NumPy

Agenda

Key Takeaways-

- What is NumPy?
- A quick recap to Vectors and Matrices
- Need for NumPy
- NumPy Arrays and multiple ways to create them
- Array’s attributes and methods
- Indexing and Selection
- NumPy Operations

NumPy

- **NumPy** stands for Numeric Python. It is a Linear Algebra Library for Python.

- **NumPy** is the basic building block for almost all Python compatible Data Science & Machine Learning libraries.
- **NumPy** has numerous benefits over traditional Python Lists, for e.g up to 50x faster than Python Lists.
- **NumPy** is a Open-Source software and has many contributors.

Vector

- Collection of numbers
- Any real time entity can be represented through a vector. E.g.

	Screen-Size	Camera	RAM	Hybrid_SIM	Android	Battery	Price	
	5.9”	48	4	1	9.0	4500	12999	$\mathbb{R}^{1X7}$

Age	Height	Weight	
 13	5.3”	48	$\mathbb{R}^{1X3}$

 [1, 0 , 0, 1, 0.....0, 1] $\mathbb{R}^{1X784}$

Case 2

- Collection of Smartphones prices

  [6500, 7999, 27999, 42500, 18300]

	Price
	6500
	7999
	27999
	42500
	18300

Similarly,

- Collection of Students heights

  [5.3, 5.8, 5.5, 4.11, 6.1]

- Collection of Employees salaries

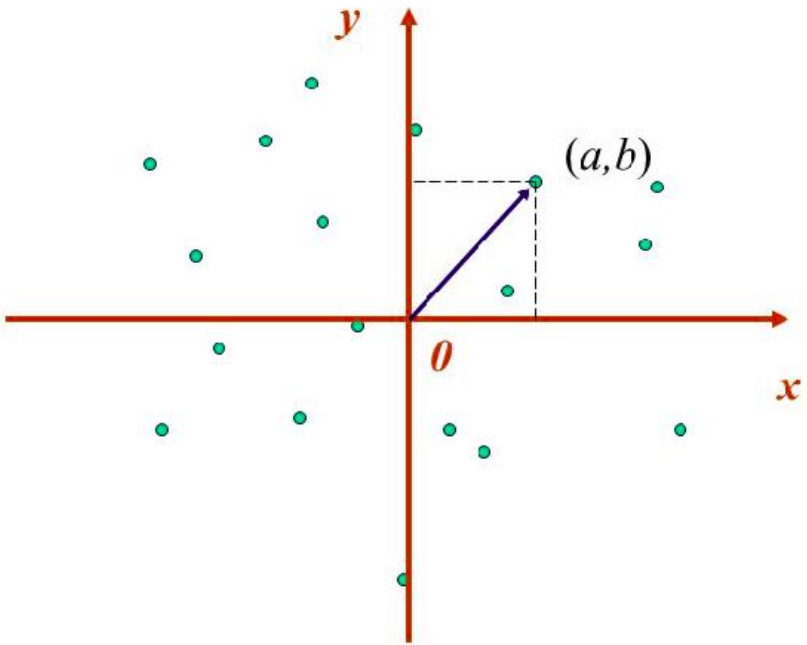
  [32000, 38000, 52000, 22000, 29000]

- Collection of runs scored

  [32, 2, 19, 5, 23, 72, 4*, 9*]

Vector - *Geometric intuition*

- A vector is represented as a point in the given coordinate system.
- A vector has its magnitude and direction.



Magnitude of a vector = $\sqrt{(a^2 + b^2)}$

Vector Operations

- Scalar multiplication
- Vector addition, subtraction, multiplication
- Projection of one vector onto another
- Angle between two vectors

Matrix

- Collection of Vectors

	Screen_Size	Camera	RAM	Hybrid_SIM	Android	Battery	Price
	5.6	16	2	1	8.0	3500	6500
	5.9	32	3	1	9.0	4300	7999
	6.1	48	6	0	10.0	5000	27999
	6.1	64	8	0	10.0	6000	42500
	6.0	24	4	0	9.0	4500	18300

0, 1, 1, 0.....1, 1

1, 0, 1, 0.....0, 1

0, 0, 1, 0.....1, 0

0, 1, 1, 1.....1, 1

1, 1, 1, 0.....0, 0

1, 1, 1, 1.....0, 1

0, 0, 0, 0.....1, 1

1, 1, 1, 0.....1, 0

0, 1, 1, 1.....0, 0

0, 1, 0, 0.....0, 1

Matrix Operations

- Matrix-Vector : Addition, Subtraction, Multiplication
- Matrix-Matrix : Addition, Subtraction, Multiplication
- Inverse, Transpose
- Decomposition

NumPy benefits over traditional Python lists

- Mathematical Operations : Extremely easy to perform mathematical/vectorized operations.
- Speed : Up to 50x faster than traditional Python lists.
- Memory : NumPy uses much less memory to store data than Python lists.
- Filtering/finding elements : Using [ ] operator and rich set of optimised built-in functions.

Quiz 1

Choose the correct statement(s).

- Vectors of different magnitude in different directions are possible.
- Vectors of same magnitude in different directions are not possible.
- Vectors of same magnitude in same direction are possible.
- All of these