

$$x - 2 = 3$$

$$x = 5.$$

2D

Simultaneous Eqn.

Systems of Eqns

$$2x_1 - x_2 = 5$$

$$x_1 - 2x_2 = 4$$

$$2x_1 - x_2 = 5$$

$$-2x_1 + 4x_2 = -8$$

0

$$\frac{3x_2}{3} = \frac{-3}{3}$$

$$x_2 = -1$$

$$x_1 = 2$$

$$x_2 = -1$$

$$x_1 - 2(-1) = 4$$

$$x_1 = 2$$

$$\begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$$

$$\cancel{A} \bar{x} = \bar{y}$$

~~A~~

$$= \frac{\bar{y}}{A}$$

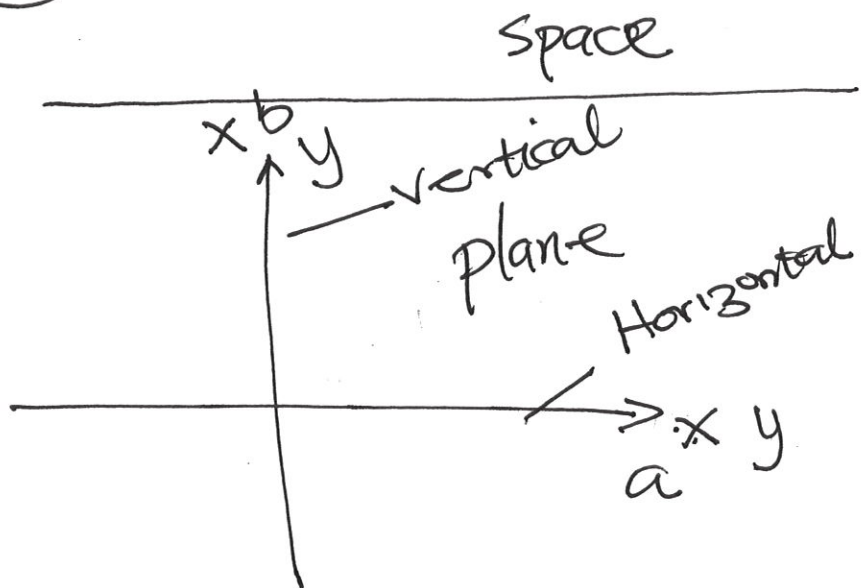
Row x Column

$$2x_1 - x_2 = 5$$

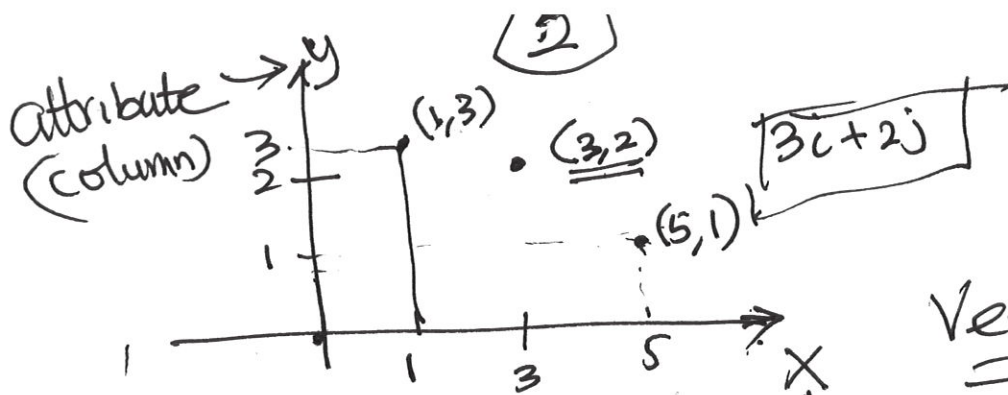
$$x_1 - 2x_2 = 4$$

$$\frac{1}{3} \cdot 3 = 1 \cdot \frac{2x}{2} = \frac{3}{2}$$

↑ ↑ Identity $x = 3/2$
Inverse 3 $\frac{1}{3}$



- Elimination } *
- Substitution }
- Graph *
- Matrix **



$$\begin{bmatrix} 1 & 3 \\ 3 & 2 \\ 5 & 1 \end{bmatrix}$$

Vectors

attribute (column)

Name	Age	Gender	Grade
	20	1	
	30	2	
	15	2	
Age	30		
20			
15			
		1	
		2	
			Gender

$$A \bar{X} = \bar{Y} \quad A^{-1} \text{ inverse of } A$$

$$A^{-1}(A\bar{X}) = A^{-1}\bar{Y}$$

$$\bar{X} = A^{-1}\bar{Y}$$

multiply

$$\frac{2X}{2} = \frac{4}{2} = 2$$

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 \\ 1 & -2 \end{bmatrix}$$

elementwise

$$A \cdot B = \begin{bmatrix} 1 & 4 \\ 3 & 8 \end{bmatrix}$$

A dot B = row column

$$1+2 \quad 2+4$$

$$\textcircled{1} \quad \begin{aligned} 2x_1 - x_2 &= 5 \\ x_1 - 2x_2 &= 4 \end{aligned}$$

$$\textcircled{2} \quad \begin{aligned} x_1 - 2x_2 &= 1 \\ 2x_1 + 3x_2 &= 9 \end{aligned}$$

$$\textcircled{3} \quad x_1 + x_2 + x_3 = 0$$

$$2x_1 - x_2 - x_3 = 3$$

$$x_1 - 3x_2 - 4x_3 = 5$$

$$Ax = b$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & -1 & -1 \\ 1 & -3 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 5 \end{bmatrix}$$

A

$$\bar{X} = A^{-1}b$$

Attribute	target
study x_1	play x_2 Grade y
20	89
30	100
20	100

x	y
-3	-5
-2	-4
-1	-3
0	-2
1	-1
2	0
3	1

$$y = mx + b$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-4 - (-2)}{-2 - 0} = \frac{-2}{-2} = 1$$

$$y = x + b$$

$$0 = 2 + b$$

$$b = -2$$

$$y = x - 2$$

$$x = 14$$

15

$$y = mx + b$$

$$y = m_1x_1 + m_2x_2$$

$$y = 2x_1 - x_2$$

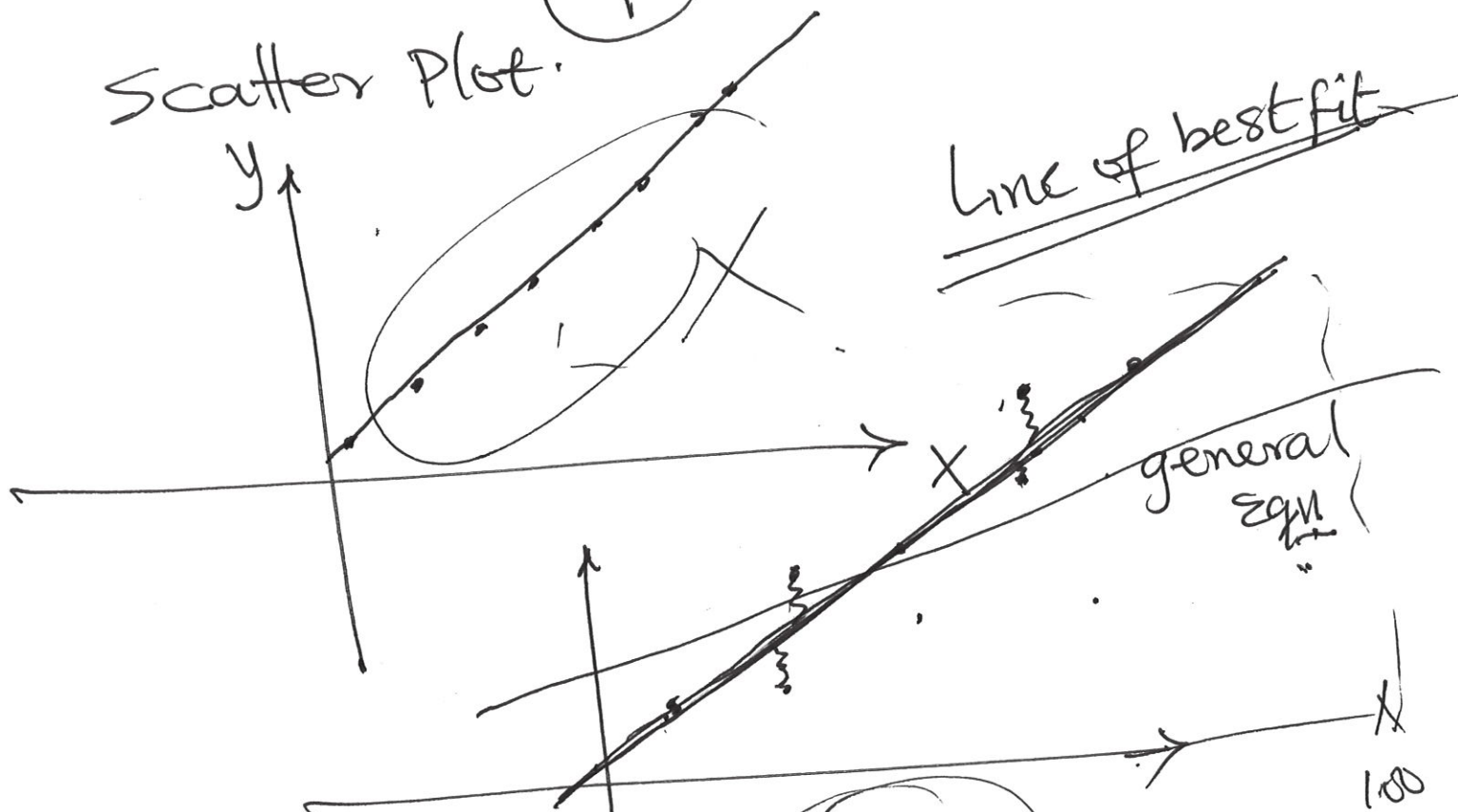
$$y = 2(15) - 5$$

$$y = 16 - 2$$

$$y = 14$$

weights

Scatter Plot.



- * Supervised learning
- * Unsupervised learning
- * classification & Regression
- * Categorical dataset

* Algorithms
Different types
Model

Data Science

Error

Metrics

Least Square Error

Mean Square Error
Sum of square Error
Absolute Error
F-2:
Confusion matrix
precision
Recall
fi-score.

5

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 4 & 2 \end{bmatrix}$$

$$\begin{matrix} (m \times n) & (n \times p) & (m \times p) \\ A \cdot B & = & C \end{matrix}$$

$$M = [1, 1, 1]$$

(3,3) (1,3)

$$A \cdot M =$$

$$\begin{matrix} (3,3) & (1,3) \\ A \cdot M & = (3,1) \end{matrix}$$

$$1 \times 2 = 2$$

$$1 \text{ --- unitary } 2 \times 1 = 2$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \text{~~1~~}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 4 & 2 \end{bmatrix}$$

=

$$\begin{bmatrix} 1 & 1/2 \\ 2 & 3 \\ 1 & 4 \end{bmatrix}$$

Over-determined

under-determined

$$\begin{bmatrix} \\ \\ \end{bmatrix}$$

$$2x_1 + 3x_2 + 4x_3 + 5x_4 = 6$$

$$x_1 + x_2 + x_3 + x_4 = 0$$

$$\begin{bmatrix} 2 & 3 & 4 & 5 \\ 1 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \end{bmatrix}$$

under-determined

$$\begin{bmatrix} 2 & 3 \\ 5 & 7 \\ 6 & 1 \\ 8 & 2 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -1 \\ 0 \\ 0 \end{bmatrix}$$

over-determined

columns << samples

columns >> samples