

## NumPy - 3

### Prereqs:

① You have attended and fully understood the ideas and concepts discussed in BOTH prev sessions

② You have:

(a) Pen + Paper (or equivalent)

(b) Colab ready to run (once link shared)

### Agenda:

→ Aggregate functions ✓

→ Sorting ✓

→ Multiplication scalar, vectors, matrix

→ Vectorization

→ Broadcasting

Indexes: 0 1 2 3 4 5

$a = \text{np.array}([1, 2, 3, 4, 5, 6])$

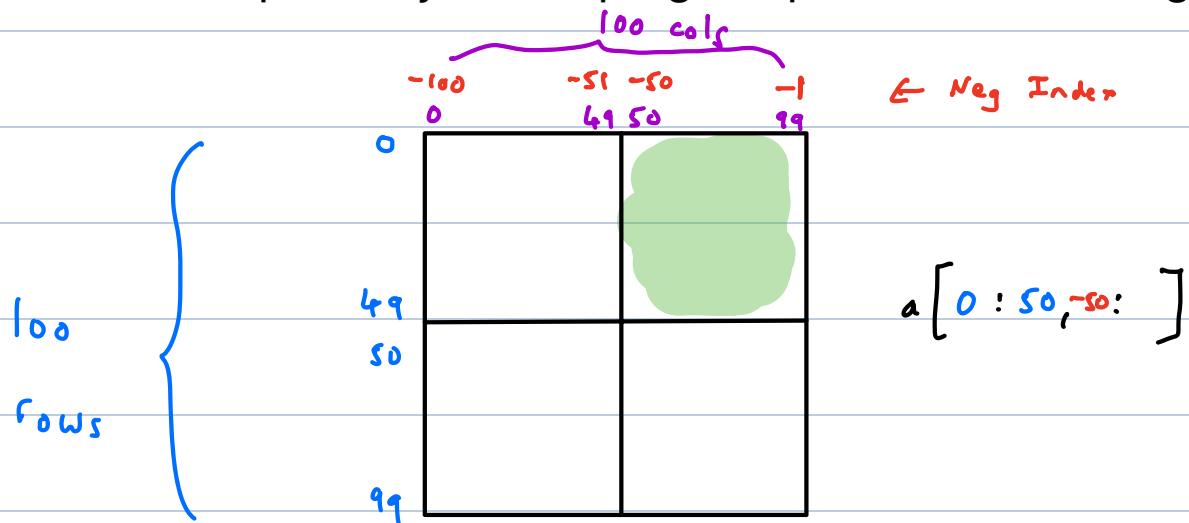
$$0/1 \rightarrow 1, 3, 5$$

a [ 1 start : stop : step ]

Diagram illustrating the components of a search result:

- Upward arrow from **Result** to **Included**
- Upward arrow from **Result** to **not included**
- Upward arrow from **Result** to **in**
- Upward arrow from **Result** to **not in**

If array "a" has an "100 x 100" pixel image, then, which of these will plot only the "top right" quarter of that image?



10 15 25

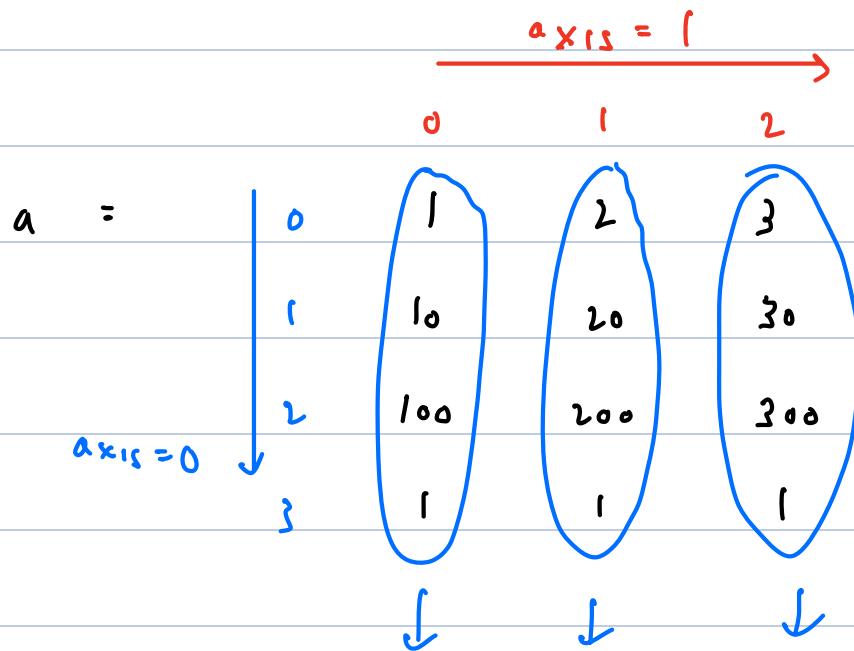
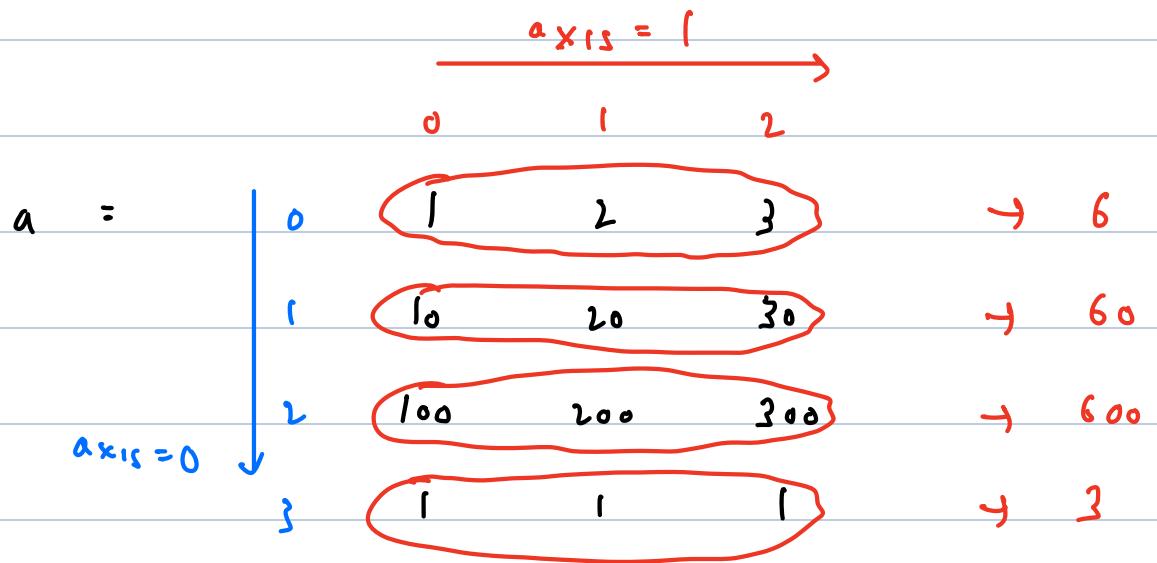
$$\text{sum} = 50$$

$$\text{mean} = 16.67$$

$$\text{max} = 25$$

$$\text{min} = 10$$

## Sum of 2D array



112      223      334

# Break! Resuming at 10:22 AM 157

# In Linear Algebra

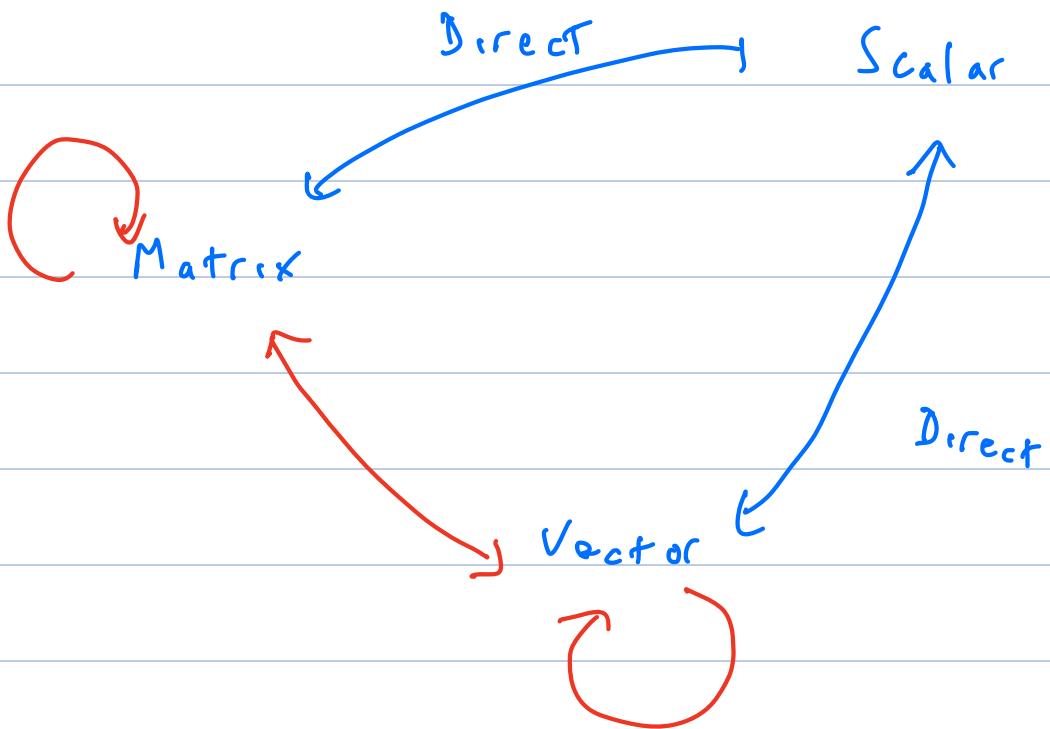
Scalar value :  $6 \quad -5 \quad 27.48$

Vector  $\rightarrow$  1d array of values

$$\begin{bmatrix} 1 \\ 2 \\ 10 \end{bmatrix} \rightarrow [1 \ 2 \ 10]$$

Matrix  $\rightarrow$  2d array

$$\begin{bmatrix} 5 & 10 \\ -1 & 16 \\ 0 & 8 \\ 0 & 0 \end{bmatrix}$$



`shape_r = shape_l`

`np.dot (vector, vector)`

`np.dot (Matrix, vector)`

`np.dot (Matrix, Matrix)`

*Result*

$(m_1, r, n_1) \quad (m_2, r, n_2) \rightarrow (m_1, n_2)$

*Equal*

## Vectorization

print (a \* 10)

7

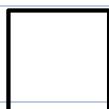
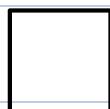
10

2

10

5

10



10

10

10

70

20

10

a = np.array ([7, 2, 5])

b = np.array ([10, 10, 15])

print (a + b)

$(4, 4)$   
 $(1, 4)$   
 $(1, 1)$   
 $(4, 4)$   
 $(4, 4)$

arr-L

arr-1

$$\left[ \begin{array}{cccc} 2 & 3 & 4 & 5 \\ 1 & 7 & 3 & 5 \\ 2 & 8 & 6 & 9 \\ 11 & 23 & 12 & 19 \end{array} \right]$$

$\left[ \begin{array}{cccc} 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \end{array} \right]$   
 $\left[ \begin{array}{cccc} 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \end{array} \right]$   
 $\left[ \begin{array}{cccc} 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 2 & 2 & 2 \end{array} \right]$

arr-1

arr-3

$$\left[ \begin{array}{cccc} 2 & 3 & 4 & 5 \\ 1 & 7 & 3 & 5 \\ 2 & 8 & 6 & 9 \\ 11 & 23 & 12 & 19 \end{array} \right]$$

$[5 \ 6 \ 8]$

$(4, 4)$

$(1, 3)$

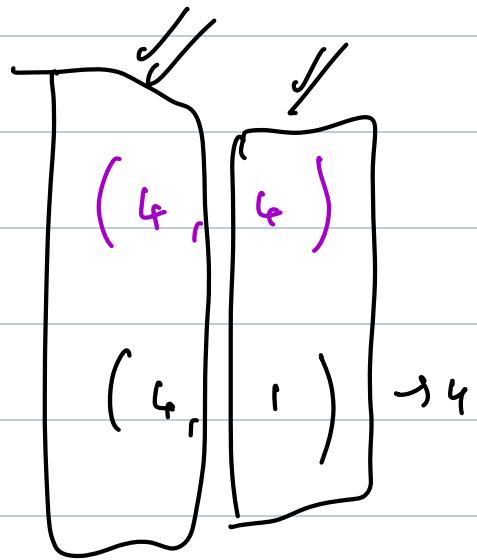
$(4, 4)$ 

arr-1

 $(4, 1)$ 

arr-4

2	3	4	5
1	7	3	5
2	8	6	9
11	23	12	19



$$a(r-1)$$

$$\begin{bmatrix} 2 & 3 & 4 & 5 \\ 1 & 7 & 3 & 5 \\ 2 & 8 & 6 & 9 \\ 11 & 23 & 12 & 19 \end{bmatrix}$$

A handwritten cursive 'n' is at the top. Below it, a large oval containing a '6' is connected by a curved line to a 'c' on the right. To the left of the oval, a 'c' is connected to a '6' by a curved line. Below these, two more 'c' and '6' pairs are connected by curved lines.

$$\left( 4, r, 4 \right)$$

( , )

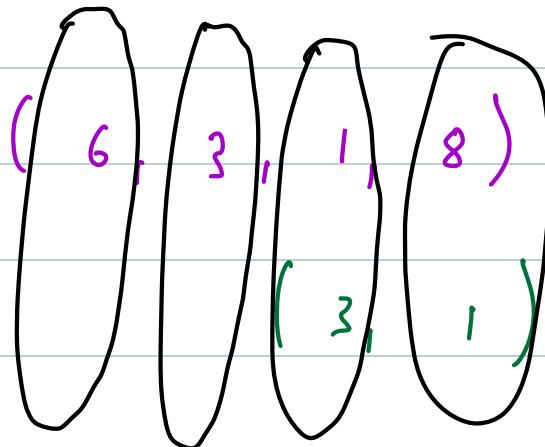
3, 2

Nung, 2, /

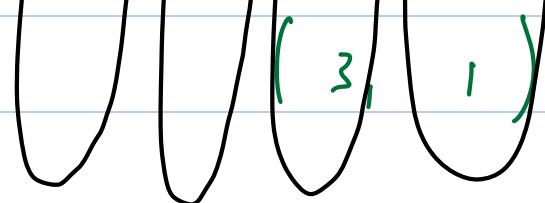
a -

( 6, 3,

shape a ↗



shape b ↗



① Write the two shapes

one below the other

& RIGHT - ALIGNED

② For each pair, put a ✓ mark  
if one of these conditions  
is satisfied:

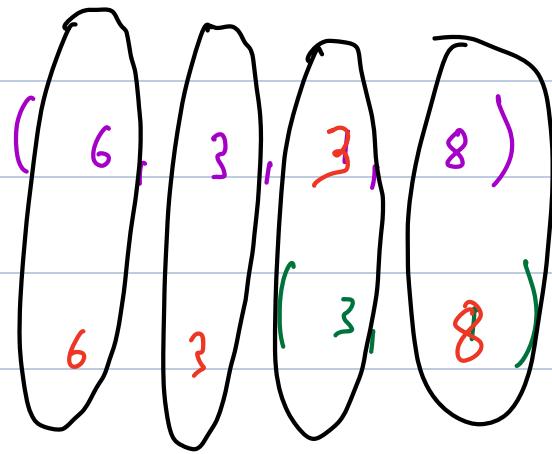
(a) Both values are equal

(b) If one of the values  
is BLANK / 1

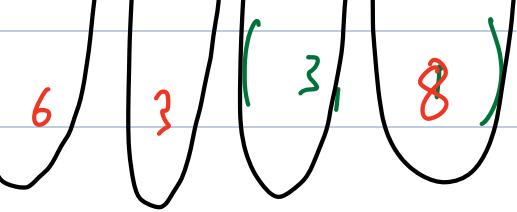
then BROADCAST if

to match the other number

shape a  $\rightarrow$



shape b  $\rightarrow$



Result  $\rightarrow (6, 3, 3, 8)$