

# Linear Algebra

Linear algebra is a branch of mathematics that focuses on the study of vectors, vector spaces (also called linear spaces), linear transformations, and systems of linear equations. It provides a framework for understanding the properties and operations of these mathematical objects, which can be represented using matrices and vectors.

① Foundational Concepts → ML, DL, NLP, Images

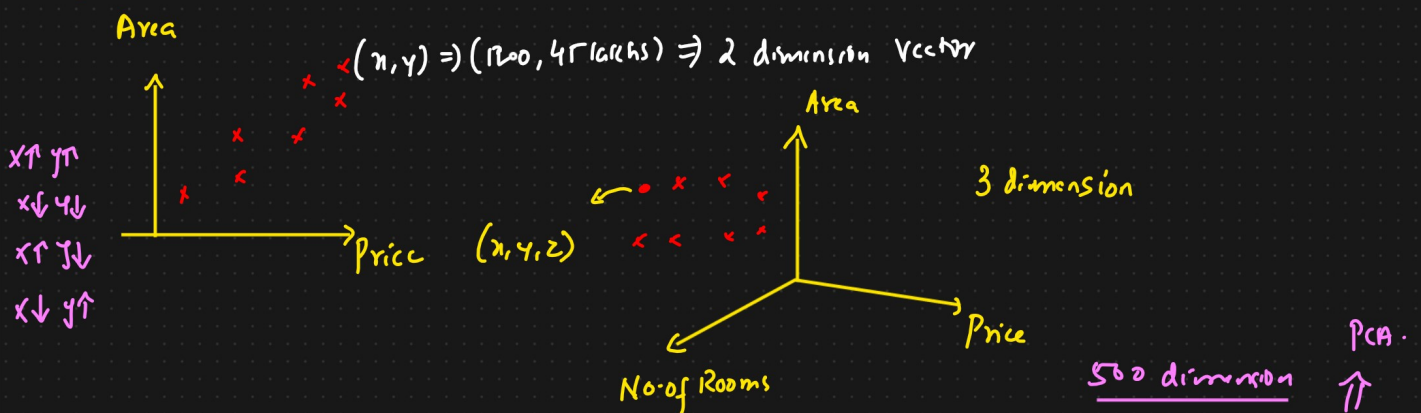
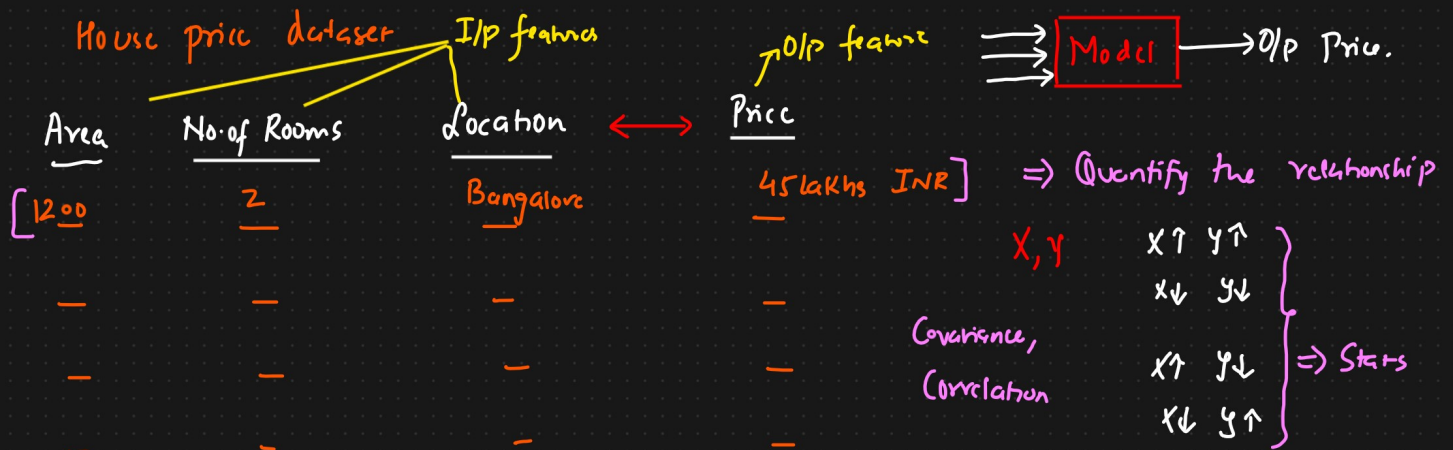
↓  
 Scalars, Vectors, Matrices, Mathematical Operation of Matrices, Linear Transformation  
 Eigen Value Eigen Vector

① Physics    ② Mathematics    ③ Computer Science Student. [Data Science].

## Applications of Linear Algebra

1) Data Representation And Manipulation

DATASET → Create Model which will be able to predict.     $\vec{V} = [1200]$      $\vec{V} = [1200 \ 2]$



① Linear algebra works higher dimension data.

↓ Dimensionality Reduction  
2 dimension

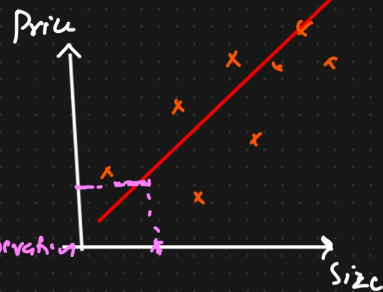
## ② Machine Learning And Artificial Intelligence

① Model Train : Linear Algebra → Matrix Multiplication

Matrix Arithmetic operation

Linear Equation

Equation of a straight line  $\Rightarrow ax+by+c=0 \Rightarrow \underline{y=mx+c}$

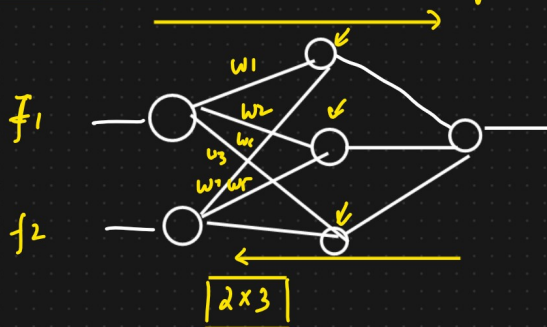


② Dimensionality Reduction  $\Rightarrow$  PCA  $\rightarrow$  Linear Algebra  $\rightarrow$  Eigen Value And Eigen Vector

Reduce from higher dimension  $\rightarrow$  lower Dimension.

③ Neural NW : Forward propagation

and Backward propagation

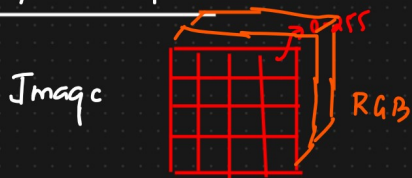


$f_1$  Area  
 $f_2$  No of Rooms  
Or Price

$\Rightarrow$  GPU  $\rightarrow$  Cores  $\rightarrow$  parallelly  
Tensorflow  $\rightarrow$  Tensors

$$\begin{bmatrix} f_1 \\ f_2 \end{bmatrix} \begin{bmatrix} w_1 & w_2 & w_3 \\ w_4 & w_5 & w_6 \end{bmatrix} \Rightarrow \text{Matrix Multiplication}$$

③ Computer Graphics

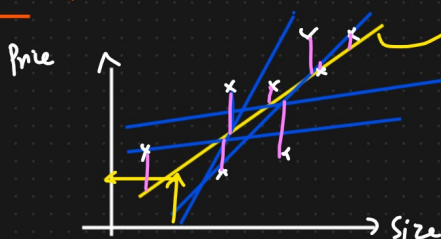


$\Rightarrow$  Scaling, Rotate, Black & White  $\Rightarrow$  linear  $\Rightarrow$  Transforming

④ Optimization

① Solving Equations : Linear Equation

Slope or coefficient  
intercept  
 $y=mx+c \Rightarrow$  Regression



$\hookrightarrow f(x) \Rightarrow$  Maximize  $f(x) \Rightarrow$  Minimize the Error  
 $\Rightarrow$  Right slope and intercept

