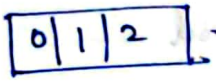
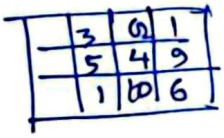
Tensors: It's nothing but a data structure. It's a container to store data numbers. Vectors, matrices all are tensors

~~0, 1, 2, 3 ⇒ 8~~

0, 1, 2 → single numbers → Scalar → 0D Tensor



→ List of numbers → Vector → 1D Tensor



→ 2D List → Matrix → 2D Tensor

This can be 3D, 4D and so on.....

So, in General They called Tensors.

2D Tensor → collection of 1D Tensors

3D Tensor → collection of 2D Tensors

4D Tensor → Collection of 3D Tensors

ND Tensor → Collection of ND-1 Tensors

Rank: Number of dimensions in a Tensor

Axes: Number of dimensions in a Tensor

Shape: (number of row, number of column)

Example of 1D Tensor:

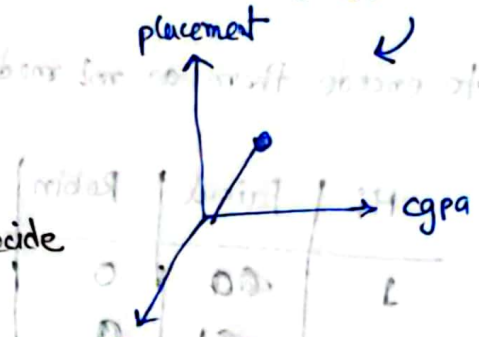
cgpa	iq	placement
3.9	91	1

→ [3.9 | 91 | 1] → 1D Tensor

↳ 3D vector

So, in a dataset, every row is a 1D Tensor

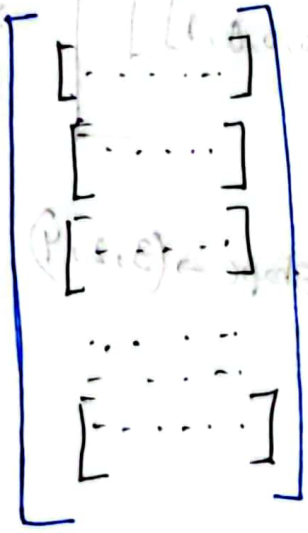
And the number of columns decide the Number of dimension the vector has.



Example of 2D Tensor:

Above every row is a 1D ~~Dataset~~ Tensor.

Suppose we have 1000 rows. They all together can make a 2D Tensor



→ 2D Tensor

~~When~~ When we separate dependent (Target) and Independent features

Independent features become 2D Tensors and Dependent column is 1D Tensor

Example of 3D Tensor:

Generally we find 3D Tensor in **NLP**

For example → Hi Faisal
Hi Nijhum
Hi Robin

We have to encode them as ml model don't ~~know~~ know about strings

Hi	Faisal	Robin	Nijhum
1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1

Hi Faisal → [1,0,0,0]

Hi Robin → [1,0,0,0], [0,1,0,0]

Hi Nijhum → [1,0,0,0], [0,0,1,0]

[1,0,0,0], [0,0,0,1]

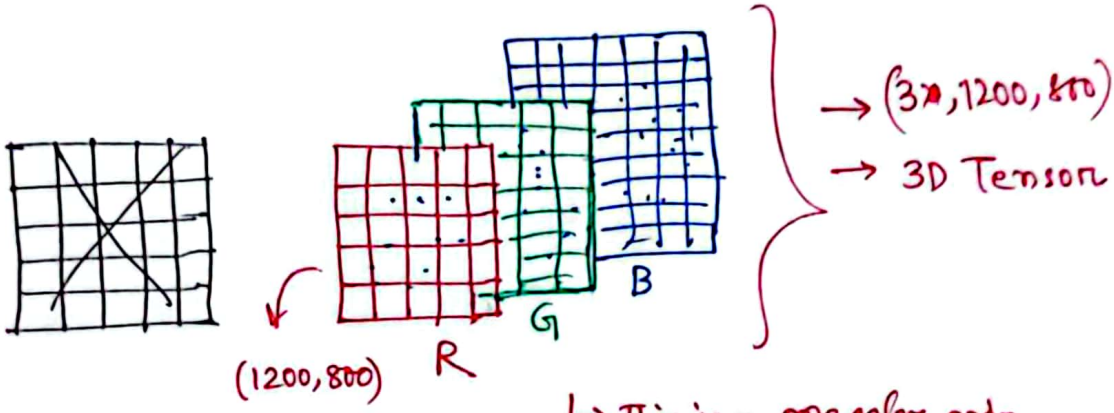
→ 3D Tensor [collection of 2D Tensor]

shape → (3, 2, 4)

[24 items]

Example of 4D Tensors:

Generally we find this in CV → Image data



↳ This is a one color code

→ When you will have a collection of color codes (Every color code will be 3D Tensor) like this, that will be a 4D Tensor.

→ Suppose for 50 color codes shape → (50, 3, 1200, 800)

Example of 5D Tensors:

A good example of this is → Videos

→ Because videos (5D) are collection of images → collection of 4D Tensors

→ Images (4D) are collection of R,G,B color code → collection of 3D Tensors

A viedo of 60 sec, 30 fps, 480 x 720p

The shape will be → 60x30, 480, 720, 3

→ (1800, 3, 480, 720) → 4D

If there are 4 videos like this,

their collection will form 5D Tensor → (4, 1800, 3, 480, 720)