→ Linear Algebra

Speed

(Scalar qty)

magnitude

30 km/h

Velocity

(vector qty)

magnitude + dir^n → Feature

30 km/h N

Tweet = [500 (likes), 400 (comments), 20 (shares), 100 (# views), 12 (clicks)]

↓

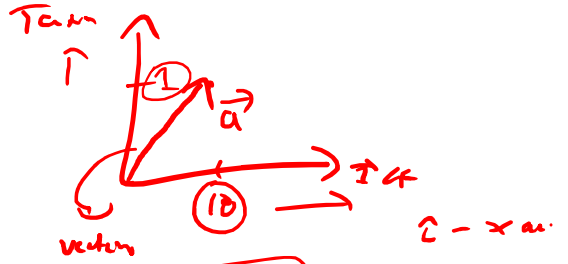
1 vector is 1 Row

$\vec{b} = \begin{bmatrix} 10 \\ 20 \\ 13 \end{bmatrix} \begin{matrix} \rightarrow x \\ \rightarrow y \\ -z \end{matrix}$

is Matrix Representation of a Vector

$\vec{b} = 10\hat{i} + 20\hat{j} + 13\hat{k}$

$\|\vec{b}\| = \sqrt{10^2 + 20^2 + 13^2}$



$\|\vec{a}\| = \sqrt{10^2 + 1^2}$

↓

magnitude

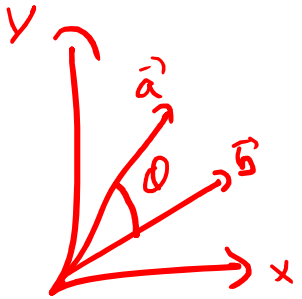
→ Multiplication of Vectors

Dot Product
(Scalar Product)

$\vec{a} \cdot \vec{b} \rightarrow \|\vec{a}\| * \|\vec{b}\| * \cos\theta$

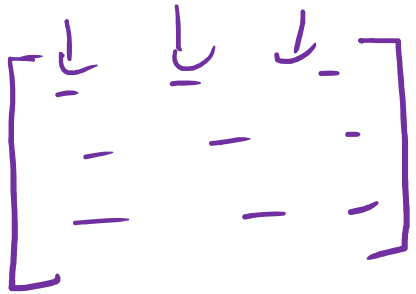
Cross Product
(Vector Product)

$\vec{a} \times \vec{b} = \|\vec{a}\| * \|\vec{b}\| * \sin\theta$



⇒ A Multi-dimensional Multi-row collection → Matrix

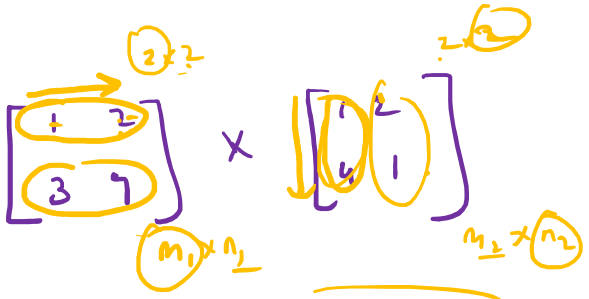
A ⇒



M x N
Row cols

3 x 3 matrix

→ A × B



$1\times1 + 2\times4$ $\quad$ $1\times2 + 2\times1 = 4$

$3\times1 + 4\times4 = 19$

$3\times2 + 4\times1 = 10$

$= \begin{bmatrix} 9_{00} & 4_{01} \\ 19_{10} & 10_{11} \end{bmatrix}_{2\times2} = C$

$m_1 \times n_2$

$C[0][1] =$

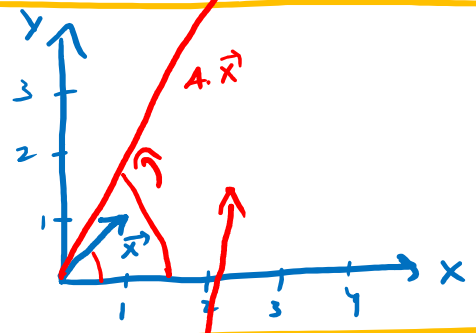
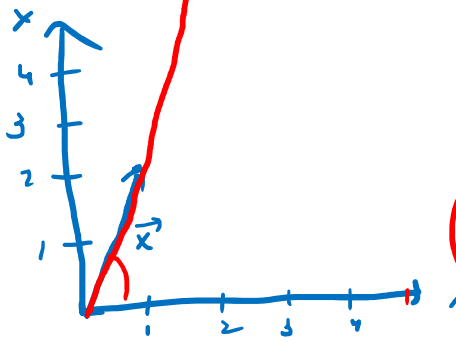
when $n_1 = n_2$

↳ then only we can multiply

$n_1 \neq n_2$ ✗

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

$A\vec{x} = \lambda \vec{x}$

A	$\vec{x}$	$A\vec{x}$
$\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}_{2\times2}$	$\begin{bmatrix} 1 \\ 1 \end{bmatrix}_{2\times1}$	 $\begin{bmatrix} 3 \\ 6 \end{bmatrix}_{2\times1} = A\vec{x}$ Scaled & Rotated
	$\begin{bmatrix} 1 \\ 2 \end{bmatrix}_{2\times1}$	 $\begin{bmatrix} 5 \\ 10 \end{bmatrix}$ Scaled & Not Rotated $\Rightarrow$ Eigen Vector

$1\times1 + 1\times2$
$2\times1 + 4\times1$

$1\times1 + 1\times2 = 5$
$2\times1 + 4\times2 = 10$

A vector that undergoes scaling without rotation is called Eigenvector & the scaling factor is k/a Eigen Value

$\begin{bmatrix} 5 \\ 10 \end{bmatrix} \Rightarrow 5 \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ — 5: Scaling factor → Eigen Value