LECTURE 6-1

SOFTMAX CLASSIFICATION : MULTINOMIAL CLASSIFICATION

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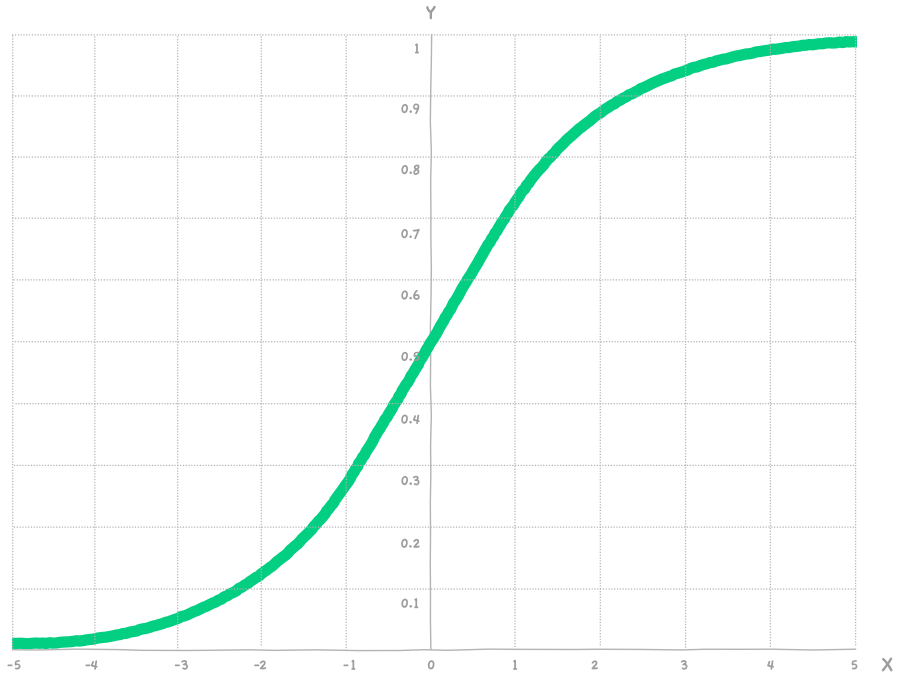
http://hunkim.github.io/ml

Logistic Regression

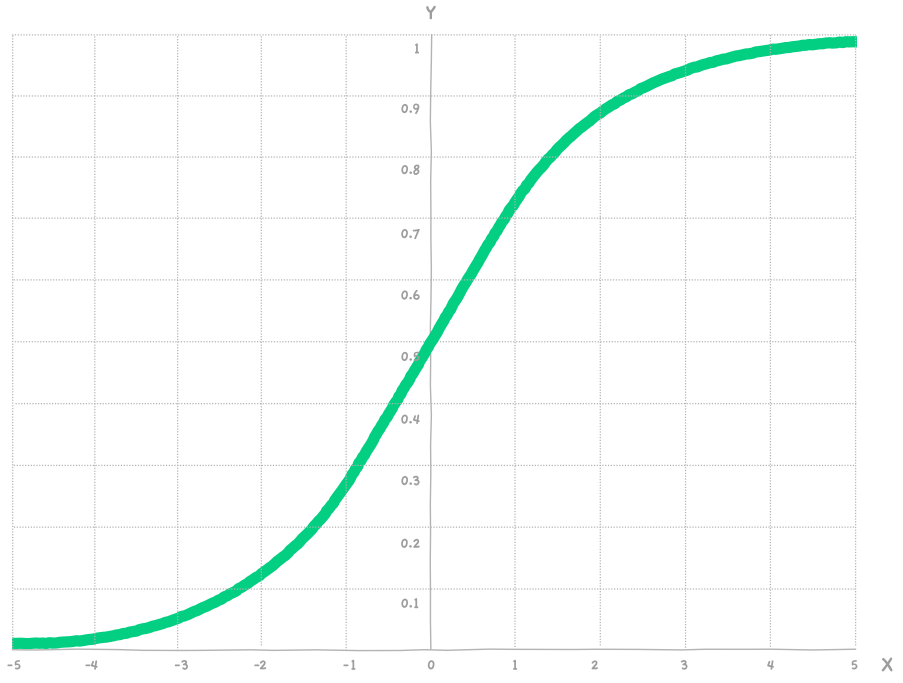
$H_L(x) = WX$

$z = H_L(x),\ g(z)$



Logistic Regression

$H_L(x) = WX$	$z = H_L(x),\ g(z)$
$g(z) = \frac{1}{1+e^{-z}}$	$H_R(x) = g(H_L(x))$



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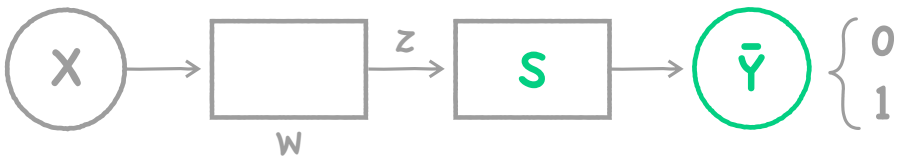
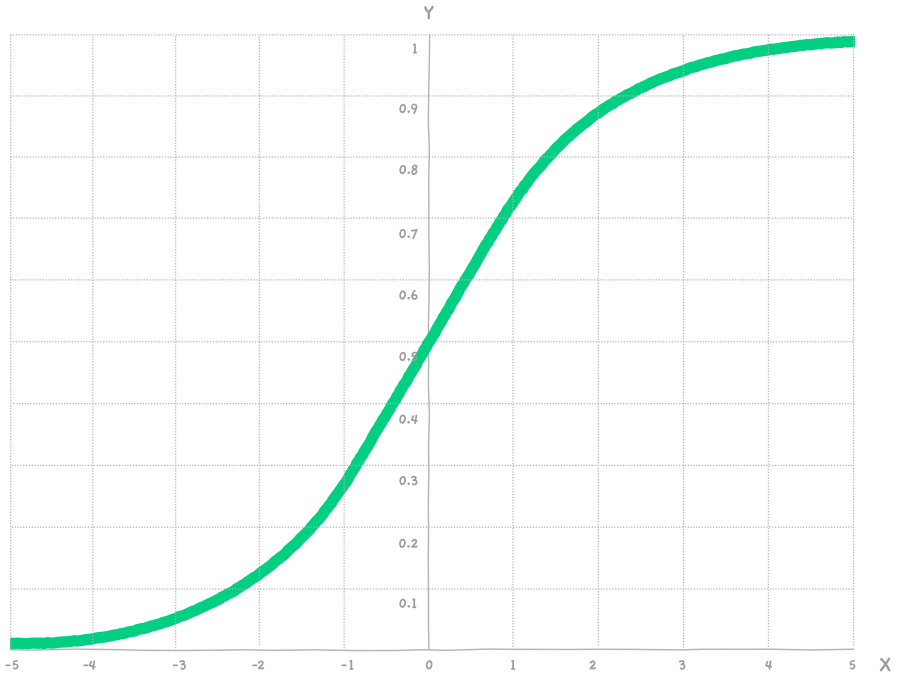
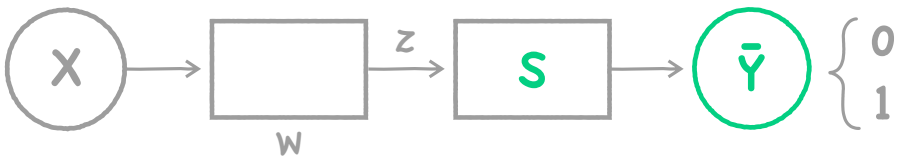




Logistic Regression

$$g(z) = \frac{1}{1+e^{-z}}$$

$$H_R(x) = g(H_L(x))$$



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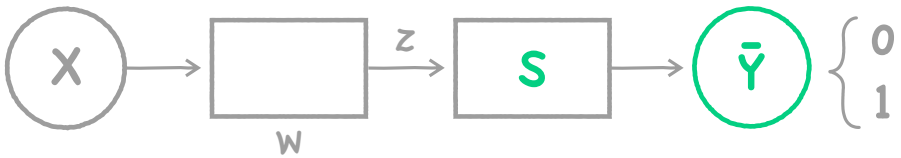
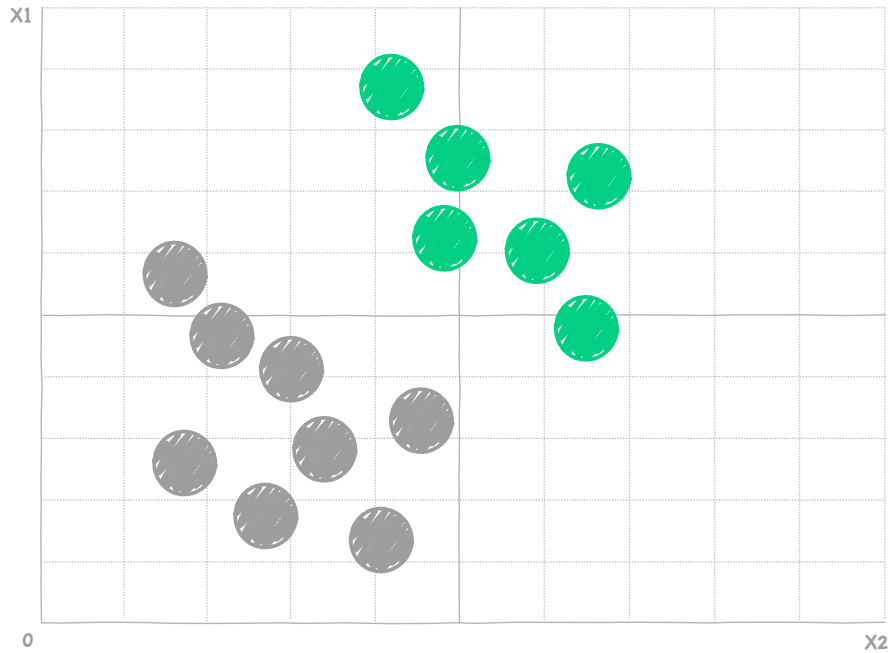
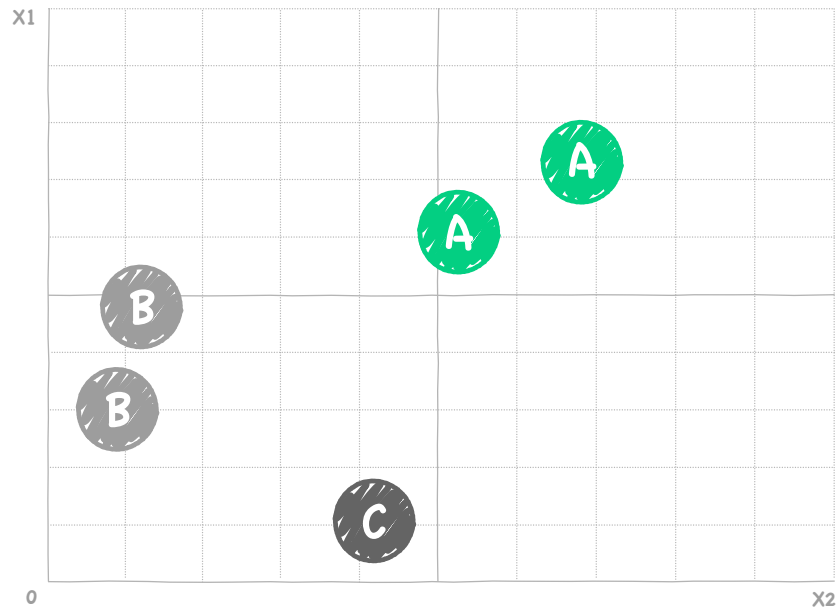


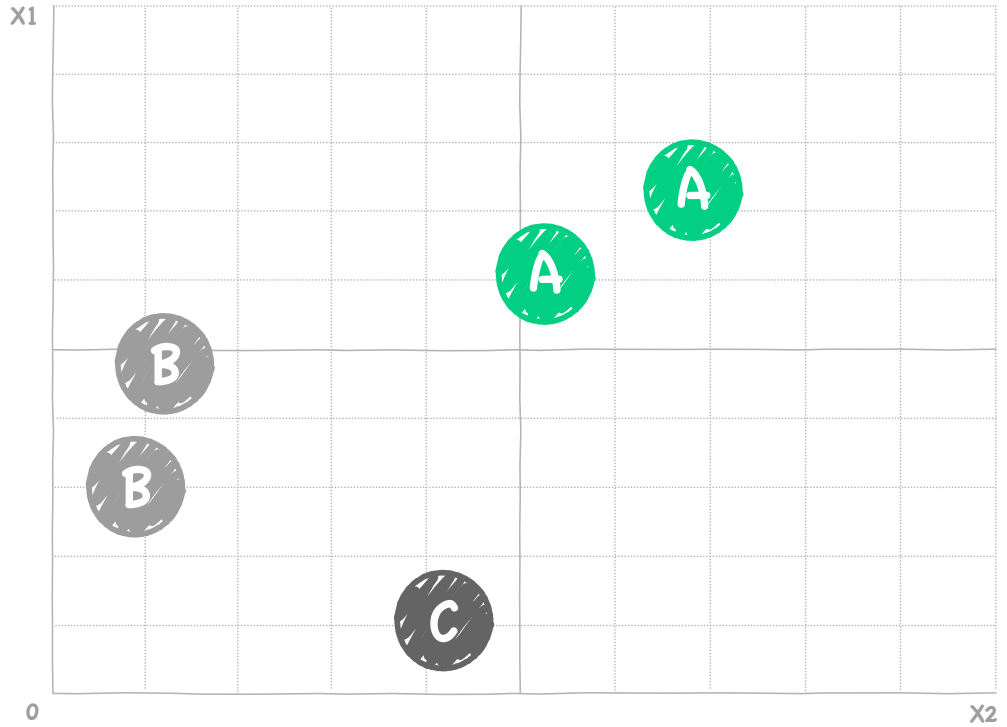


Multinomial Classification

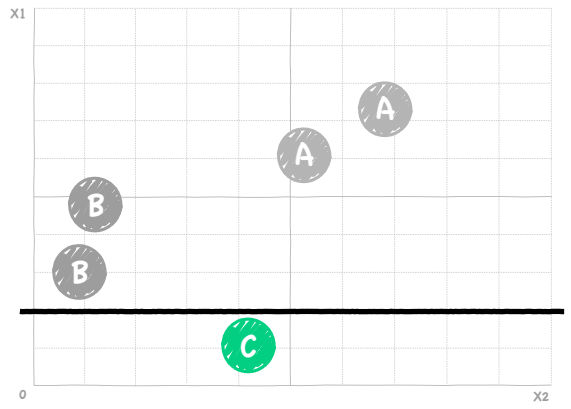
X1(hours)	X2(attendance)	X3(grade)
10	5	A
9	5	A
3	2	B
2	4	B
11	1	C



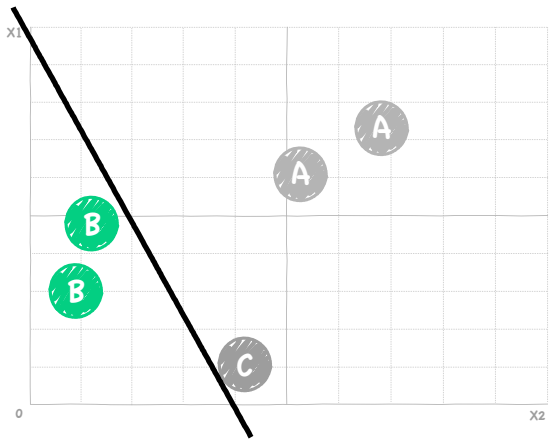
Multinomial Classification



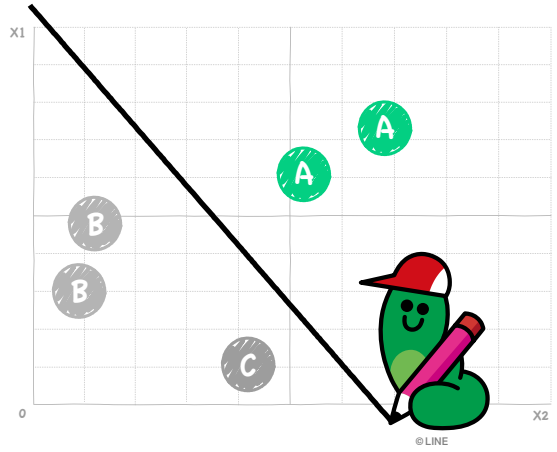
Multinomial Classification



H: C or Not

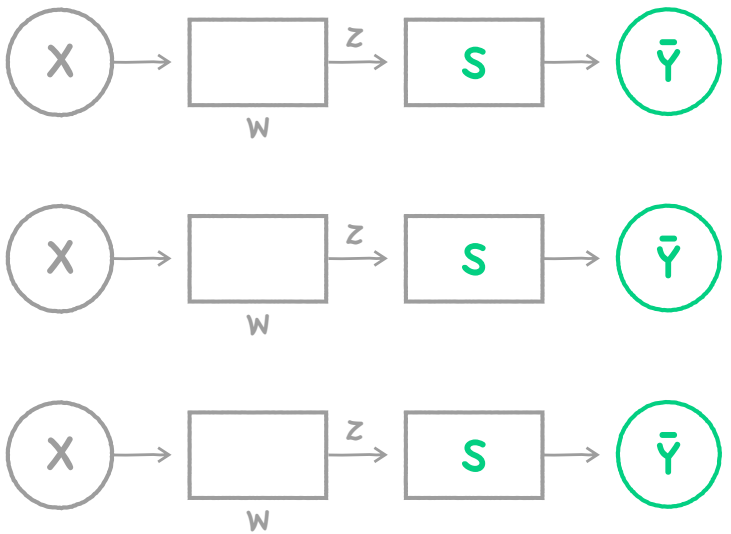


H: B or Not



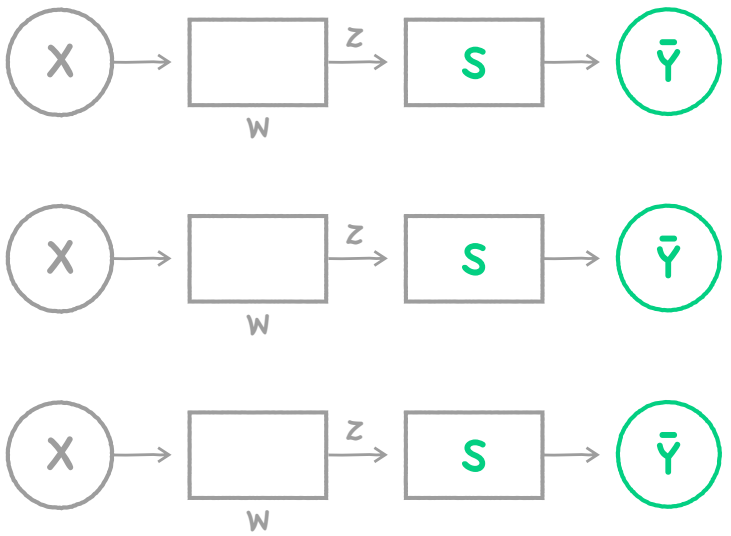
H: A or Not

Multinomial Classification



Multinomial Classification

$$\begin{bmatrix} w_1 & w_2 & w_3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} w_1x_1 + w_2x_2 + w_3x_3 \end{bmatrix}$$



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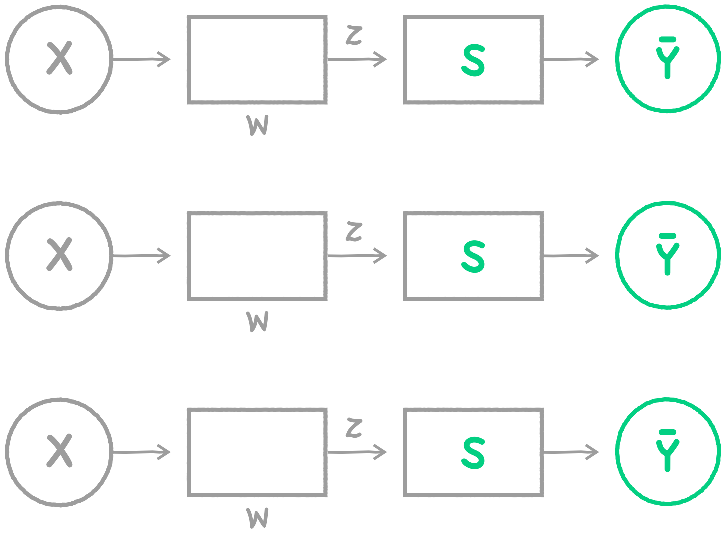
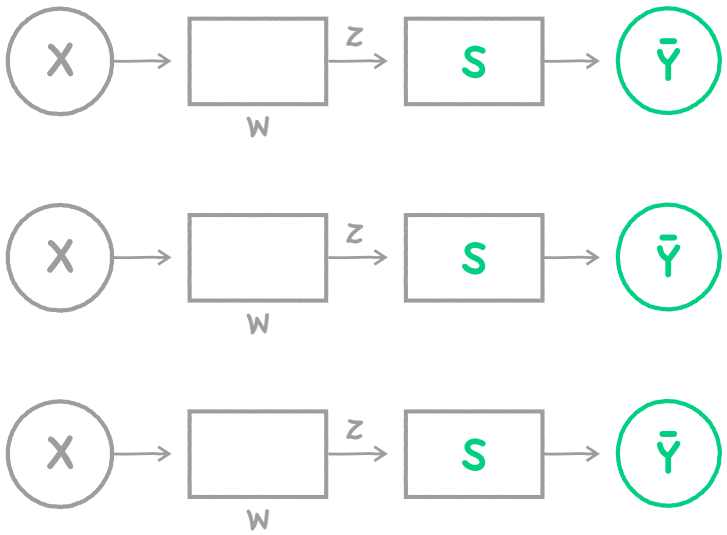


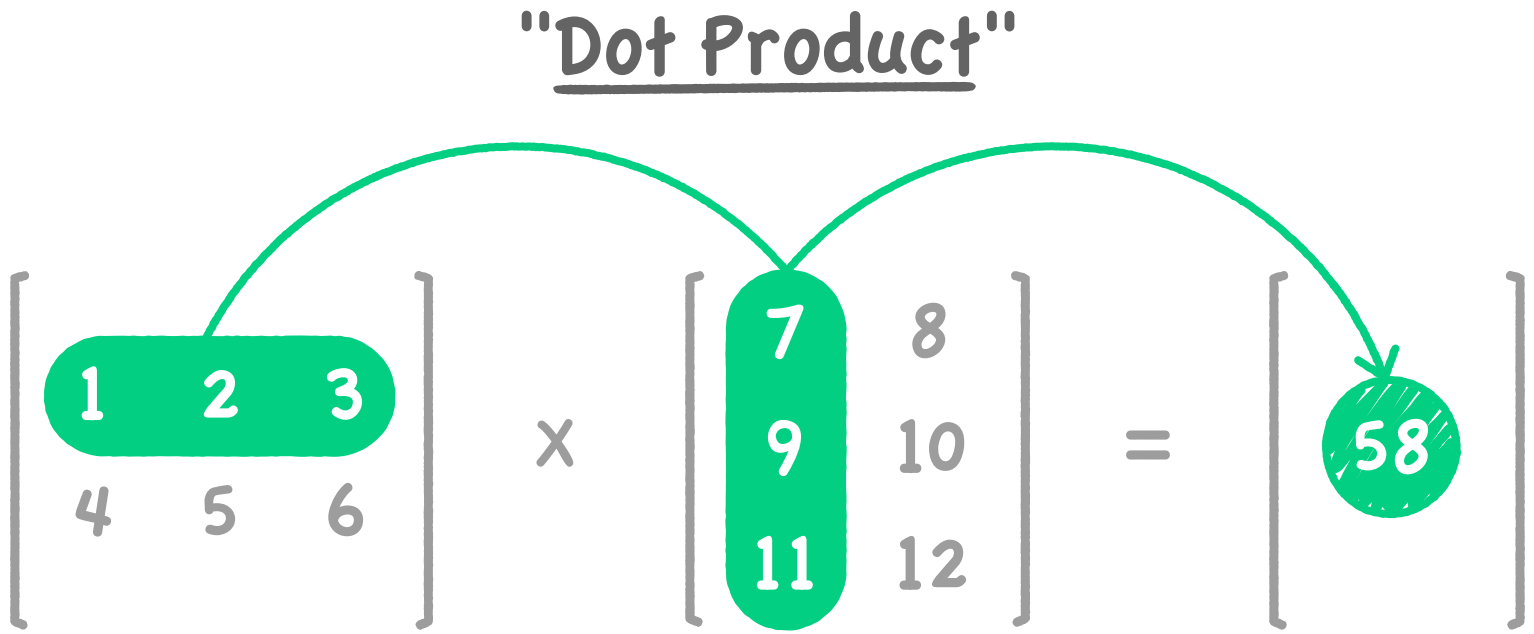
Multinomial Classification

$$\begin{bmatrix} w_1 & w_2 & w_3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} w_1x_1 + w_2x_2 + w_3x_3 \end{bmatrix}$$

$$\begin{bmatrix} w_{A1} & w_{A2} & w_{A3} \\ w_{B1} & w_{B2} & w_{B3} \\ w_{C1} & w_{C2} & w_{C3} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} =$$



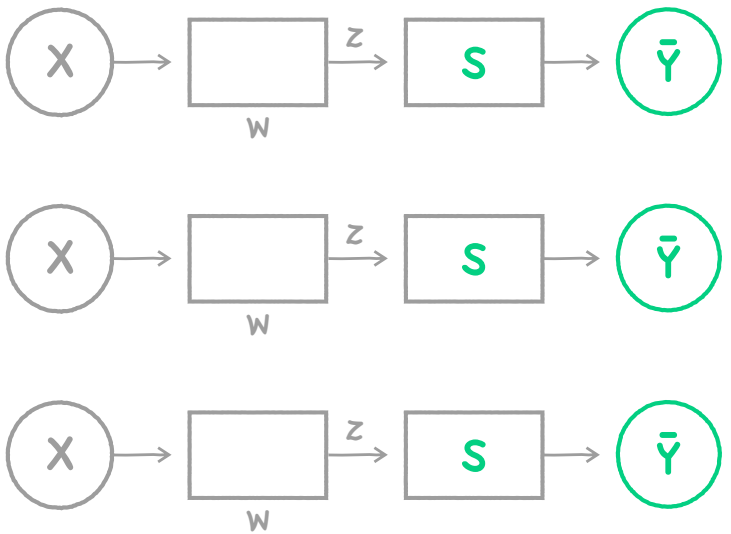
Matrix Multiplication



https://www.mathsisfun.com/algebra/matrix-multiplying.html

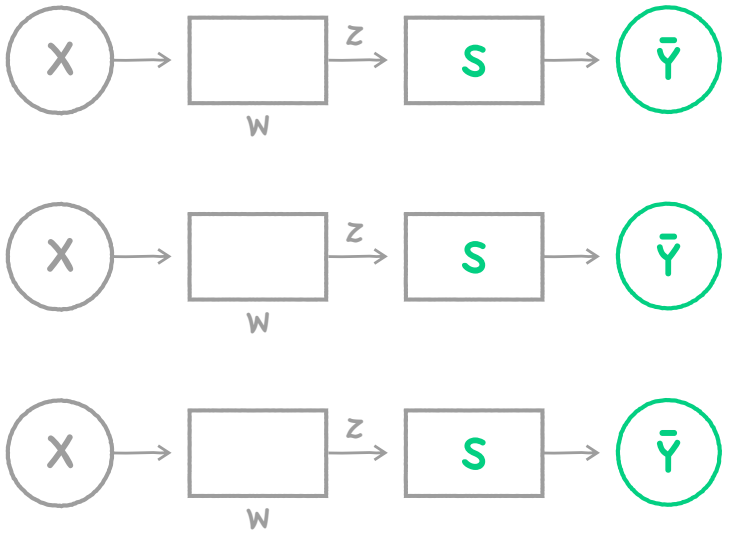
Multinomial Classification

$$\begin{bmatrix} w_{A1} & w_{A2} & w_{A3} \\ w_{B1} & w_{B2} & w_{B3} \\ w_{C1} & w_{C2} & w_{C3} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} w_{A1}x_1 + w_{A2}x_2 + w_{A3}x_3 \\ w_{B1}x_1 + w_{B2}x_2 + w_{B3}x_3 \\ w_{C1}x_1 + w_{C2}x_2 + w_{C3}x_3 \end{bmatrix}$$



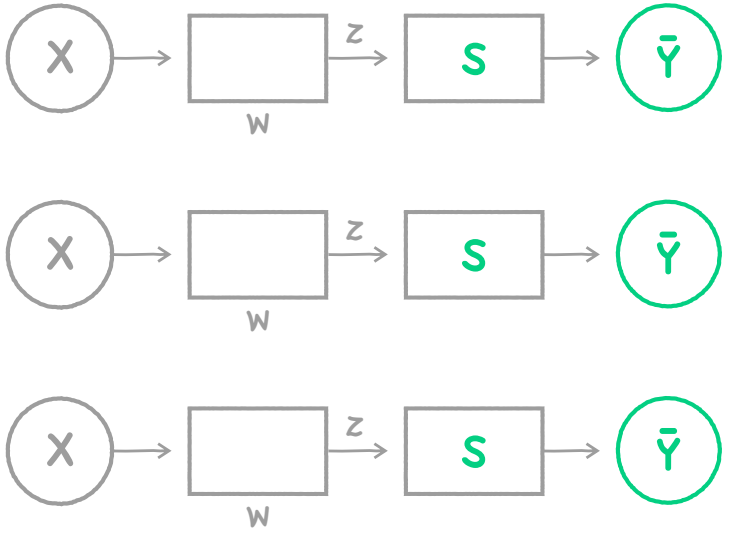
Multinomial Classification

$$\begin{bmatrix} W_{A1} & W_{A2} & W_{A3} \\ W_{B1} & W_{B2} & W_{B3} \\ W_{C1} & W_{C2} & W_{C3} \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} W_{A1}X_1 + W_{A2}X_2 + W_{A3}X_3 \\ W_{B1}X_1 + W_{B2}X_2 + W_{B3}X_3 \\ W_{C1}X_1 + W_{C2}X_2 + W_{C3}X_3 \end{bmatrix} = \begin{bmatrix} \bar{Y}_A \\ \bar{Y}_B \\ \bar{Y}_C \end{bmatrix}$$



Where Is Sigmoid?

$$\begin{bmatrix} w_{A1} & w_{A2} & w_{A3} \\ w_{B1} & w_{B2} & w_{B3} \\ w_{C1} & w_{C2} & w_{C3} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} w_{A1}x_1 + w_{A2}x_2 + w_{A3}x_3 \\ w_{B1}x_1 + w_{B2}x_2 + w_{B3}x_3 \\ w_{C1}x_1 + w_{C2}x_2 + w_{C3}x_3 \end{bmatrix} = \begin{bmatrix} \bar{y}_A \\ \bar{y}_B \\ \bar{y}_C \end{bmatrix}$$



NEXT LECTURE

SOFTMAX CLASSIFICATION : SOFTMAX & COST FUNCTION