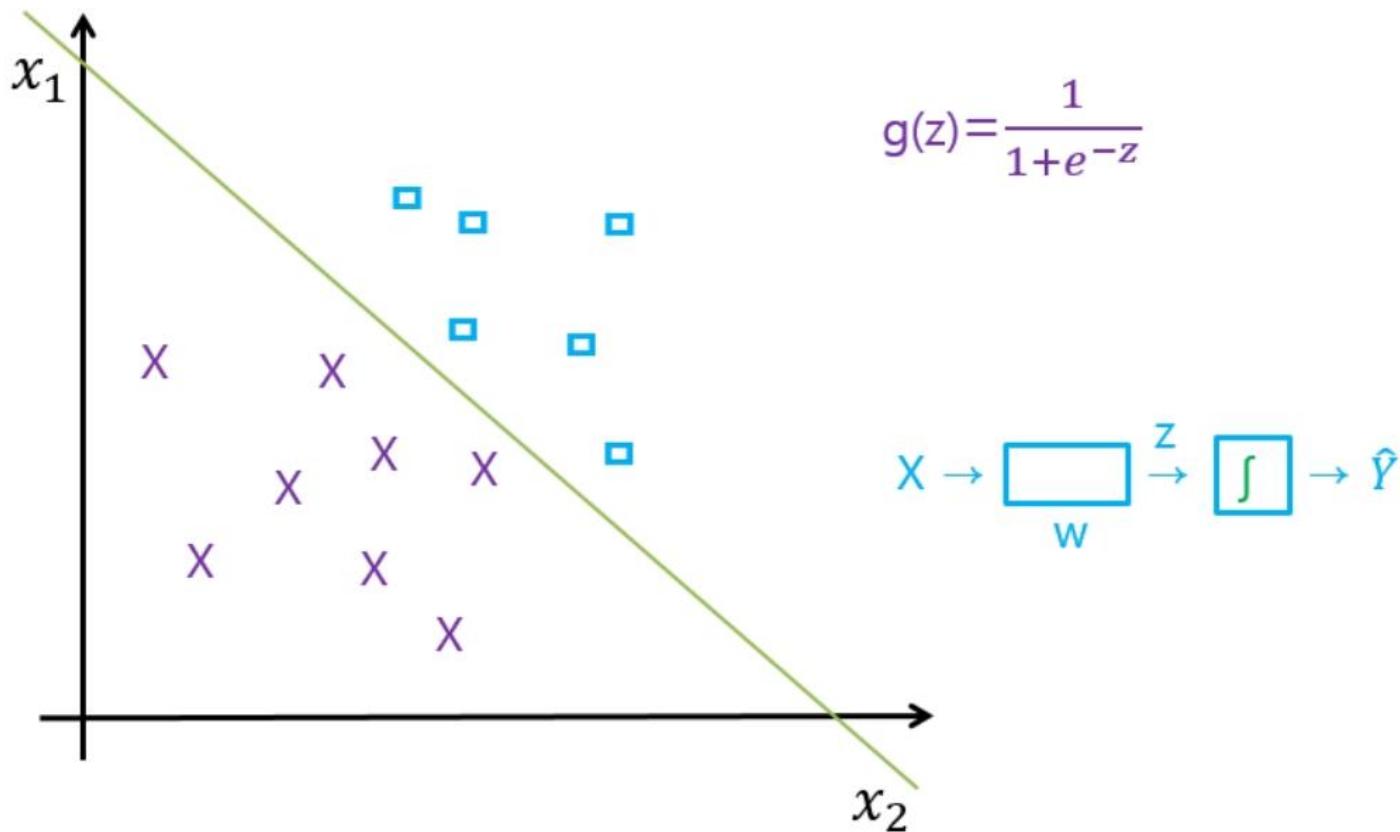


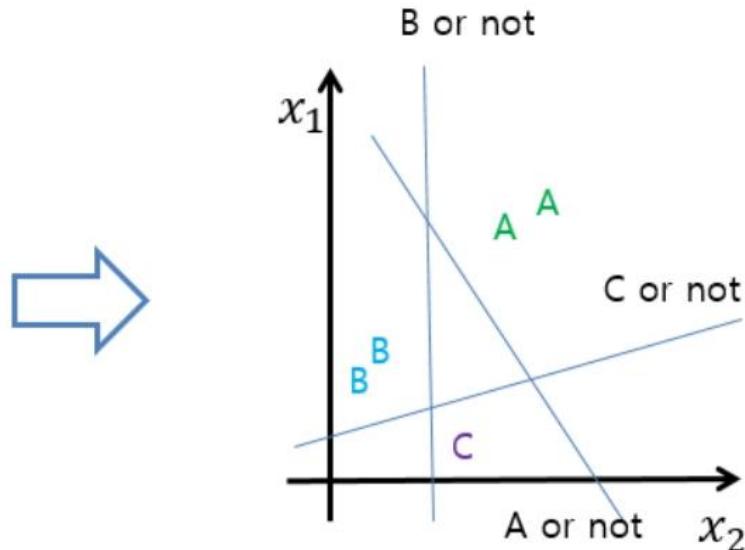
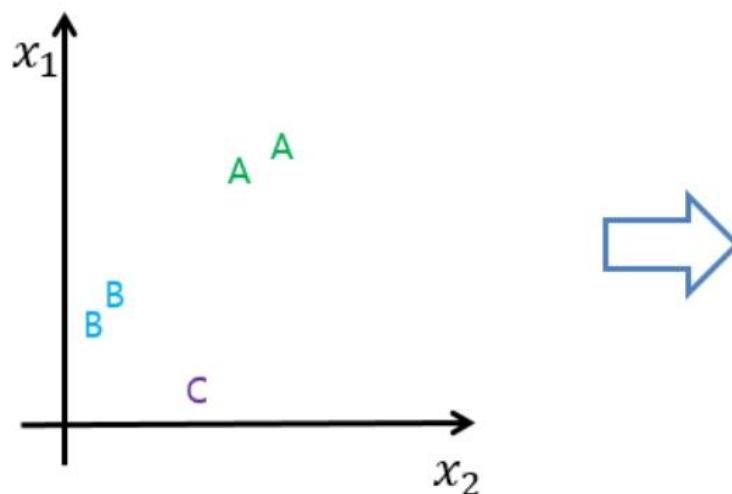
softmax

LOGISTIC REGRESSION

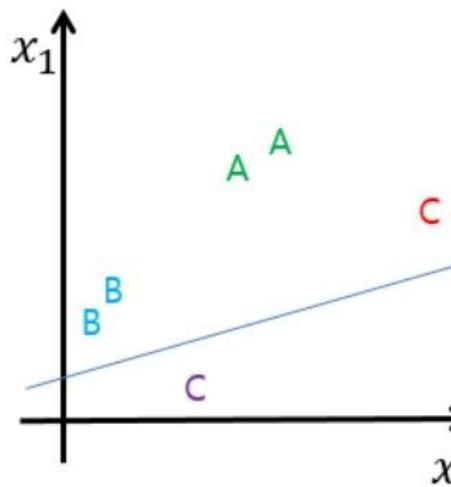


MULTINOMIAL CLASSIFICATION

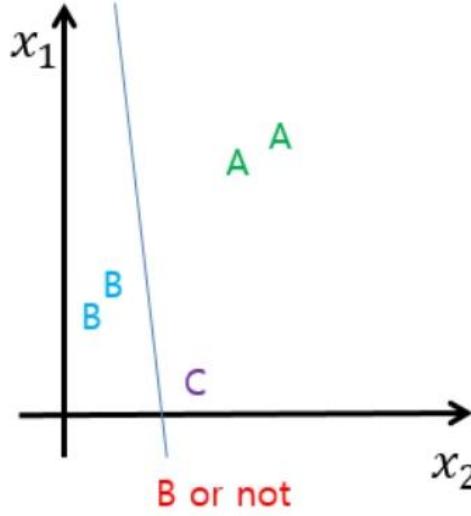
x_1 (hours)	x_2 (attendance)	y (grade)
10	5	A
9	5	A
3	2	B
2	4	B
11	1	C



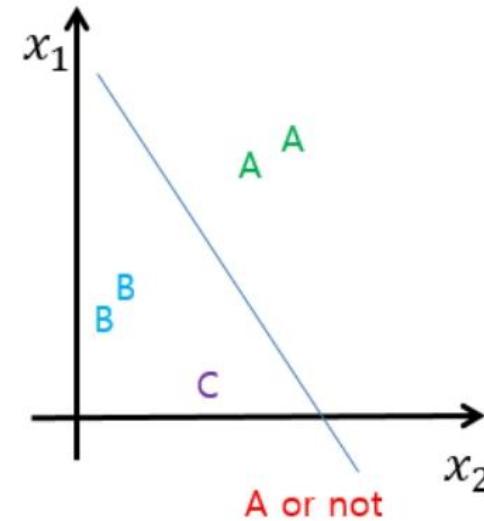
MULTINOMIAL CLASSIFICATION



$X \rightarrow \boxed{\quad} \rightarrow \hat{Y}$
A



$X \rightarrow \boxed{\quad} \rightarrow \hat{Y}$
B



$X \rightarrow \boxed{\quad} \rightarrow \hat{Y}$
C

X1	X2
----	----

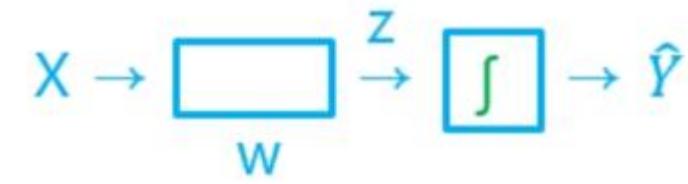
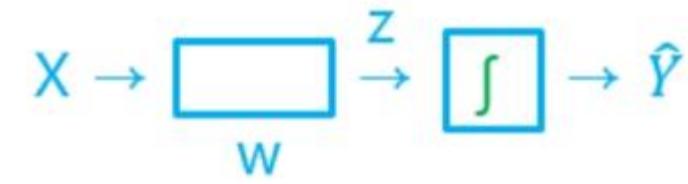
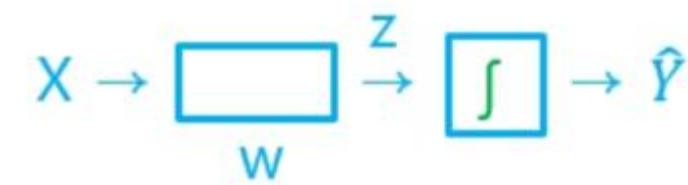
Wa1
Wa2

X1	X2
----	----

Wb1
Wb2

X1	X2
----	----

Wc1
Wc2



X1	X2
----	----

wa1	wb1	wc1
wa2	wb2	wc2

=

$$\begin{aligned}
 & X1 * Wa1 + X2 * Wa2 \\
 & X1 * Wb1 + X2 * Wb2 \\
 & X1 * Wc1 + X2 * Wc2
 \end{aligned}$$

$$X \rightarrow \boxed{} \xrightarrow[W]{z} \boxed{\int} \rightarrow \hat{Y}$$

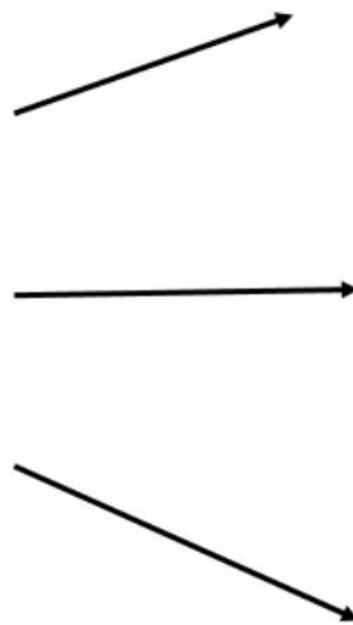
$$X \rightarrow \boxed{} \xrightarrow[W]{z} \boxed{\int} \rightarrow \hat{Y}$$

$$X \rightarrow \boxed{} \xrightarrow[W]{z} \boxed{\int} \rightarrow \hat{Y}$$

SIGMOID?

LOGISTIC
CLASSIFIER

$$WX = Y \begin{bmatrix} 2.0 \\ 1.0 \\ 0.1 \end{bmatrix}$$



$$p = 0.7$$



$$p = 0.2$$



$$p = 0.1$$



SOFTMAX

$$Y \begin{bmatrix} 2.0 \\ 1.0 \\ 0.1 \end{bmatrix} \rightarrow \begin{array}{l} 0.7 \\ 0.2 \\ 0.1 \end{array}$$
$$S(y_i) = \frac{e^{y_i}}{\sum_j e^{y_j}}$$

SCORES → PROBABILITIES

SOFTMAX

```
hypothesis = tf.nn.softmax(tf.matmul(X,W)+b)
```

$$\text{tf.matmul}(X,W) + b \quad \left[\begin{array}{c} 2.0 \\ 1.0 \\ 0.1 \end{array} \right] \xrightarrow{\text{S}(y_i) = \frac{e^{y_i}}{\sum_j e^{y_i}}} \begin{array}{c} 0.7 \\ 0.2 \\ 0.1 \end{array}$$

SCORES ————— PROBABILITIES