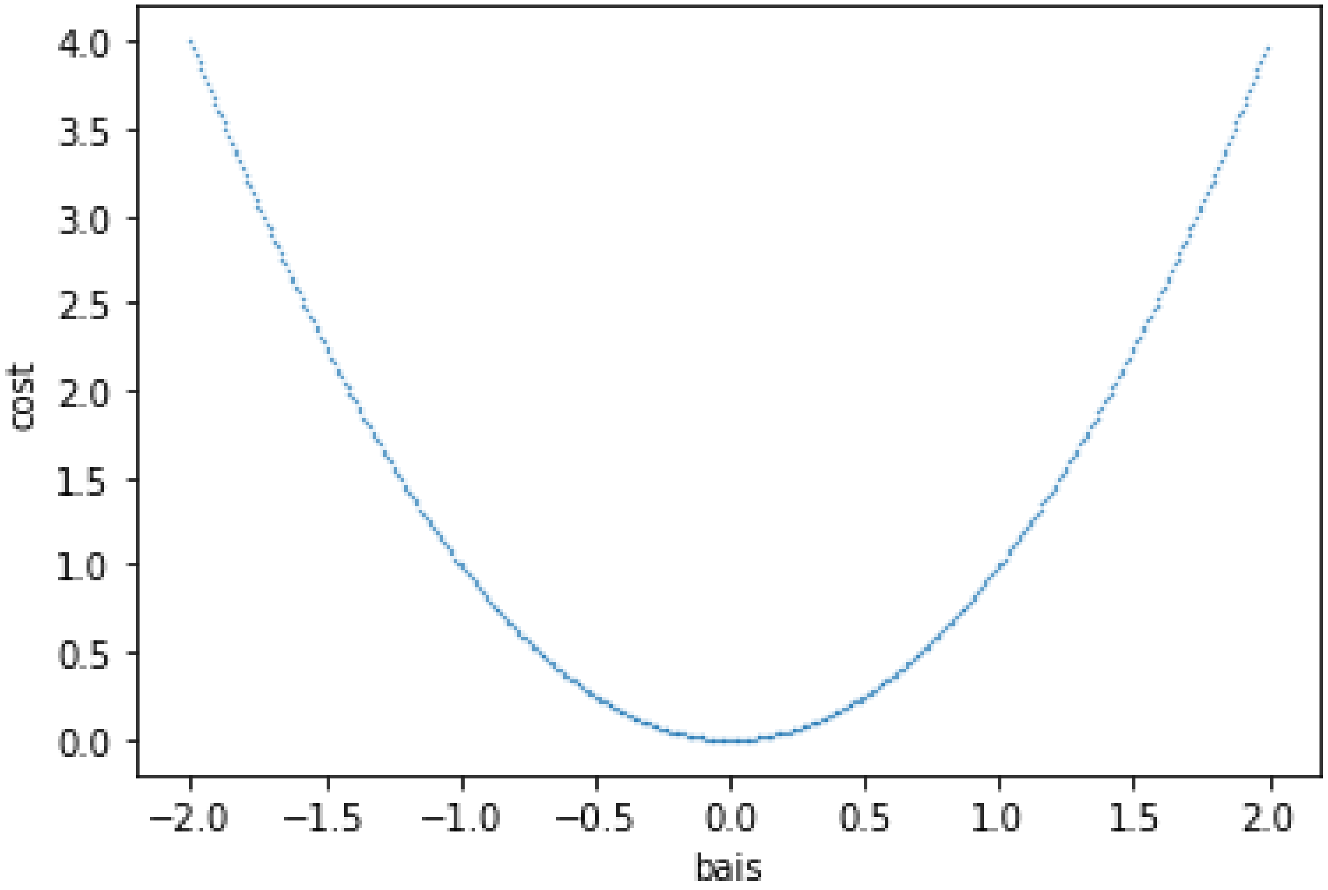
MSE

Gradient Descent





Gradient Descent



Gradient Descent

Consider only Weight for understand

$$cost(W) = \frac{1}{m}\sum_{i=1}^{m}\left(Wx^{i} - y^{i}\right)^{2}$$

$$W := W - \alpha\frac{\partial}{\partial W}cost(W)$$

Gradient Descent

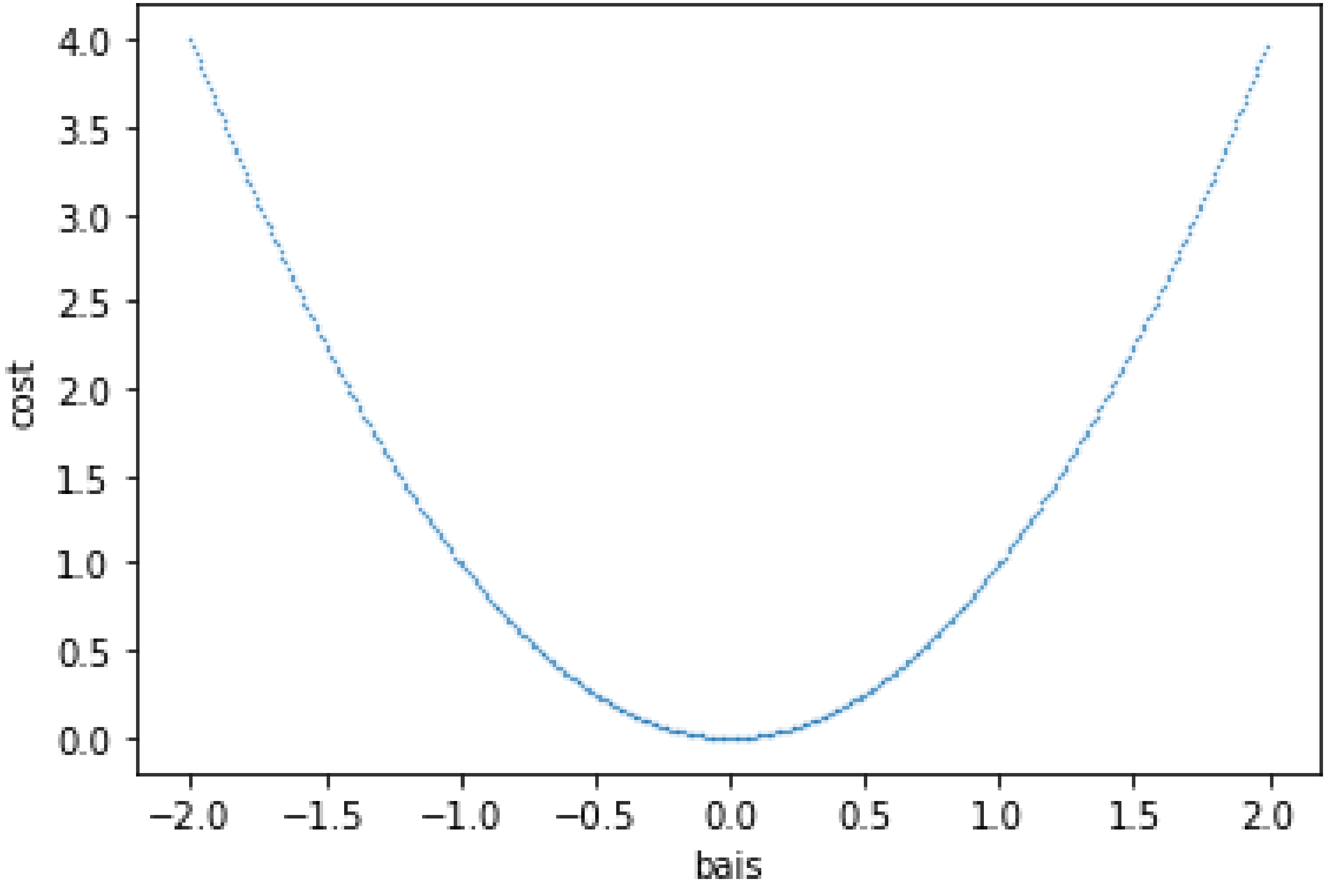
Gradient Descent

Consider only Weight for understand

$$W := W - \alpha \frac{1}{m} \sum_{i=1}^{m} \left(W x^i - y^i\right) x^i \quad \alpha : Learning\ Rate$$

편의상 2 제거

Why use Learning Rate



Problem

Local Minimum, Global Minimum

Multi-Variable

	f1	f2	f3	f4	f5	Y
X1	1	3	1	4	2	0
X2	2	4	3	5	6	1.3
X3	1	3	1	2	3	1.2
X4	2	3	2	1	2	2.3
X5	2	4	3	3	1	3.4

Multi−Variable

	f1	f2	f3	f4	f5	Y
X1	1	3	1	4	2	0
X2	2	4	3	5	6	1.3
X3	1	3	1	2	3	1.2
X4	2	3	2	1	2	2.3
X5	2	4	3	3	1	3.4

$$H(x) = Wx + b$$

$$H(f_1, f_2, f_3, f_4, f_5) = w_1 f_1 + \ldots + w_5\, f_5 + \mathrm{b}$$

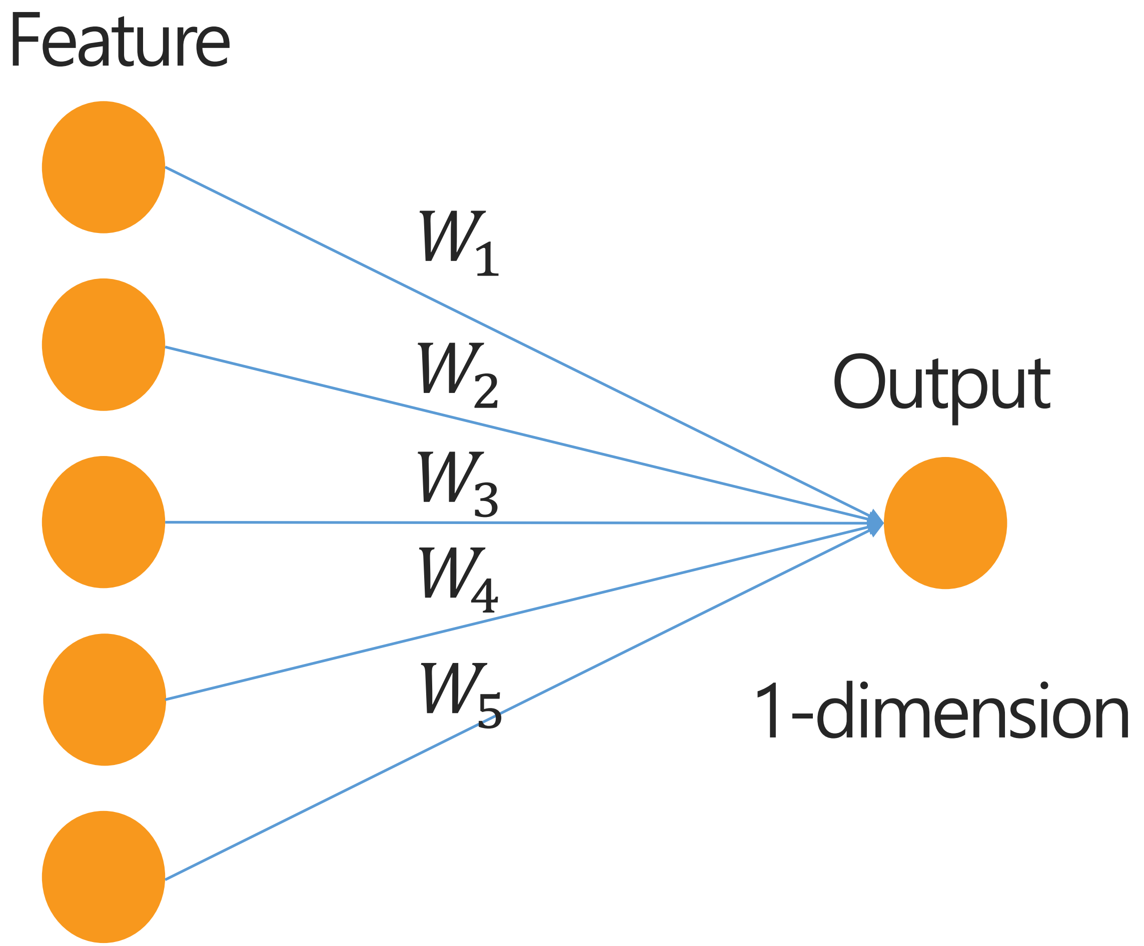
$$cost(W, b) = \frac{1}{m}\sum_{i=1}^{m}\left(H\left(f_1^i, f_2^i \ldots f_5^i\right) - y^i\right)^2$$

Matrix

$w_1 f_1 + \ldots + w_5 f_5 + b$

$$\begin{bmatrix} f_1^1 & \cdots & f_5^1 \\ f_1^2 & & f_5^2 \end{bmatrix} * \begin{bmatrix} w_1 \\ \vdots \\ w_5 \end{bmatrix} + \begin{bmatrix} b_1 \\ \vdots \\ b_5 \end{bmatrix} = output$$

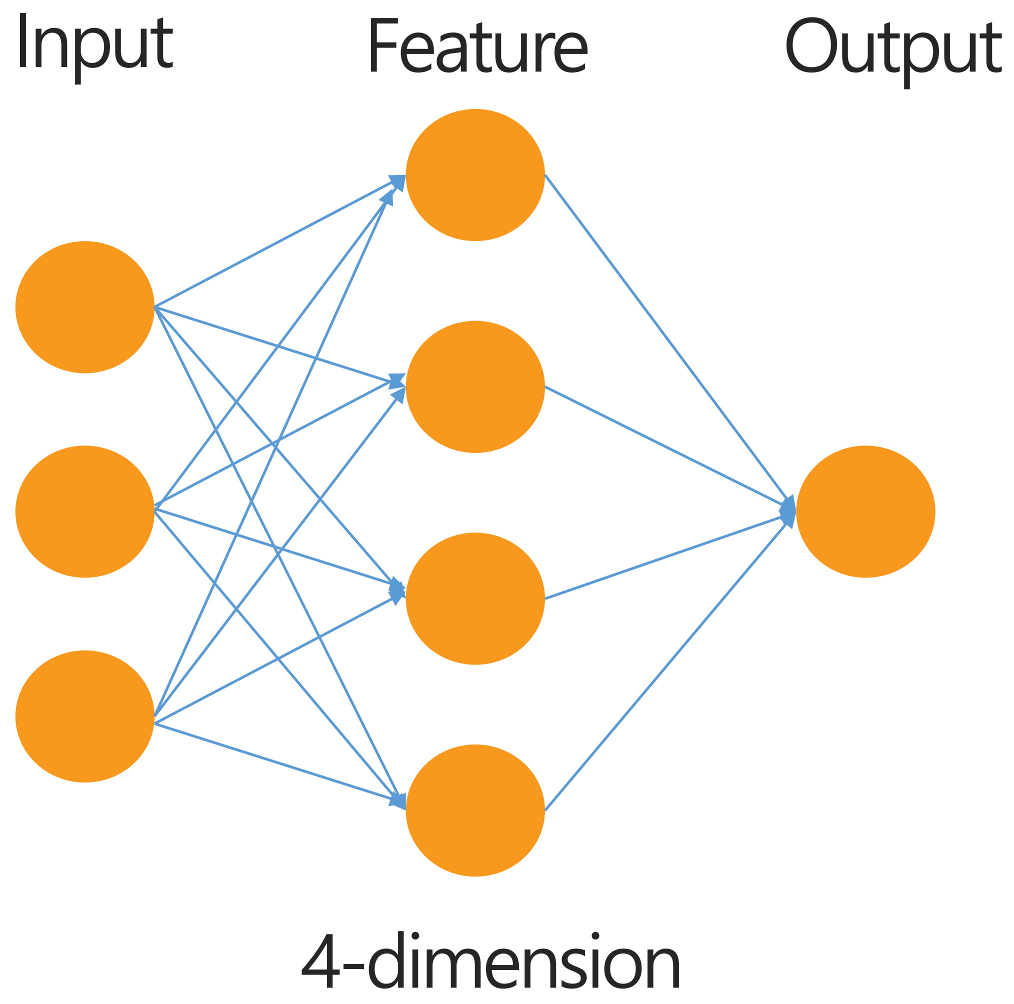
$H(X) = XW + B$



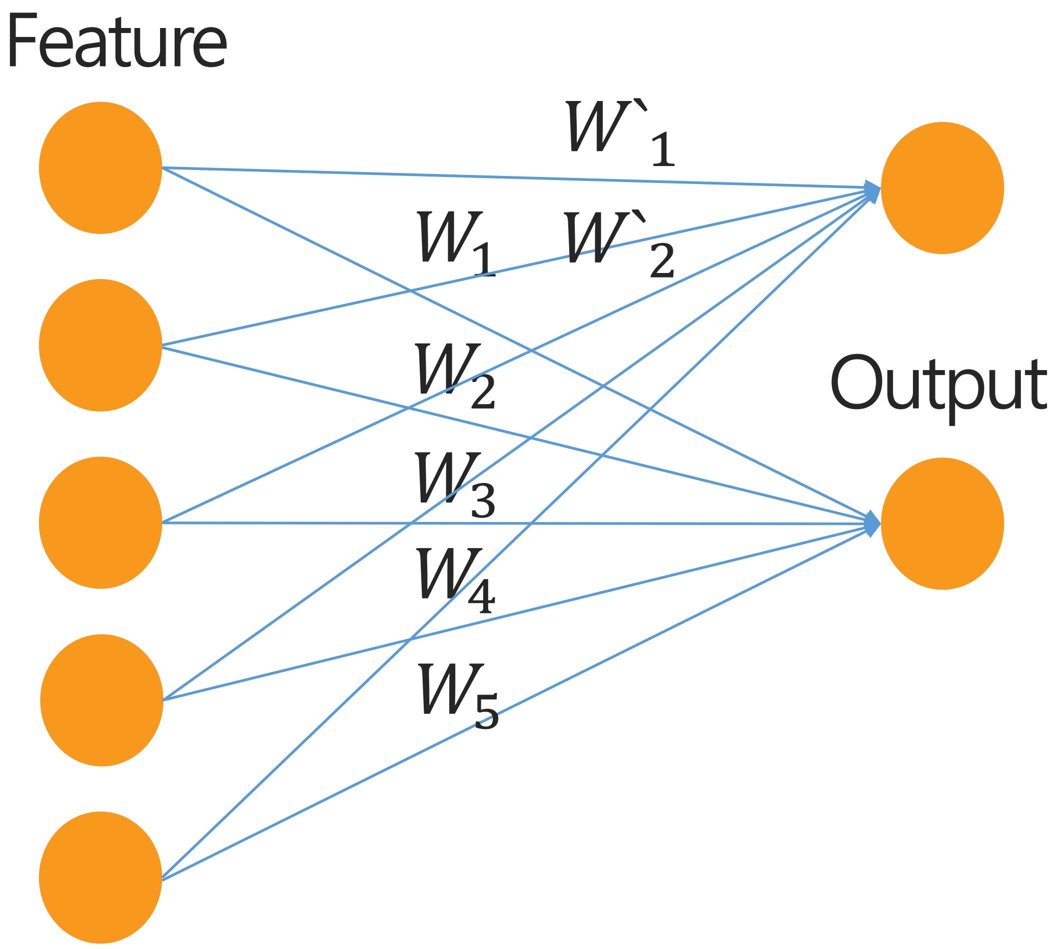
How to Increase

Dimension

Basic Model



Matrix_Problem



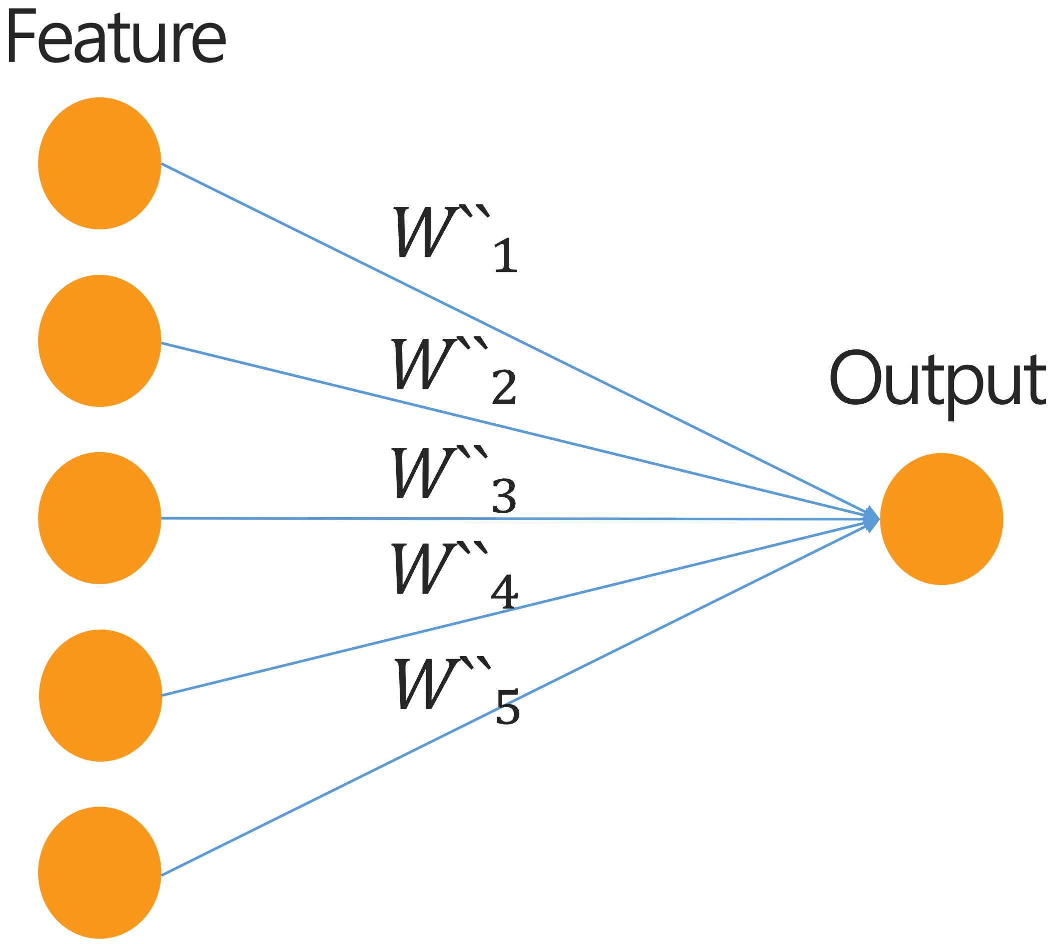
Matrix_Problem

$$\begin{bmatrix} f_1^1 & \cdots & f_5^1 \\ f_1^2 & & f_5^2 \end{bmatrix} * \begin{bmatrix} w_1 \\ \vdots \\ w_5 \end{bmatrix} + \begin{bmatrix} b_1 \\ \vdots \\ b_5 \end{bmatrix} = output$$

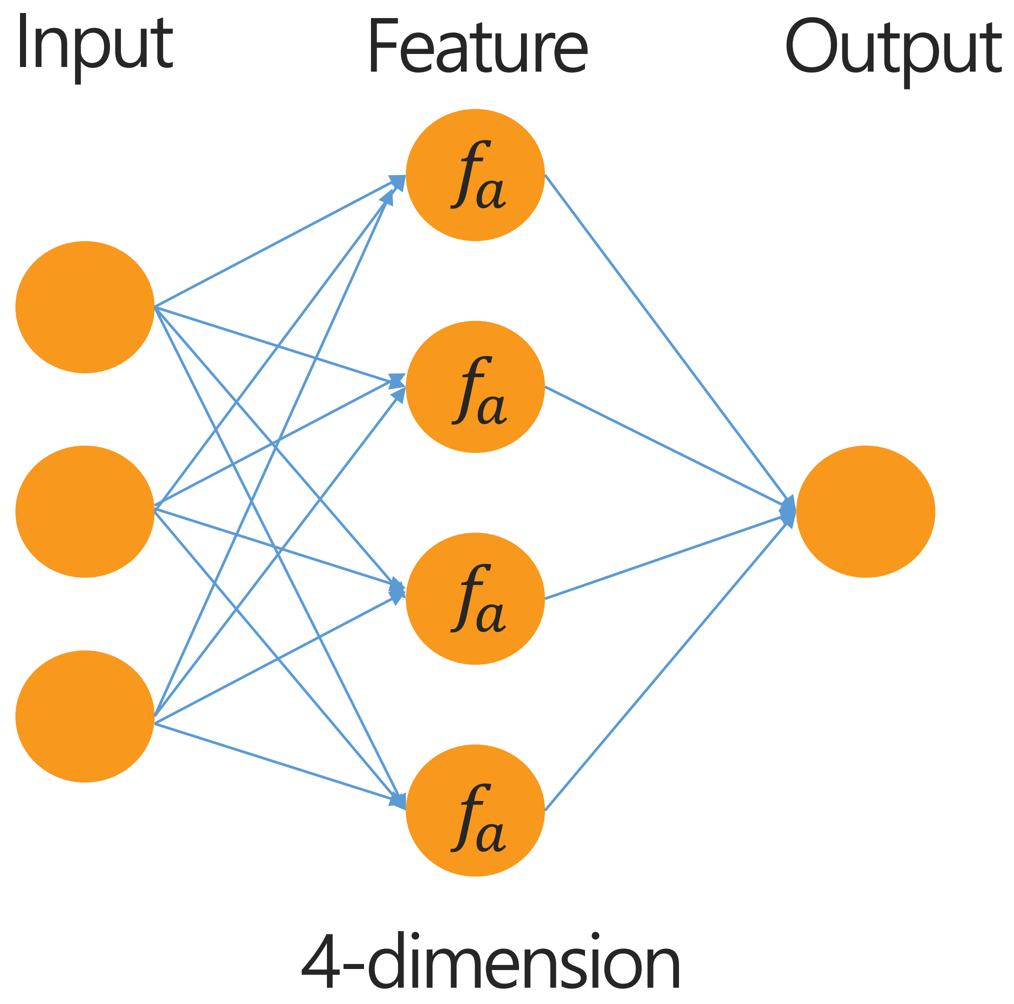
$$\begin{bmatrix} w_1 \\ \vdots \\ w_5 \end{bmatrix} + \begin{bmatrix} w`_1 \\ \vdots \\ w`_5 \end{bmatrix} = \begin{bmatrix} w``_1 \\ \vdots \\ w``_5 \end{bmatrix}$$

$$\begin{bmatrix} f_1^1 & \cdots & f_5^1 \\ f_1^2 & & f_5^2 \end{bmatrix} * \begin{bmatrix} w`_1 \\ \vdots \\ w`_5 \end{bmatrix} + \begin{bmatrix} b`_1 \\ \vdots \\ b`_5 \end{bmatrix} = output$$

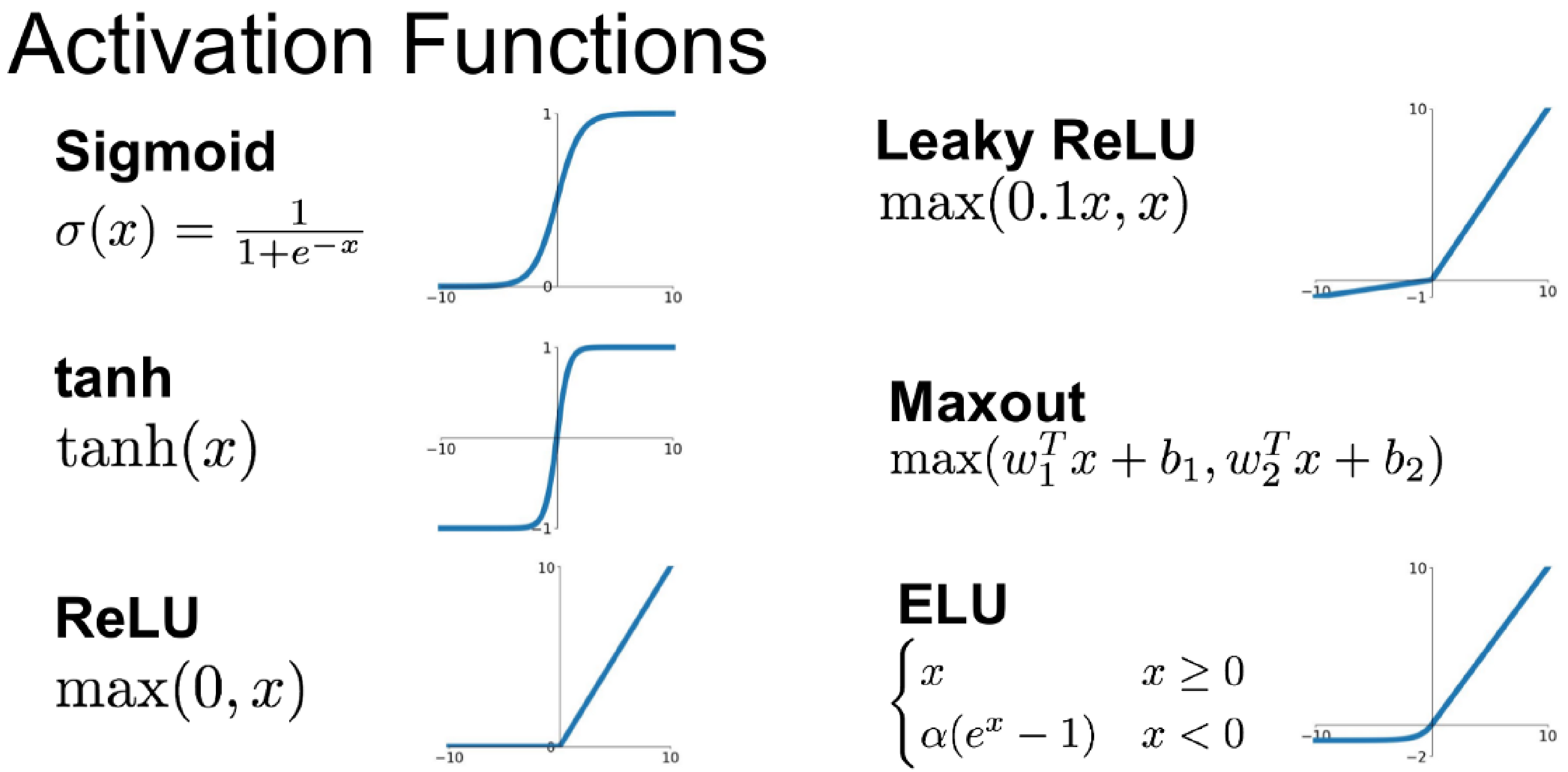
Matrix_Problem



Matrix_Problem



Matrix_Problem



추후에 자세히 다룰 예정

출처(URL) : https://medium.com/@shrutijadon10104776/survey-on-activation-functions-for-deep-learning-9689331ba092

Final Out_Range

	f1	f2	f3	f4	f5	Y
X1	1	3	1	4	2	0
X2	2	4	3	5	6	1.3
X3	1	3	1	2	3	1.2
X4	2	3	2	1	2	2.3
X5	2	4	3	3	1	3.4

Output => Continue

Ex) 0~3.4

Final Out_Range

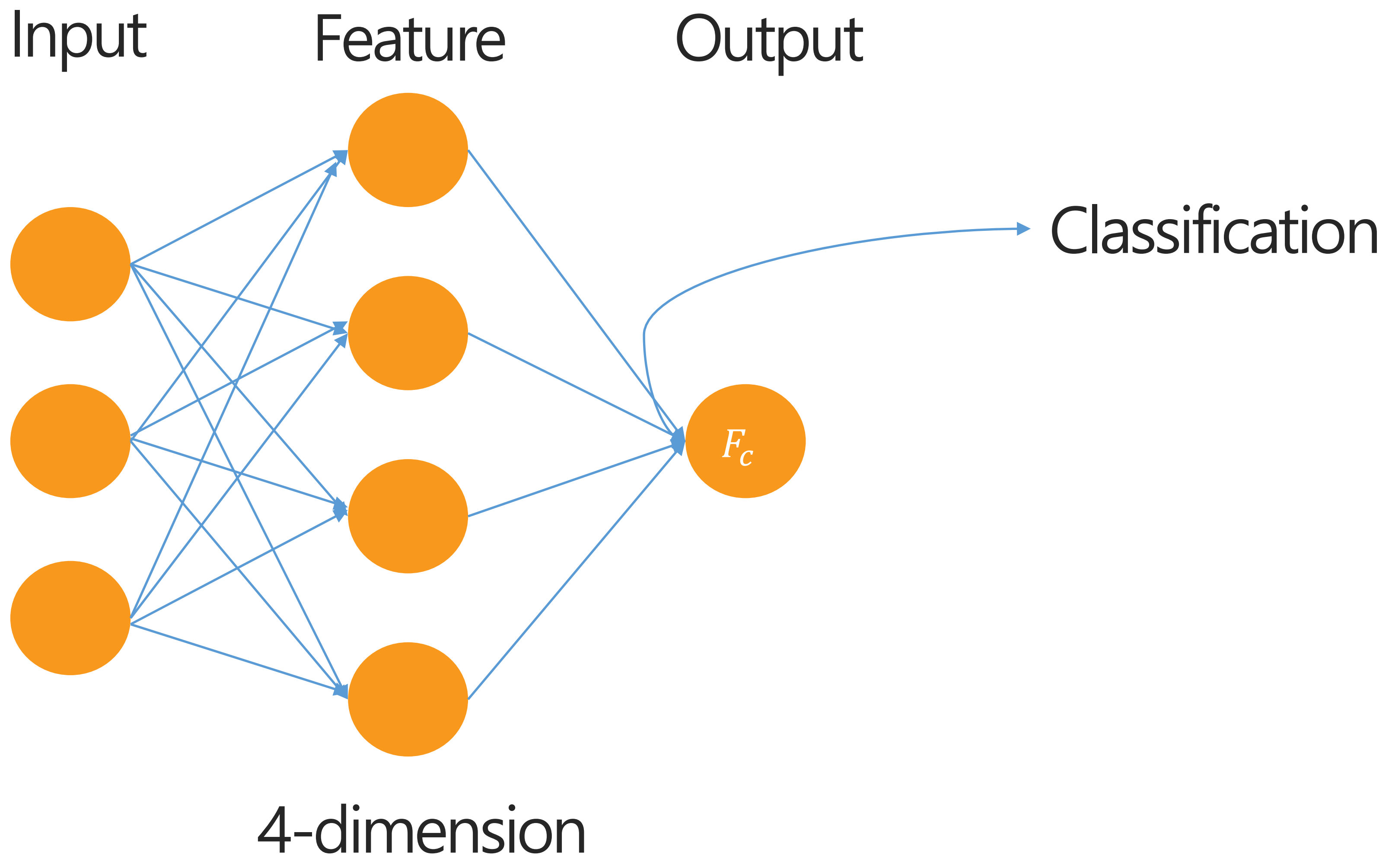
Cat=0

Dog=1

CAT 출처(URL) : https://www.bbc.com/news/uk-england-stoke-staffordshire-52047832

DOG 출처(URL) : https://www.theguardian.com/science/2019/jun/17/how-dogs-capture-your-heart-evolution-puppy-dog-eyes

Binary Classification



Binary Classification

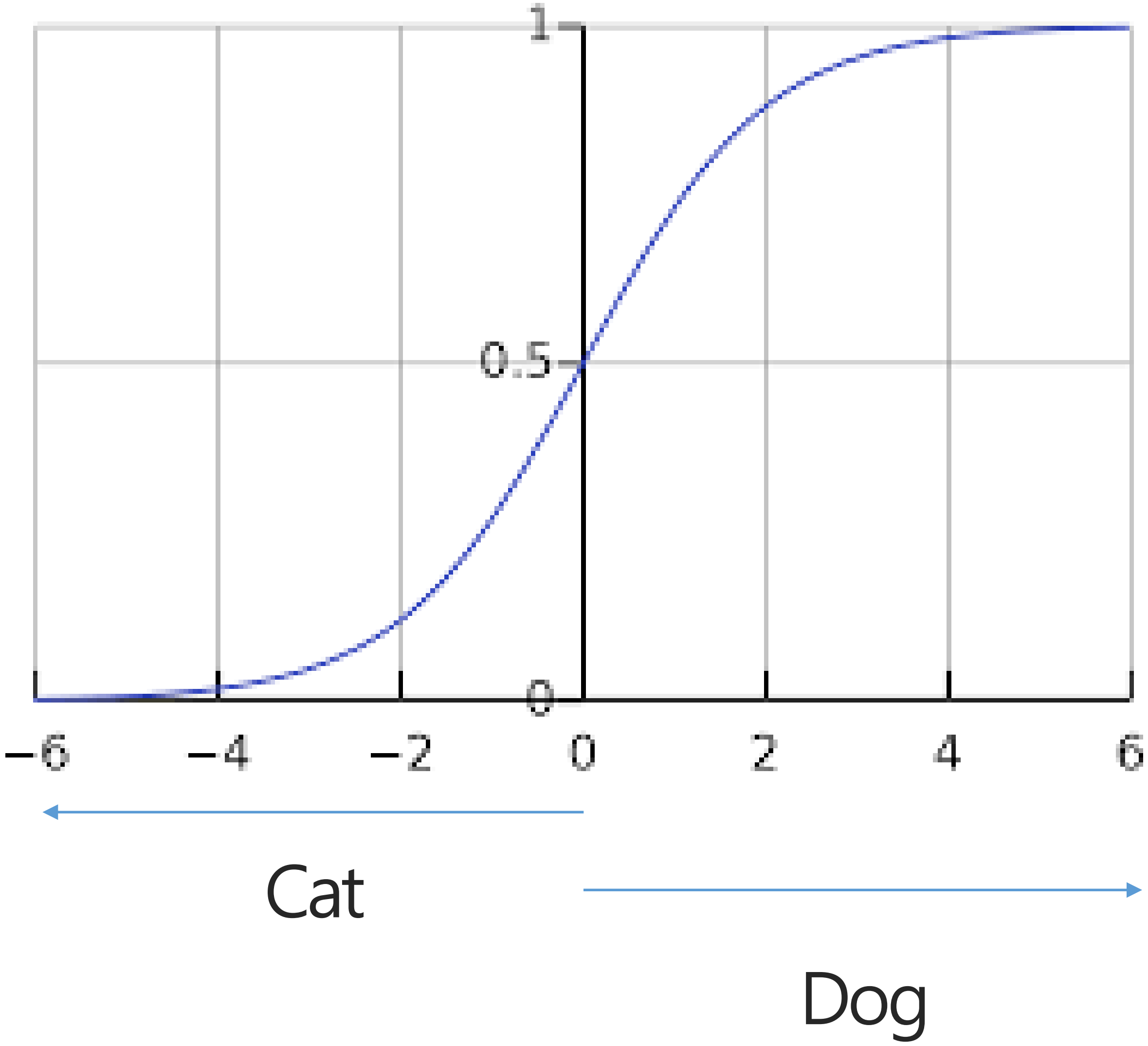


Image 출처(URL) : https://en.wikipedia.org/wiki/Sigmoid_function

How to Make

Binary Classification Cost Function

Cost Function

Cross Entropy

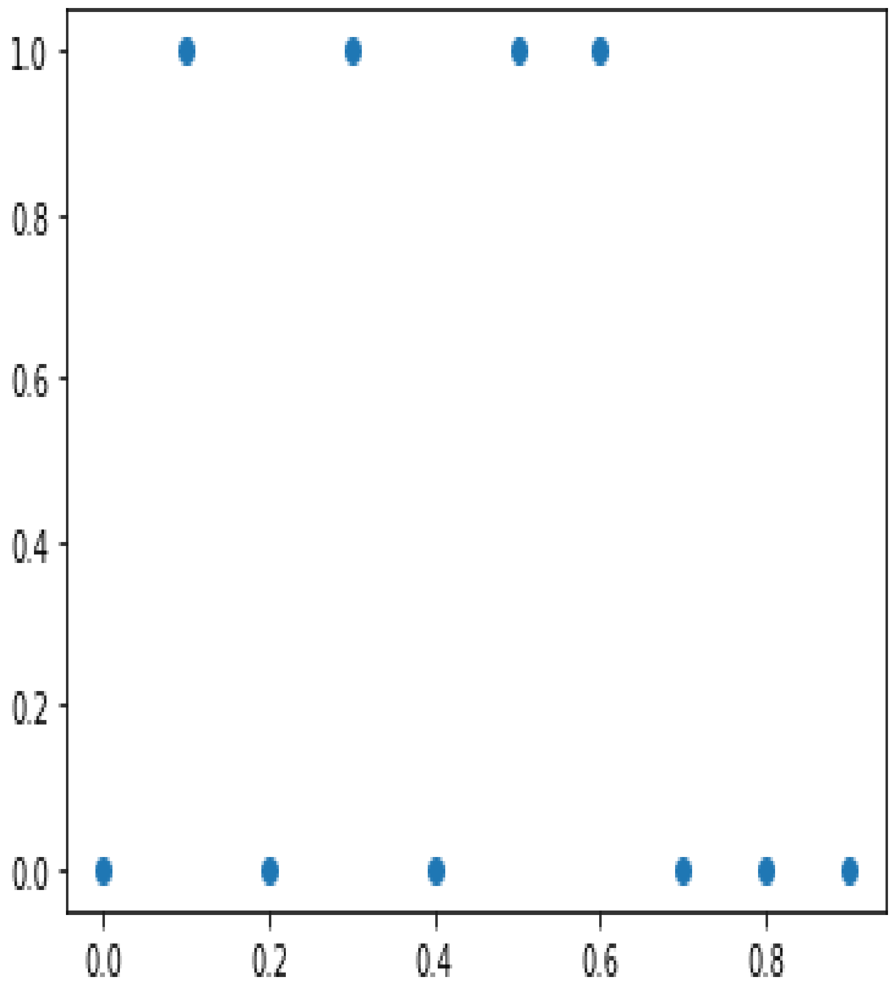
Y => Discrete

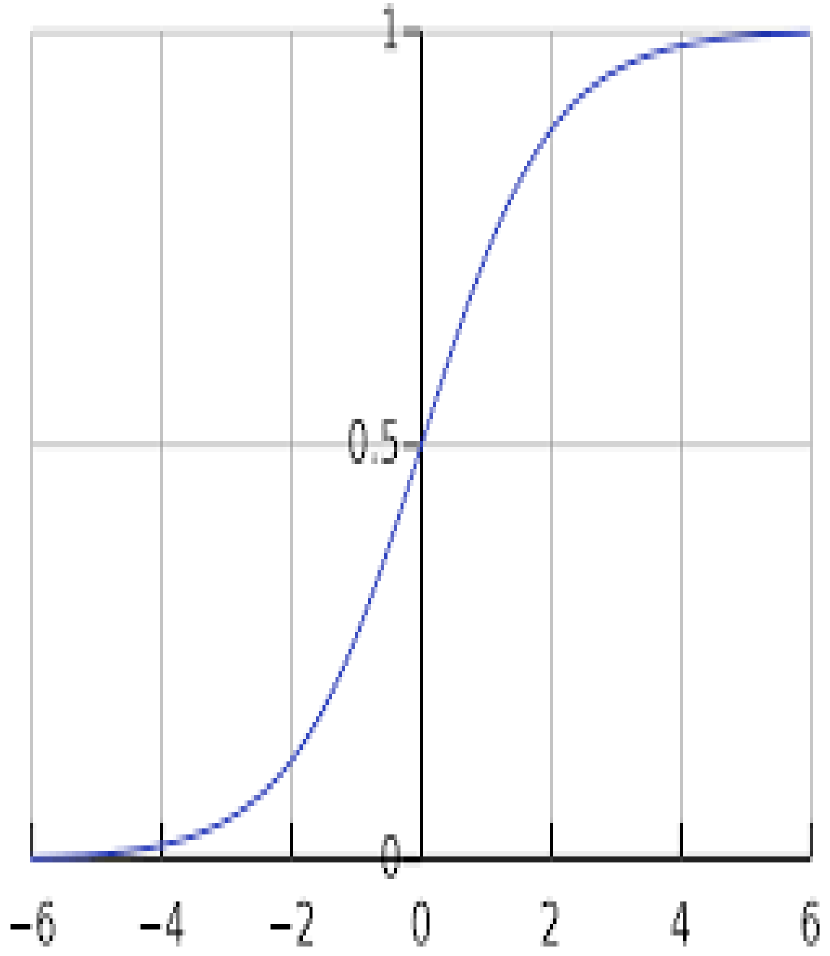
$$H(X) = \frac{1}{1 + e^{uX}}$$

$$cost(W) = \frac{1}{m}\sum_{i=1}^{m}\left(H(X) - y^{i}\right)^{2}$$

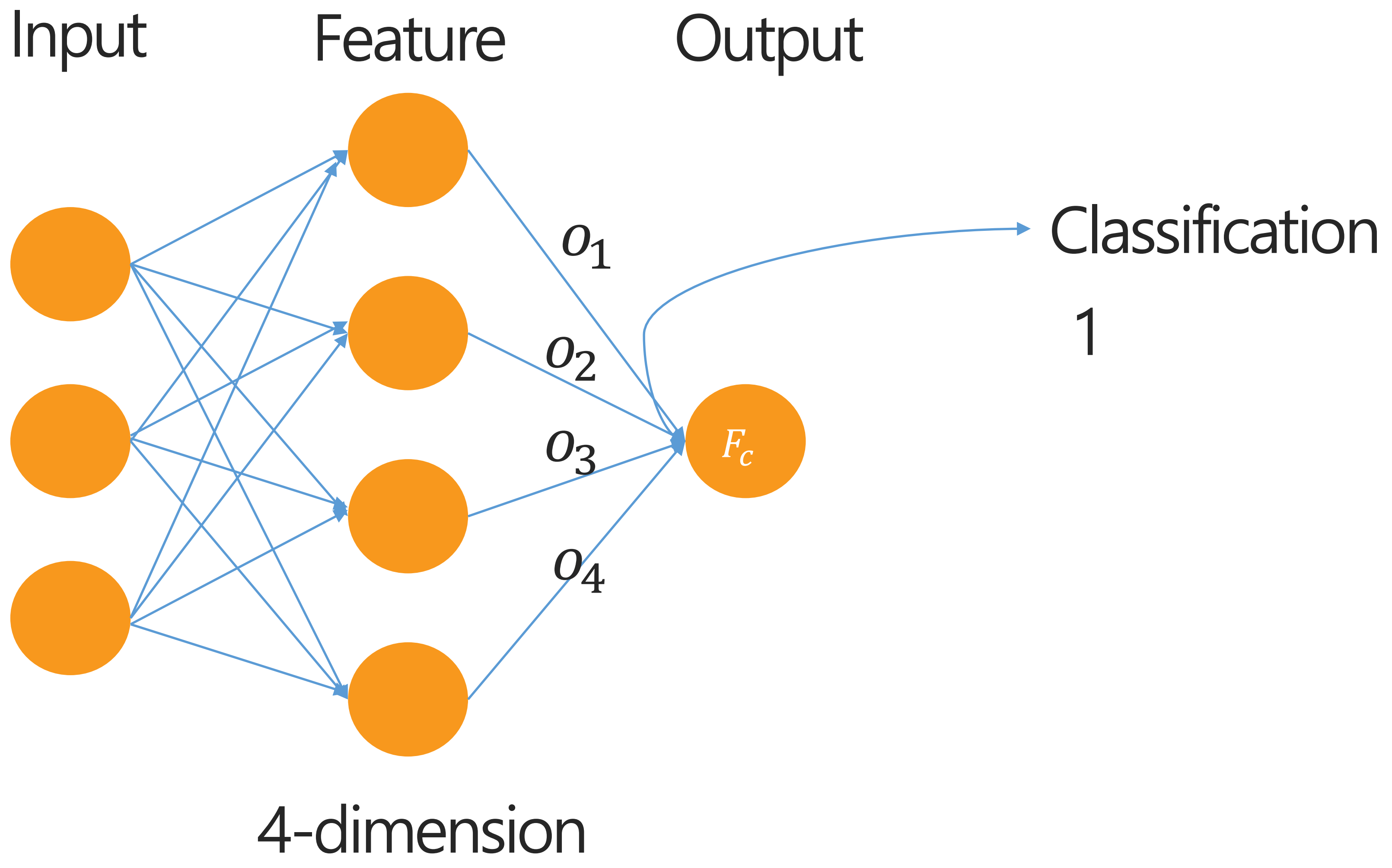
Binary

X	Y
0	0
0.1	1
0.2	0
0.3	1
0.4	0
0.5	1
0.6	1
0.7	0
0.8	0
0.9	0





Binary

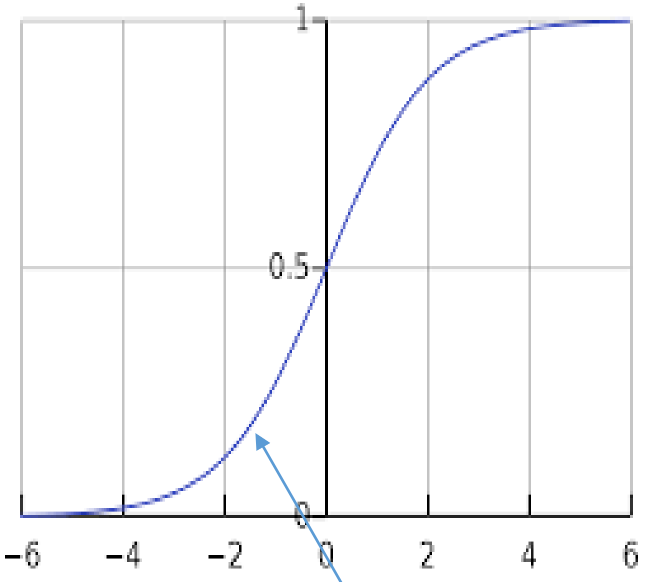


Input
Feature
Output
o_1
o_2
o_3
o_4
F_c
Classification
1
4-dimension

Binary

$$H(o) = \frac{1}{1 + e^{ou}}$$

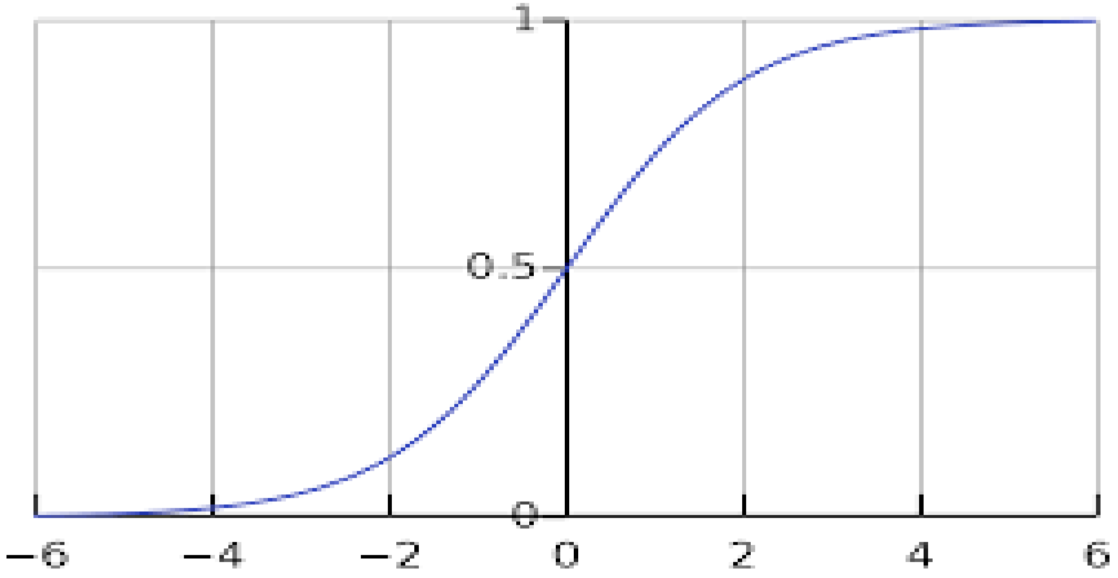
o= $o_1 + o_2 + o_3 + o_4$



W

Binary

MSE, ABS Problem



If) w=> (-2 ~ 0) => y=1   MSE => 0.5로 수렴

w=> (0 ~ 2) => y=0   Local Minimum 빠지기 쉽다.

Cross Entropy

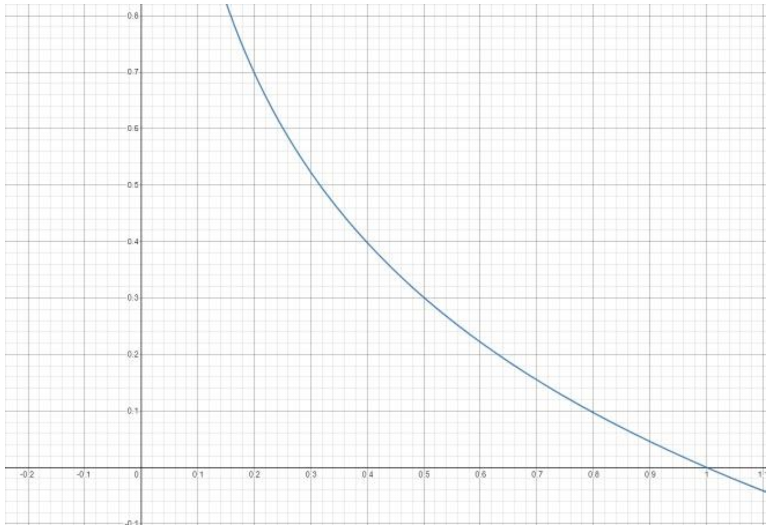
$$H(P,Q) = -\sum P(x)\log(Q(x))$$

$$c(H(x),y) = \begin{cases} -\log\big(H(x)\big) & : y = 1 \\ -\log(1 - H(x)) & : y = 0 \end{cases}$$

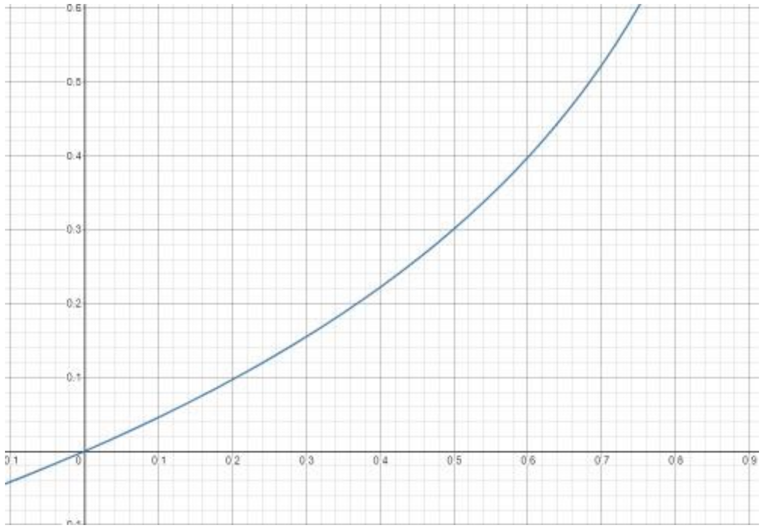
$$c(H(x),y) = -ylog\big(H(x)\big) - (1-y)\log(1-H(x))$$

Cost Function

$$c(H(x),y) = \begin{cases} -\log\left(H(x)\right) & : y = 1 \\ -\log(1 - H(x)) & : y = 0 \end{cases}$$



-log(x)

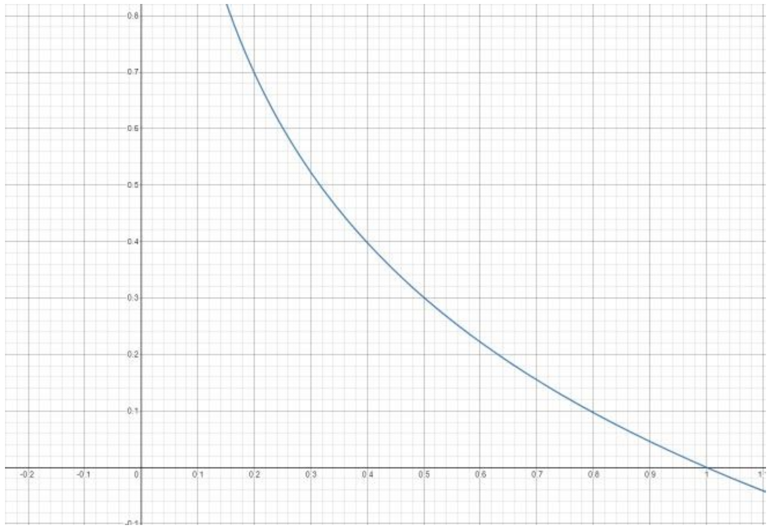


-log(1-x)

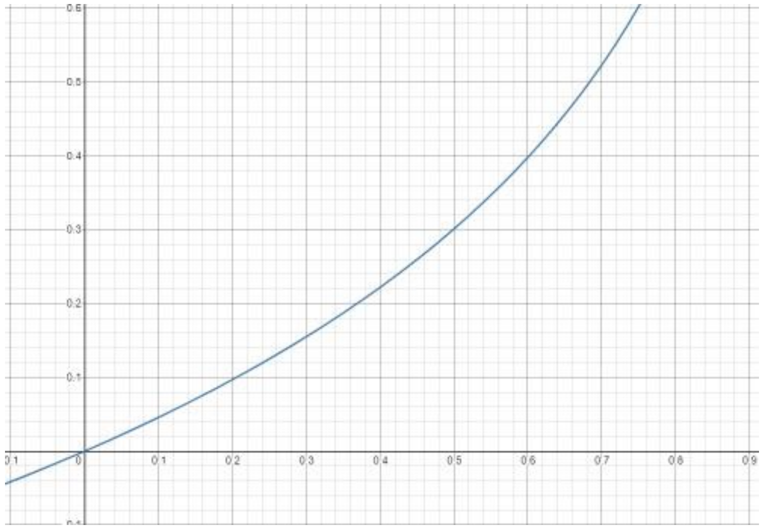
Cost Function

$$H(o) = \frac{1}{1+e^{ou}}$$

o= $o_1 + o_2 + o_3 + o_4$



-log(x)



-log(1-x)

Cost Function

$$H(o) = \frac{1}{1+e^{ou}}$$

o= $o_1 + o_2 + o_3 + o_4$

$o_1 = 0.1, o_2 = 0.2, o_3 = 2.5, o_4 = -2$

o= $0.7, predict\ y \Rightarrow 1$ But y=> 0

$o_1 \Rightarrow 0.02, o_2 \Rightarrow 0.1, o_3 \Rightarrow 1.5, o_4 \Rightarrow -2.3$

o= $-2.3 + 1.62$

$o_1 \Rightarrow 0.2, o_2 \Rightarrow 0.4, o_3 \Rightarrow -0.5, o_4 \Rightarrow -0.3$

o= $-0.2, predict\ y \Rightarrow 0$ But y=> 1

각, o_i 의 역할 들이 점점 생긴다.

Next

Multinomial Classification

감사합니다

THANK YOU