Agenda

- Sorting
- Matrix multiplication
  - np.dot
  - @
  - np.matmul
- Vectorization
- BroadCasting

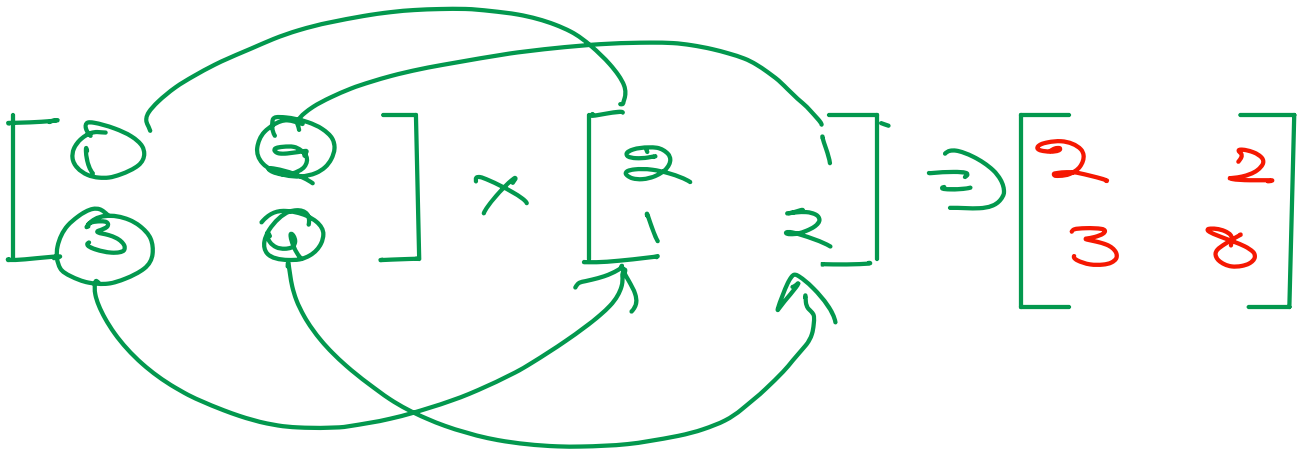
Sorting

1. sort method (OOP) list.sort
   - Inplace Operation
2. sorted function
   - X Inplace operation

   np.sort
   - X inplace

Matrix multiplication

① Two matrices : Element Wise



② Computer Vision

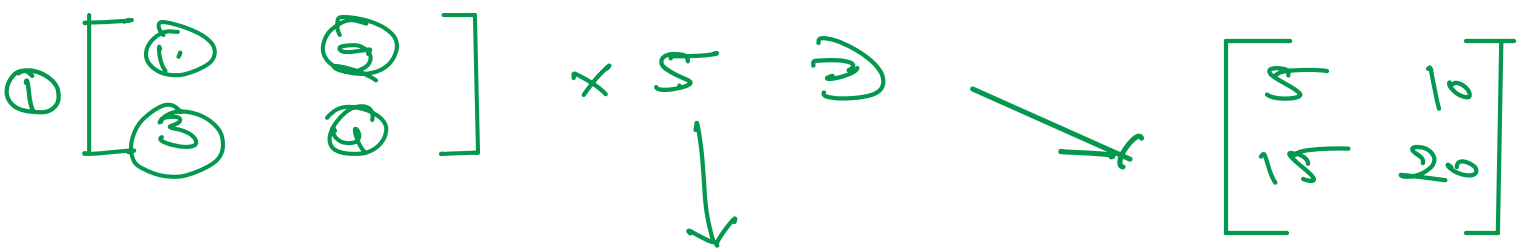
↓

CNN

↓

Convolution

③ Matrix × Scalar = S



② $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \times \begin{bmatrix} 5 & 5 \\ 5 & 5 \end{bmatrix}$

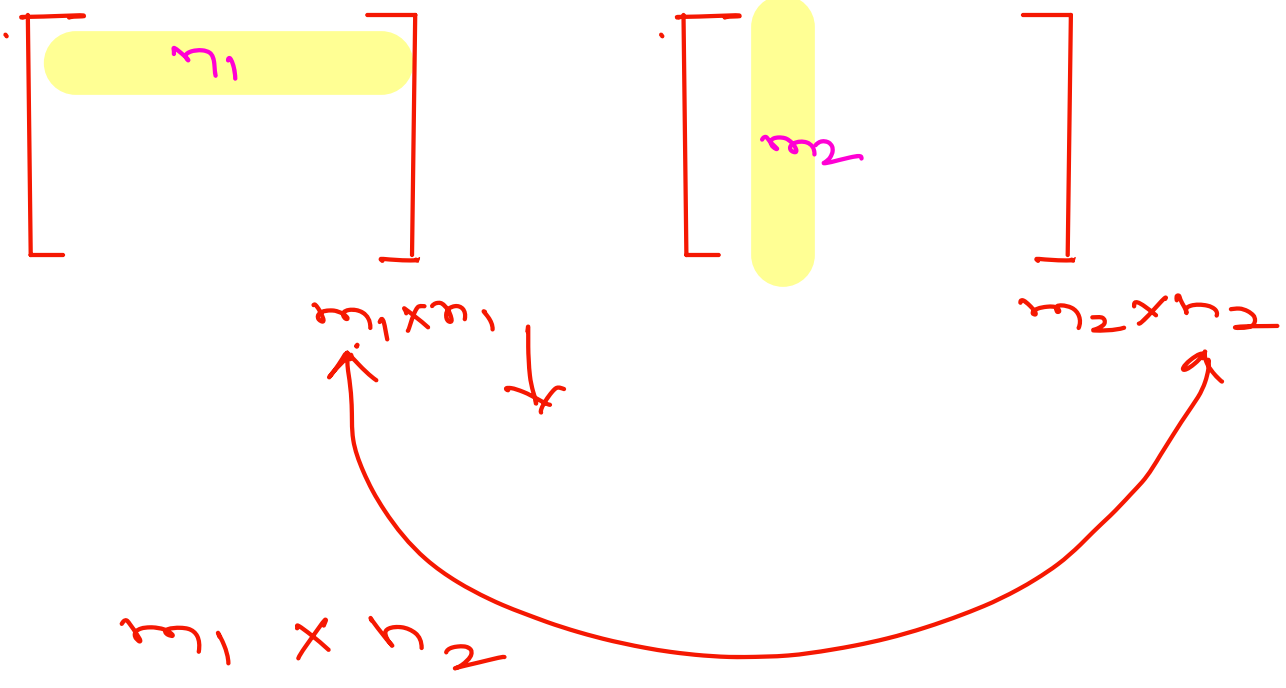
(Element Wise)

③ Standard Matrix Multiplica

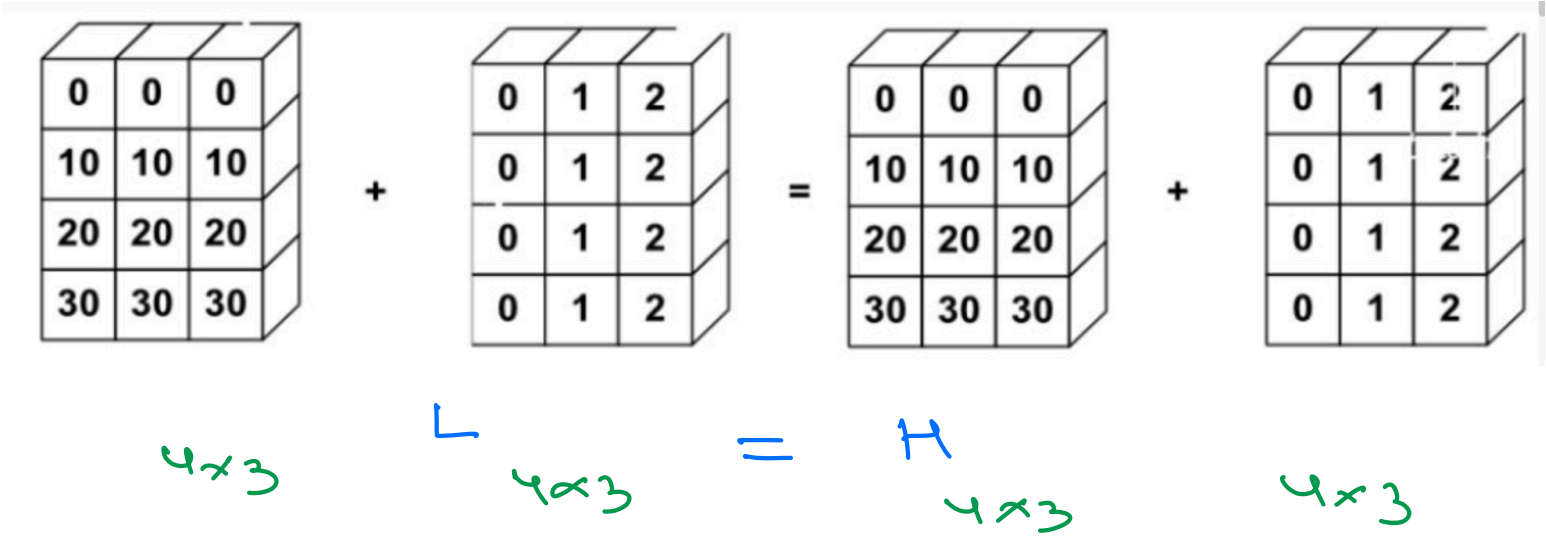
a_1 ⊙ m_1 × n_1

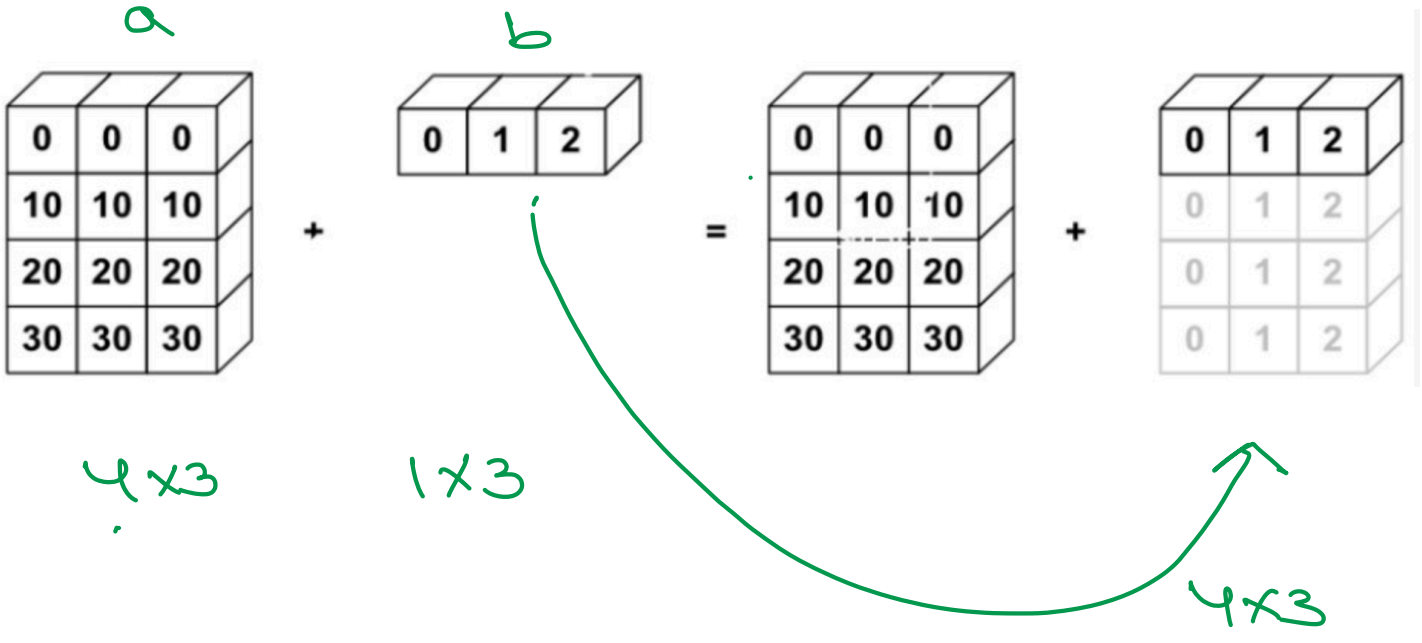
a_2 ⊙ m_2 × n_2

$a_1 \times a_2$ ⊙ $n_1 == m_2$



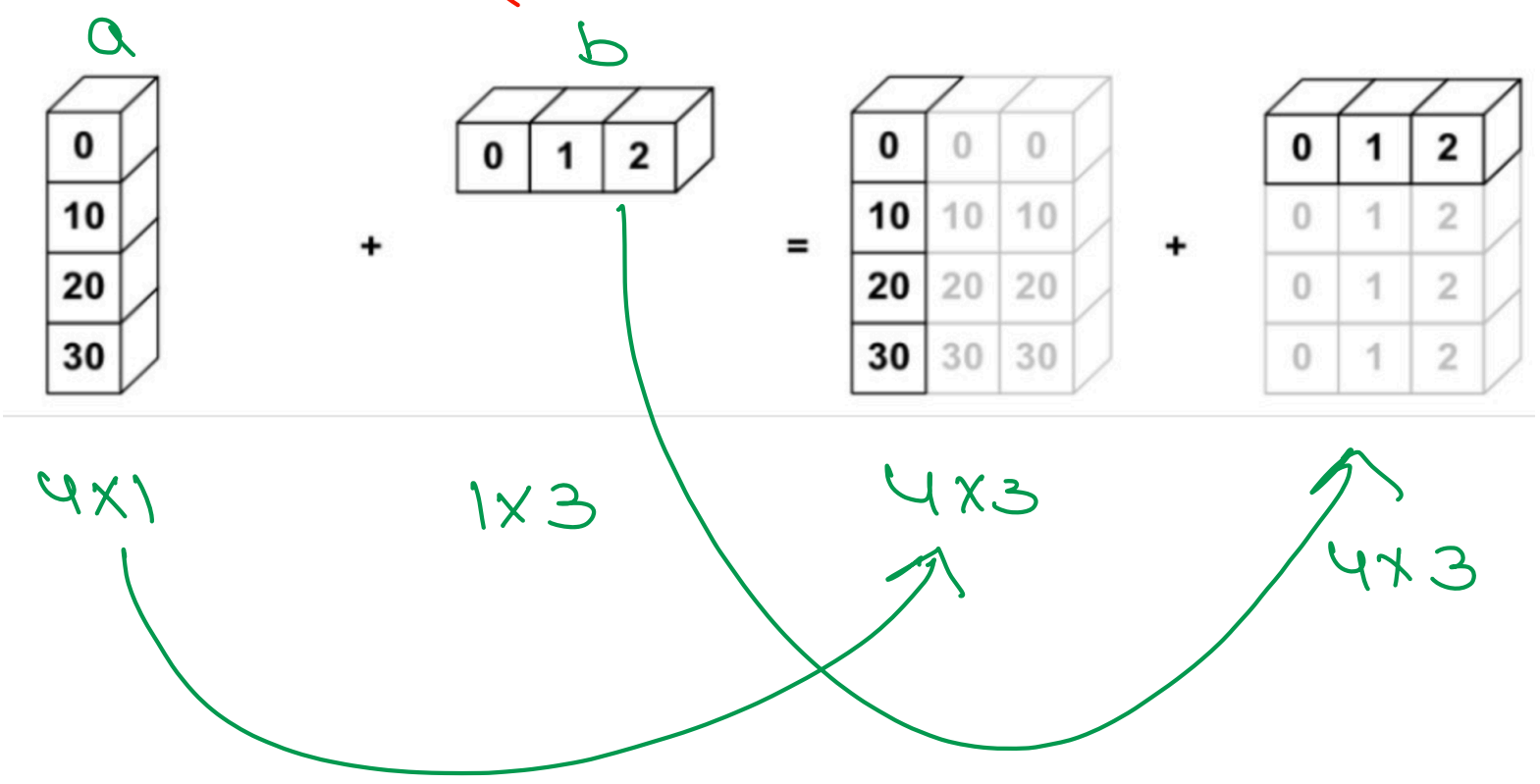
Broadcasting





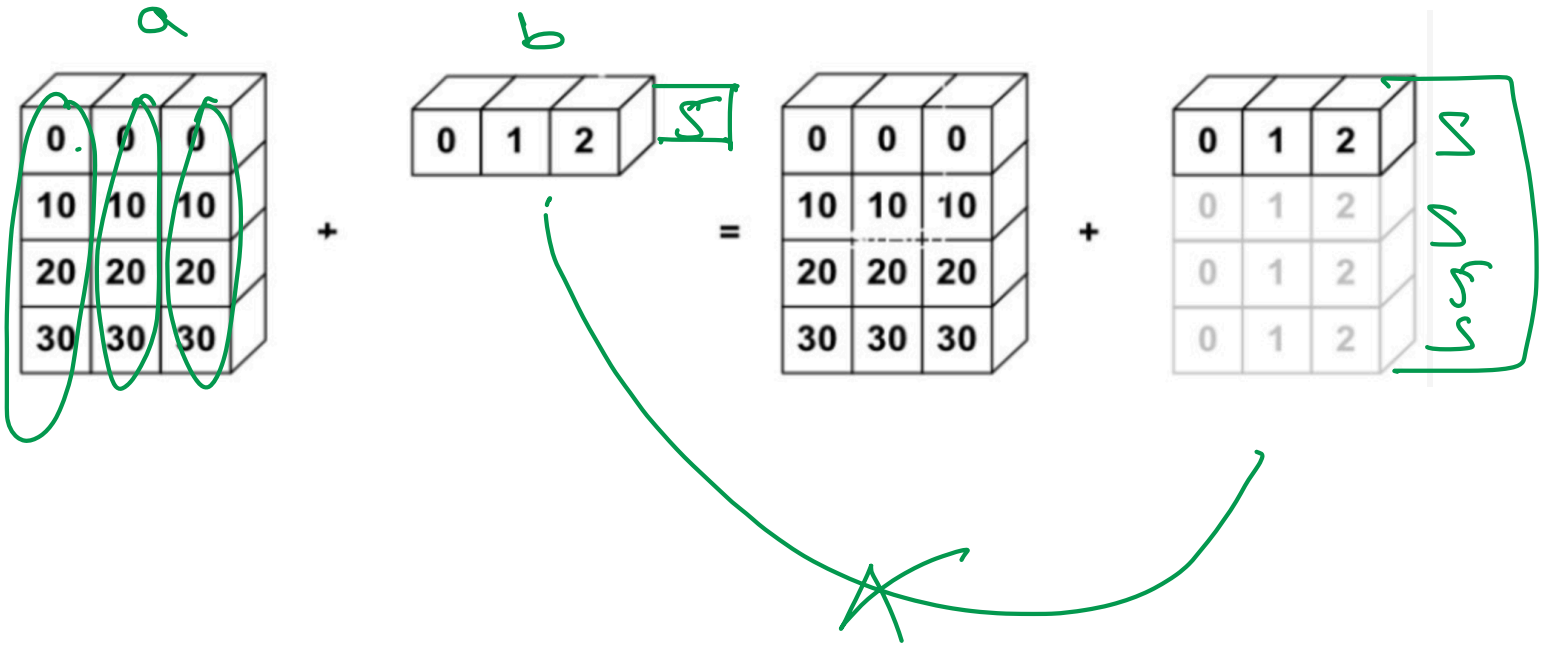
L.H.S = R.H.S

(Broadcasting)

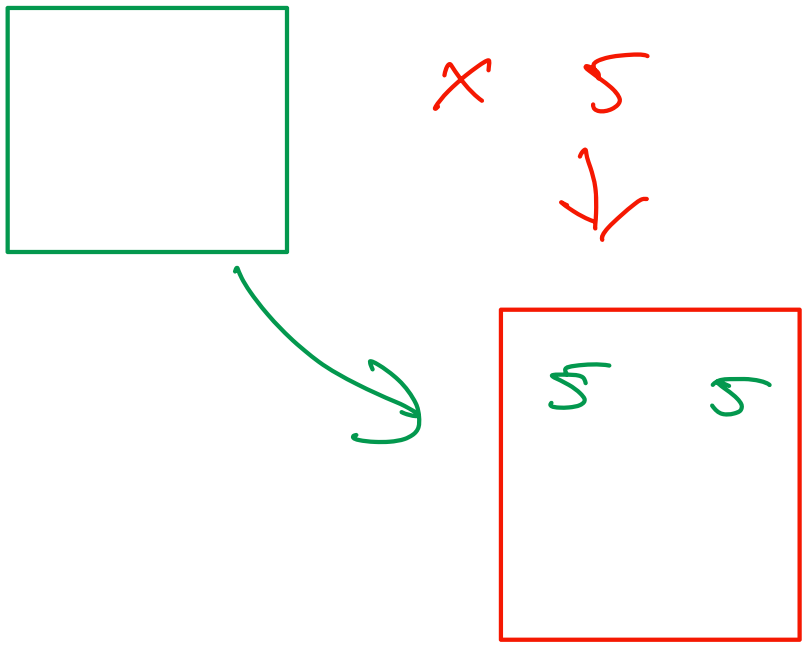

a
b
0
10
20
30
0 1 2
+
=
0 0 0
10 10 10
20 20 20
30 30 30
0 1 2
0 1 2
0 1 2
0 1 2
+
4x1
1x3
4x3
4x3

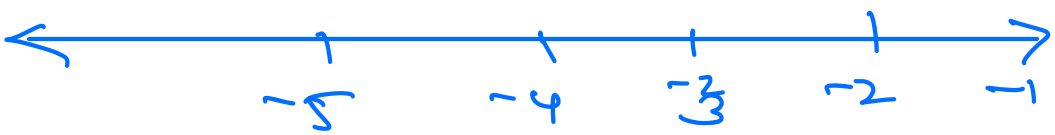
1x

X Error


a
b
0 0 0
10 10 10
20 20 20
30 30 30
0 1 2
+
=
0 0 0
10 10 10
20 20 20
30 30 30
0 1 2
0 1 2
0 1 2
0 1 2
+
Lys

1





-5 → -1

arr[-5 : -1, -1]

row col

-5 : -1 : -1