MATRICES

A matrix is a rectangular array of numbers, symbols or expressions arranged in rows and columns. (A matrix is a group of vectors).

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & & & \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

⇒ has a_{ij} where i denots the row and j denots the columns

Example of matrices in data sciences

m × n → columns
↳ rows

1) Data representation

Dataset

	Math Score	Physic score	Biology score
1)	55	65	75
2)	65	60	55
3)	70	45	80

$$\begin{bmatrix} 55 & 65 & 75 \\ 65 & 60 & 55 \\ 70 & 45 & 80 \end{bmatrix}$$

F_1, F_2, F_3 — 3×3

2) Images in computer vision

3 x 3 grayscale image

0 (black) ⟷ 255 (white)

IMAGE =

0	128	255
255	128	0
128	255	128

$$\Rightarrow \begin{bmatrix} 0 & 128 & 255 \\ 255 & 128 & 0 \\ 128 & 255 & 128 \end{bmatrix}$$

3×3

3) Confusion Matrix: Accuracy of the model

f1, f2 → Model → O/p → $\hat{y}$ ⇒ predicted output
→ y → actual output

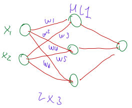
Confusion matrix = $\begin{bmatrix} 50 & 10 \\ 5 & 35 \end{bmatrix}$ 2×2 ⇒

50 → True positive
10 → false positive
5 → false positive
35 → True negative

$$\frac{T_P + T_N}{T_P + F_N + F_P + T_N} = \text{Accuracy}$$

True positive (50) : Positive case the model predicted correctly
False Positive (10): Model said "positive" but it was actually negative
False Negatives (5): Model said "negative" but it was actually positive
True negatives (35): Negaative cases it predited correctly
Accuracy = 50 + 35 / (50 + 10 + 5 + 35)

4. Neural Network: Matrix operation [Linear regresion]



forward propagation

$$L = W^T x + b$$

X_1 X_2

matrix multiplication

$$W = \begin{bmatrix} w_1 & w_2 & w_3 \\ w_4 & w_5 & w_6 \end{bmatrix}$$

$$X = [x_1 \quad x_2]$$

+

$$b = [b_1, b_2, b_3]$$

independent feactures

Nº Of Study Hours	IQ	Score (O/P) feacture
4	100	90
5	90	85
-	-	-

dependent feacture

Regresion $y = mx + c$ → $y = m_1 x_1 + m_2 x_2 + c$
↳ slope ↳ slope of coeficient
↳ $m^T x + c$
$\{ m = [m_1, m_2],\ x = [x_1, x_2] \}$

5 NLP

Dataset:	Review	Positive/Negative
	The food is bad	0
	The food is good	1

$$\begin{bmatrix} [0.1 & 0.2 & 0.3] \\ [0.4 & 0.5 & 0.6] \end{bmatrix} \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$