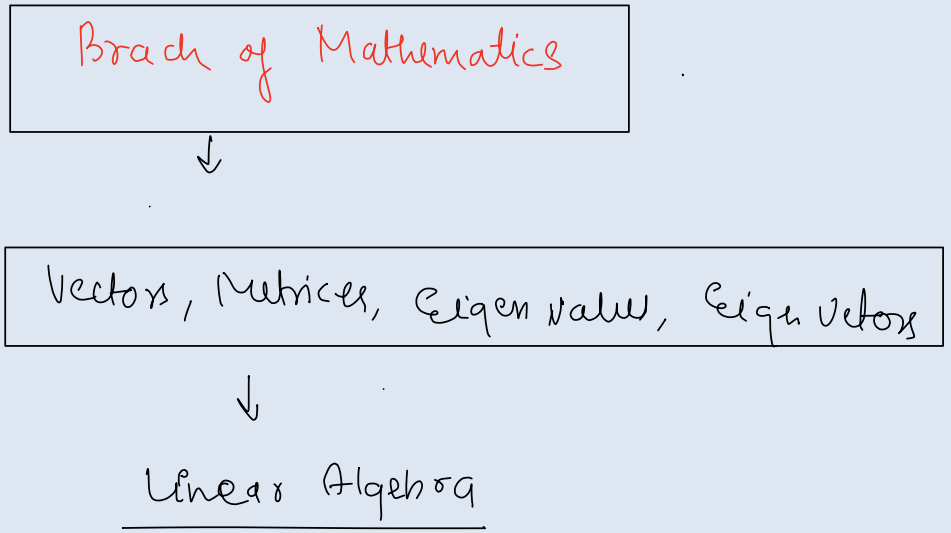
Linear Algebra:

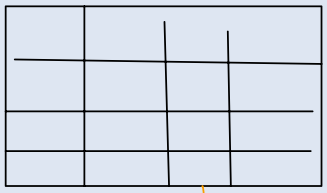


* Importance → use case → House (Data Representation)

1) Vectors →

	No Room	Area	Acre	Price
Data value	2	600sq	5 acr	2100$

$$[2 \quad 6 \quad 5 \quad 2100] \rightarrow \text{vectors}$$

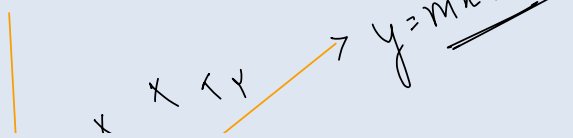
2) Image –  4x4 → Num's

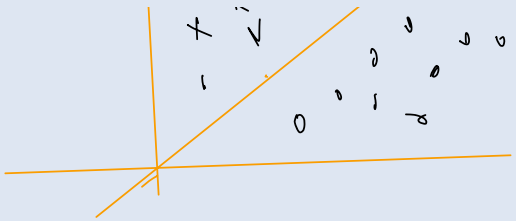
Image

(2) → I love Mathematics → Numerical → [0 1 0]

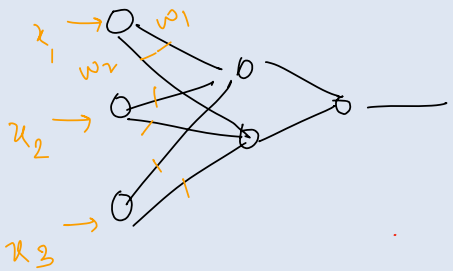
{ Textual → vectors } → word → Embedding

(3) → Model Training →





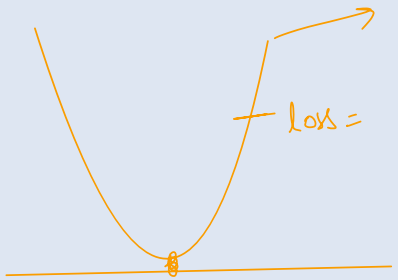
Neural Network →



$w_1, w_2, w_3, w_4 \ldots\ldots$

$x_1 \times w_1 + w_2 \times x_2 \ldots\ldots$

(4) optimizes →



$y = mx + c$

loss / optimez.

(5) → Robotics → Movemt → vector / map dire

(6) → Data compression →

Dimensolity Reduction →

Signal processiy →

Rewmmtion Systems →

→ vectors → 1) Vector

2) Appliction

3) opations → Sum, Sub,

4) Data servic.

Day 2 → Vectors :-

It is a collection of number, representing data features, or data. It has both Magnitude & Direction

Scalar → Scalar has Magnitude but No direction (or dim)

Scalar (M)

Vector (D, M)

Mag

5km

↓

Scalar

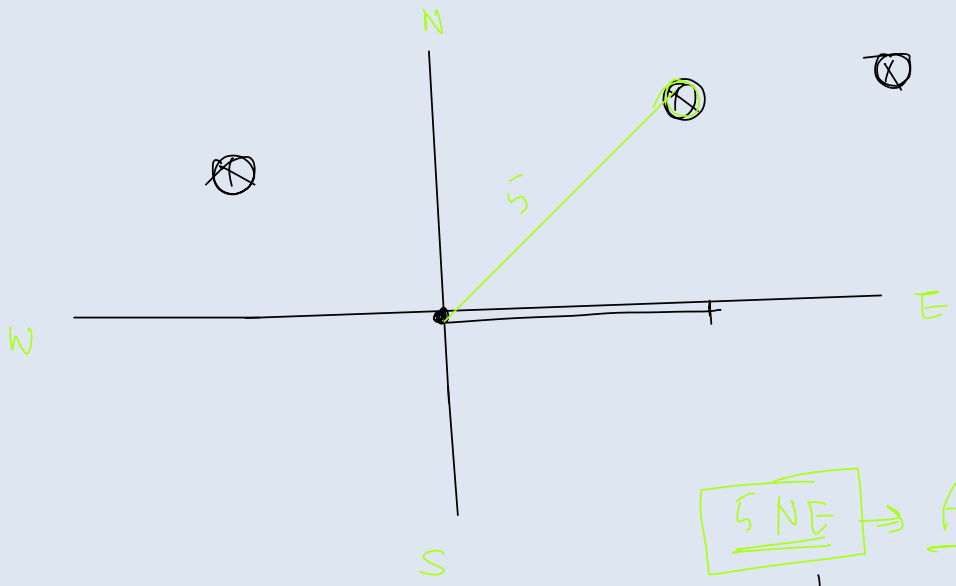
Mag

5km (NE)

Dir

↓

Vector



5 NE ⇒ Accurate

Representation ⇒ $\vec{5}$

[5 1]

[5 1 3] → Multiple dimension

↓

Represent

Ex → House → data features →

House ⇒

3 Rooms

2 Bathroom

1 Kitchen

[3 2 1] → 3 dimension

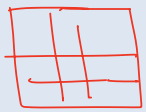
↓

Multiple feature ⇒ 50

* [1 2 3 . . . . . 50] → Multiple dimension

* Applications → Text Representation → NLP

I love Math → [[1 0 0] [0 1 0] [0 0 1]]

(2) → Image processing →  → Matrix →

3x3

1 x 9 — vector

(3) → Recommandation system →

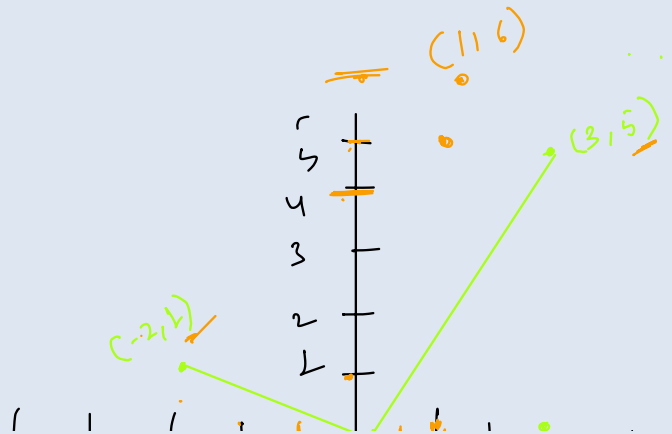
Day -3 →

Adding of Vectors :

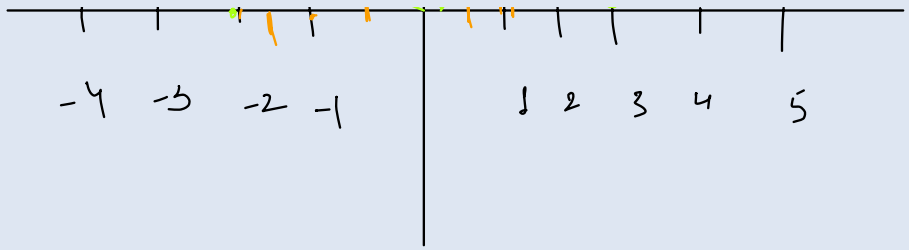
$$x = \begin{bmatrix} 2 \\ 1 \end{bmatrix} \qquad y = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$$

$$x + y =$$

$$x \begin{bmatrix} -2 \\ 1 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 \\ 6 \end{bmatrix}$$



$x \to -2 \cdots 1$



Machine

(1) → $F_A = [-2, 5, 3]$

F_B [1 2 3]

→ F_C [1, 7, 6]

(2) → NLP → good → [1 0 0]

Movie → [0 1 0]

'good movie' → [ ]+[ ]

(3) Recommendations => [Histor + Genre + trends]

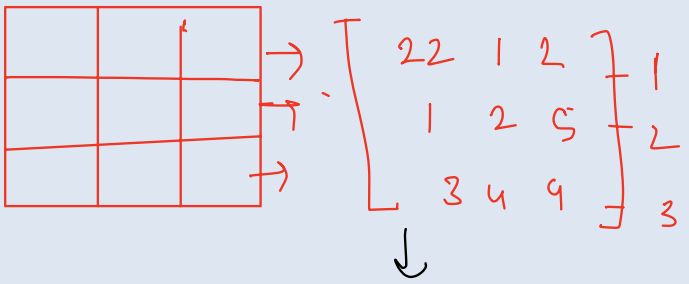
{ [ ]+[ ]+[ ] }

AI → Computer Vision →

RGB –

↓

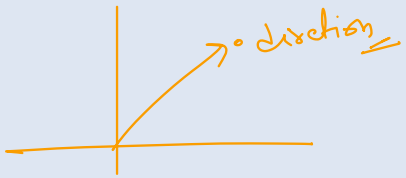
Grayscal



↓

[22 + 1 + 3]

[1 + 2 - 4]

Components → ① → 

(Mag, dire)

(x, y z)

x y z

② → Magnitude ⇒ x_2 [0 1 2]

$\sqrt{x^2 + y^2 + z^2}$ = length

(1, 1, 2)

0 + 1 + 4 = $\sqrt{5}$

③ Unit vector ⇒ (0 1 2) n

$V = \frac{V}{|V|}$ = direction ① 1x direction

Day 4 : 1) Scalar Mutiplication (coming late) — 1) Scalar

2) Dot product ✓

3) Cross product ✗

KNN, SVM → 2) Normalization of vector

(3) → projection of vector = (PCA)

(4) Euclian (Distance formula) → (NLP)

Scalar Multiplication

(1) → $V = [2, 3]$

k = scalar value = 5 learning (0.01)

$kV = k \cdot V =$ $2[2, 3]$

↓

Scalar

$[2 \cdot 2, 2 \cdot 3]$ $[4, 6]$

② → $V = [3, 4] \Rightarrow \frac{V}{|V|} -$ Unit (Direction)

$|V| = 5$

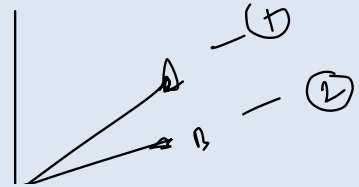
$[3, 4)$

$|V| \Rightarrow \sqrt{(3)^2 + (4)^2} = \sqrt{9+16} = \sqrt{25} = 5$

$= \left[\frac{3}{5}, \frac{4}{5}\right]$ → Normalized Vector

PCA → 10 → 3

③ → Vector projection →



$V_1 = [3, 4]$

$V_2 = [1, 2]$

Proj V_1 on V_2 → $P_{\frac{V_1}{V_2}} \Rightarrow \frac{V_1 \cdot V_2}{|V^2|^2} \cdot V_2$

$V_1 \cdot V_2 = (3 \times 1 + 4 \times 2) = [3, 8] = 11$

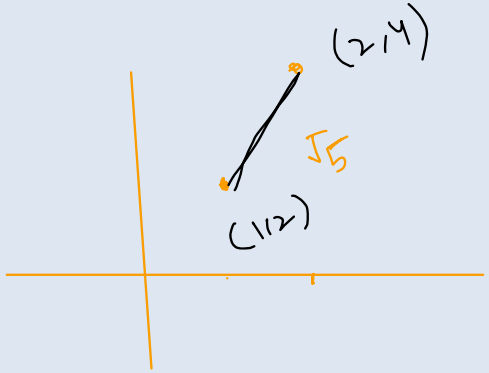
$|V_2^2| = [(1)^2 + (2)^2] = 1 + 4 = 5$

$\Rightarrow \frac{11 \cdot (V_2)}{5}$ 11 (1, 2]

22 22 = 11 22

5 5 | 5 ' 5

Distence Calculation



$v_1 = [x_1, y_1] = [1, 2]$

$v_2 = [2, 4] = [x_2, y_2]$

Euclidean Formula $\Rightarrow \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

$\Rightarrow \sqrt{(2-1)^2 + (4-2)^2} = \sqrt{(1)^2 + (2)^2}$

$\sqrt{5}$