



Numpy Avançado

MODULE II

TENSORES

What is Numpy?

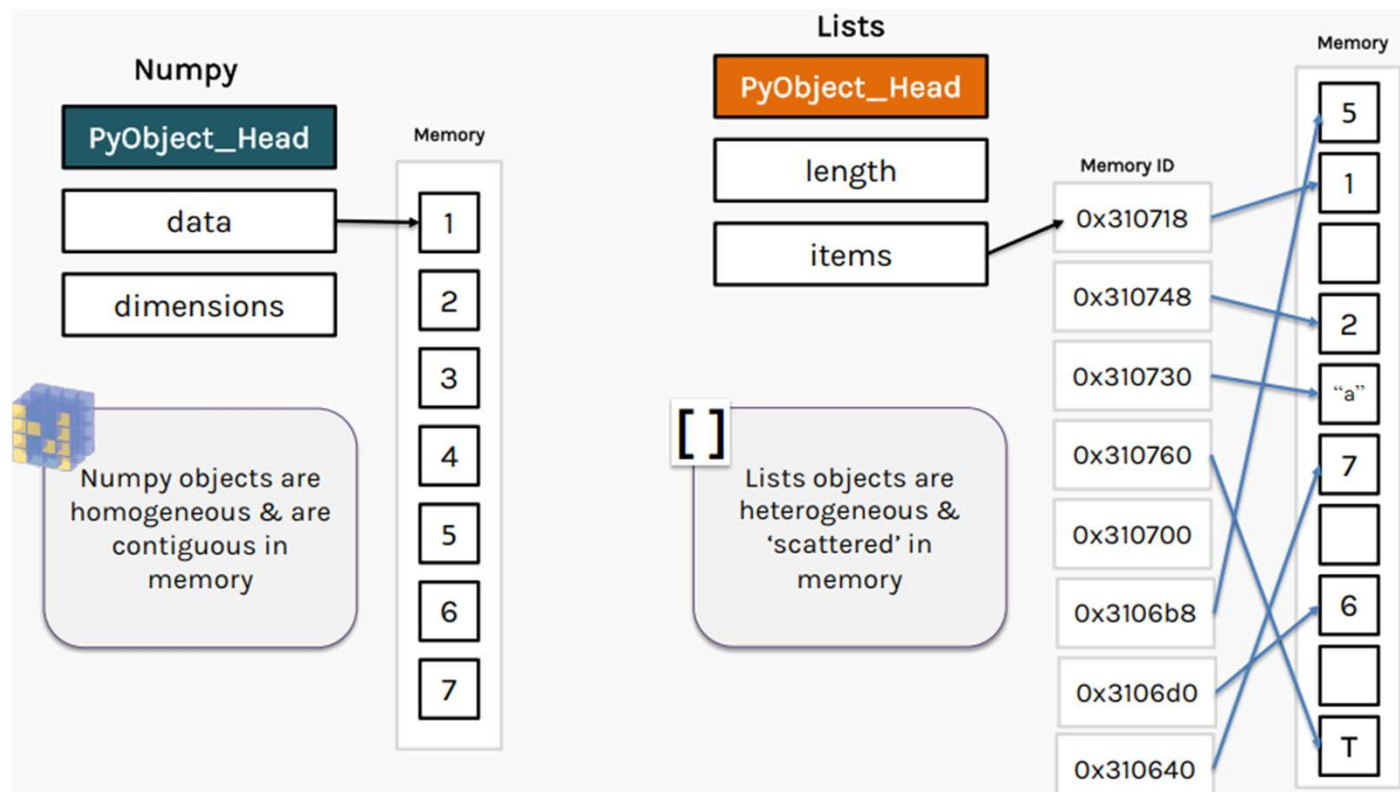


Numpy allows users to build multidimensional arrays and high-level mathematical functions.

- Fast numerical computations
- Takes up lesser storage than lists
- High-level math functions

```
# importando o pacote numpy
import numpy as np
#
harray = np.array(range(100))
print(type(harray))
#
print(harray.shape)
#
print(harray.size)
```

List vs Numpy?



np.array

Properties:

- Shape
- Size
- axis

Creation

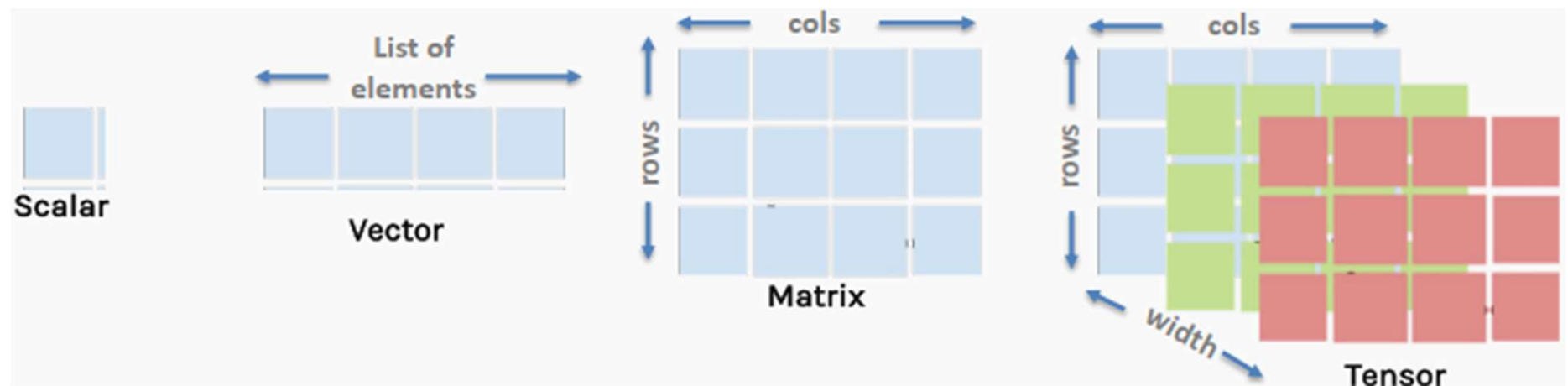
- zeros, ones
- arange, linspace

Operations

- Indexing & slicing
- reshape

The `array` is a central datastructure of the Numpy library

np.array



scalar

List

Pandas DataFrame

Tensor

20

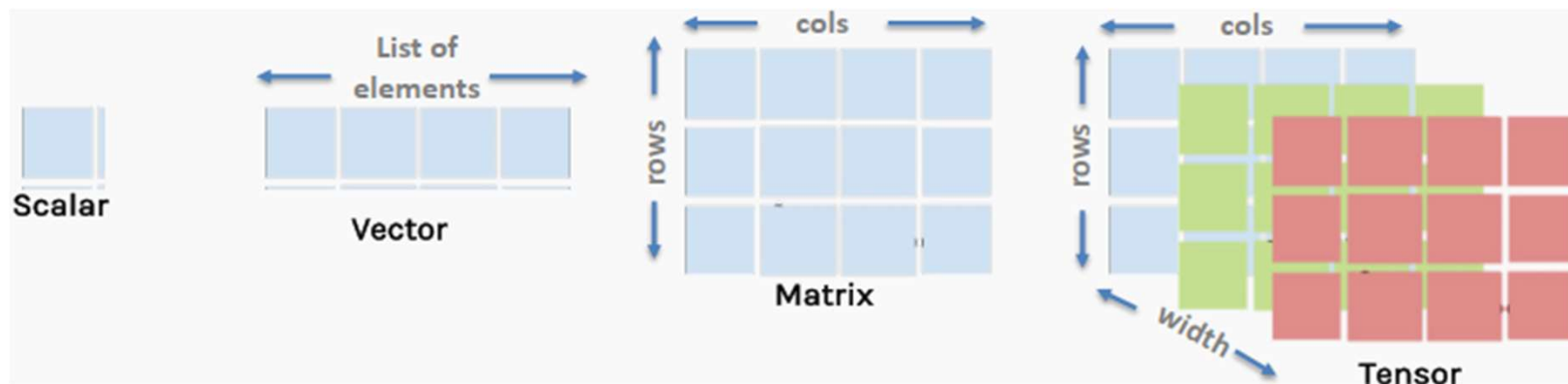
[10, 12, 45, 70]

Diagram illustrating a Pandas DataFrame structure with rows and columns.

Regd. No	Name	Marks%
1000	Steve	86.28
1001	Mathew	91.63
1002	Jose	72.90
1003	Patty	69.23
1004	Vin	88.30



np.ndarray

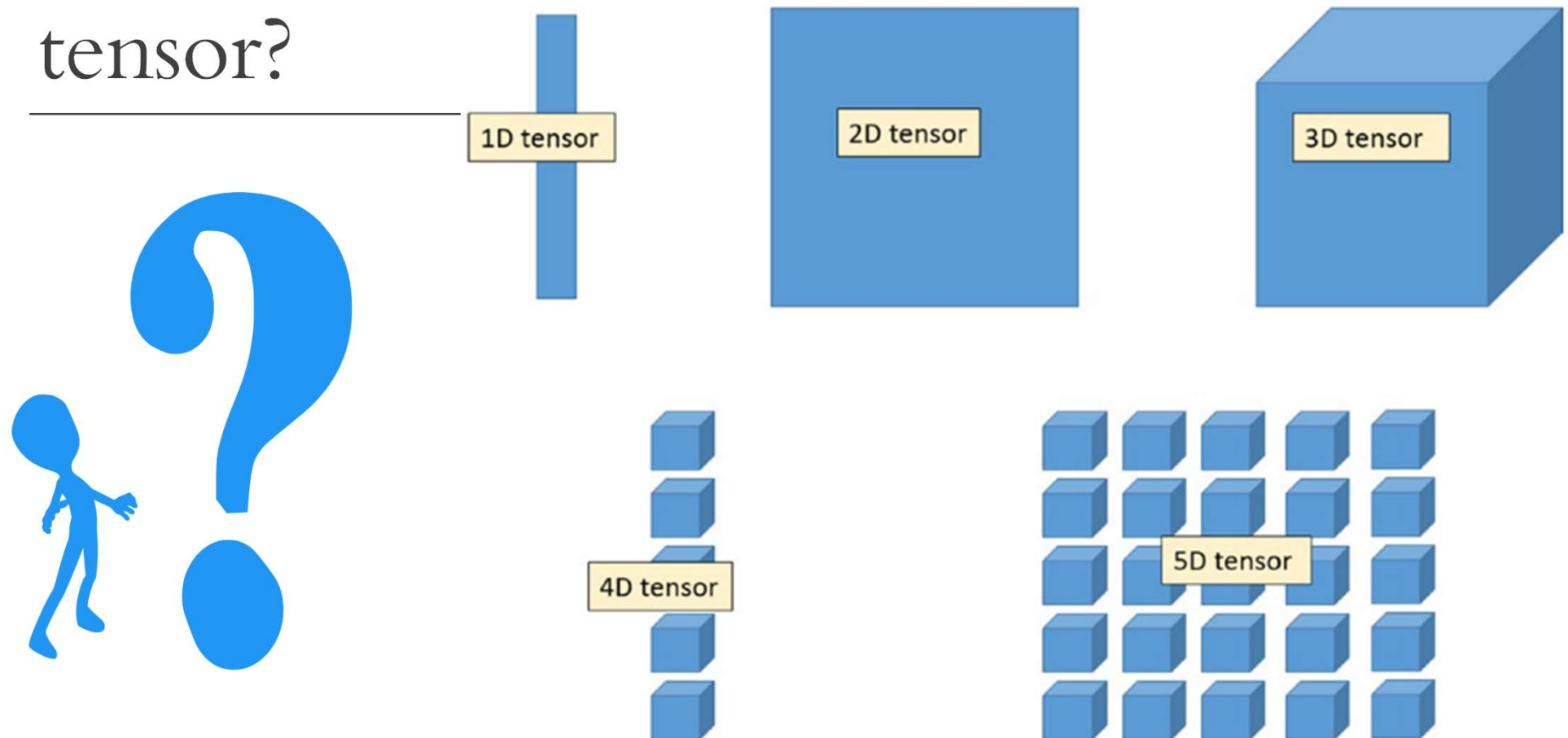


scalar	List	A pandas DataFrame	Tensor
<pre>age = 50 np.array(age) > array(50)</pre>	<pre>age_list= [10, 12, 45, 70] np.array(age_list) > array([10, 12, 45, 70])</pre>	<pre>a = np.array([[1, 2, 3, 4], [5, 6, 7, 8], [1, 2, 4, 3]]) np.array(a)</pre>	<pre>a = np.array([[[1,2,3],[5,6,7],[1,2,4],[1,2,4]] ,[1,2,3],[5,6,7],[1,2,4],[1,2,4]] ,[1,2,3],[5,6,7],[1,2,4],[1,2,4]]) print(np.array(a)) print(a.shape)</pre>

What is a tensor?

- A tensor is a generalization of vectors and matrices to potentially higher dimensions
- TensorFlow represents tensors as n-dimensional arrays of base data types
- When writing TensorFlow programs, the main object you manipulate and pass around is a `tf.Tensor` object
 - A `tf.Tensor` object consists of:
 - data type (float32, int32, string, etc.)
 - shape (e.g. 3 x 1 vector has shape (3, 1))

What is a tensor?

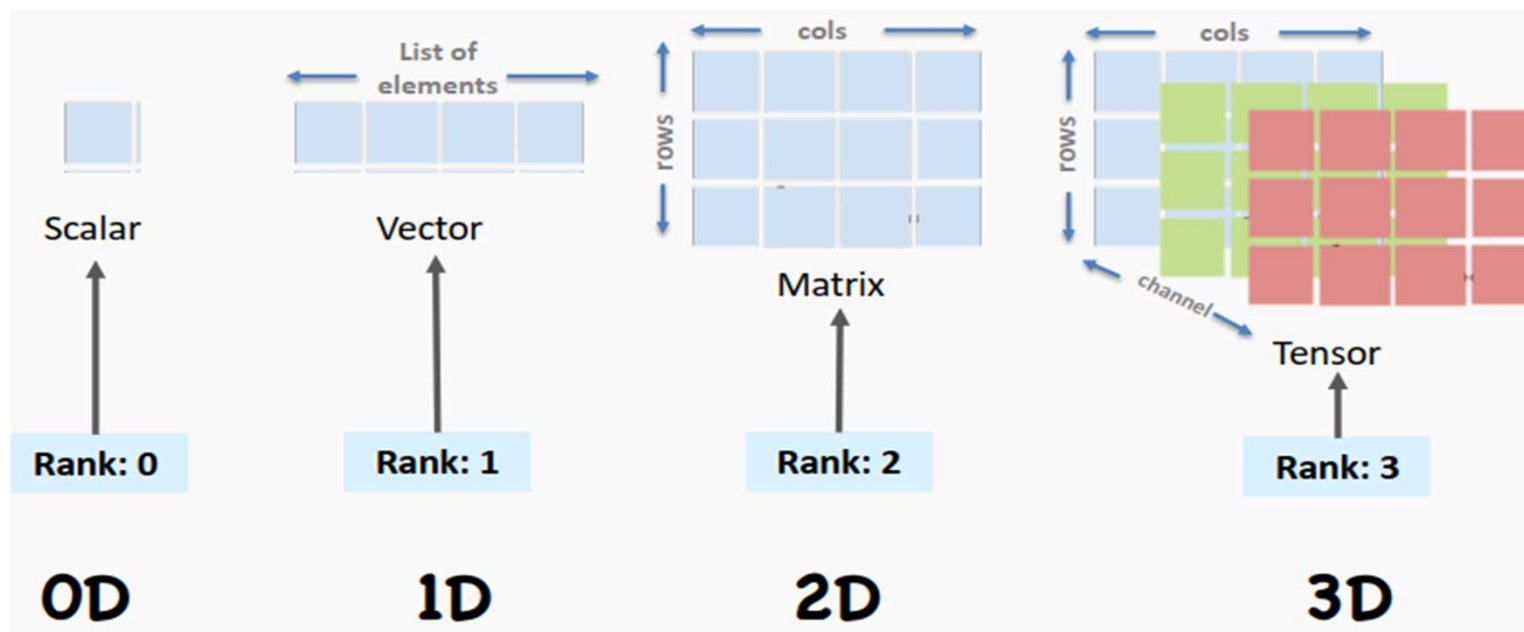


What is a tensor?

A tensor is identified by three parameters:

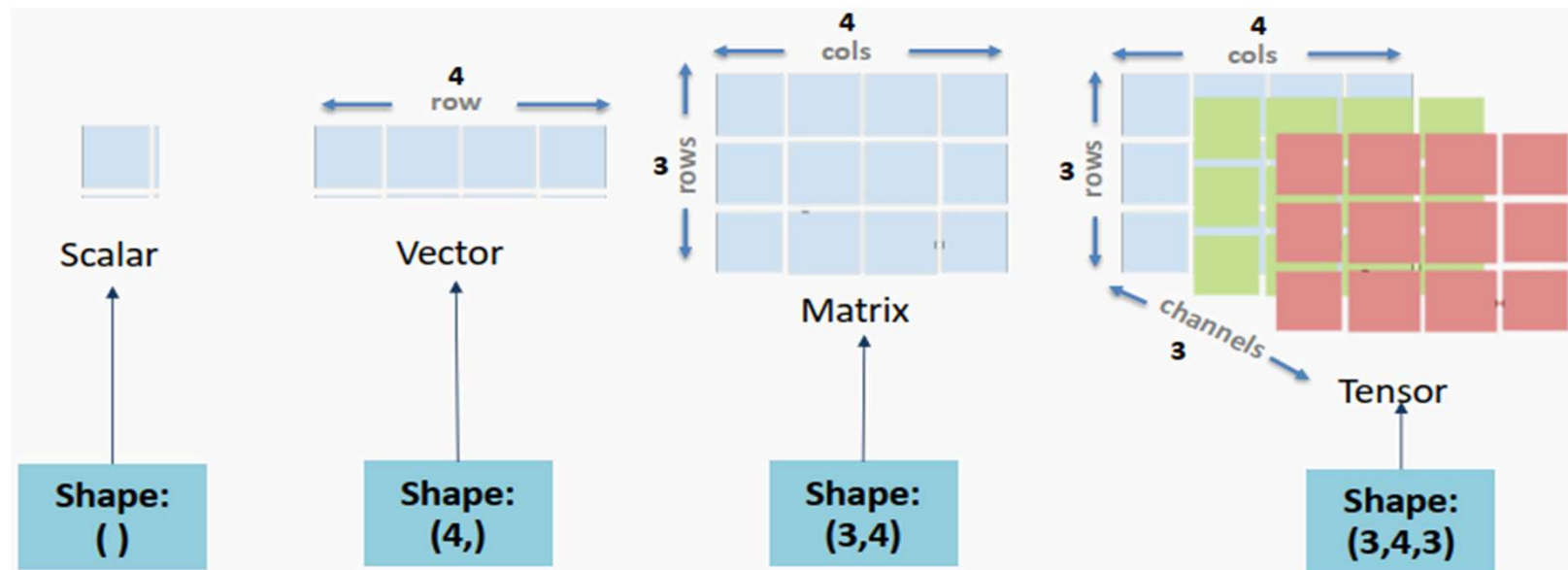
- Rank - Dimension of the tensor (a matrix has rank 2, a vector has rank 1)
- Shape - Number of rows and columns (e.g. (3,3) is a 3x3 matrix)
- Type -Type of tensor elements.

RANK



The **rank** of the array is the number of dimensions. `ndarray.ndim` will tell you the number of axes, or dimensions, of the array.

SHAPE



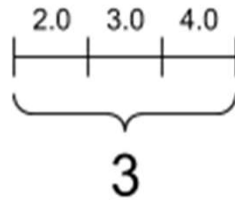
The **shape** of the array is the number of elements present in each dimension. `ndarray.shape` will display a tuple of integers that indicate the number of elements stored along each dimension of the array

SHAPE

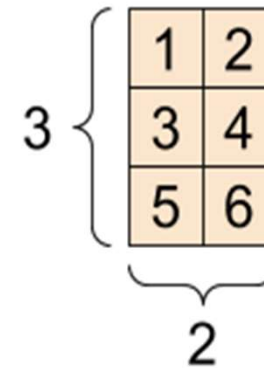
Um escalar, forma: []

4

Um vetor, forma: [3]



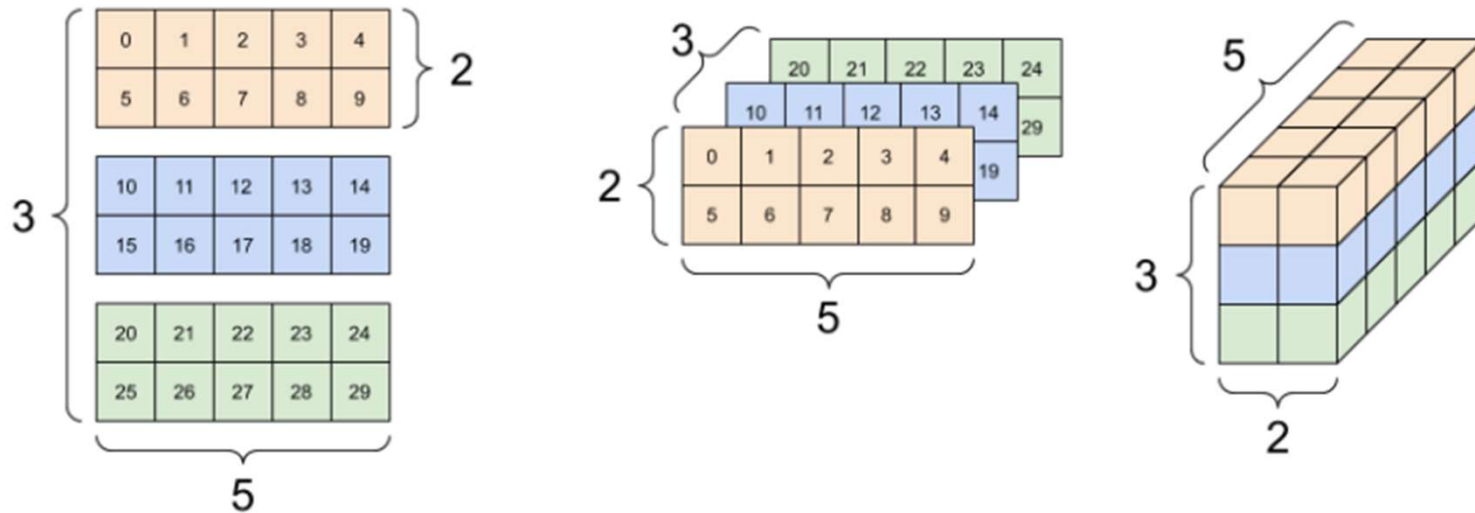
Uma matriz, forma: [3, 2]



The **shape** of the array is the number of elements present in each dimension.

SHAPE

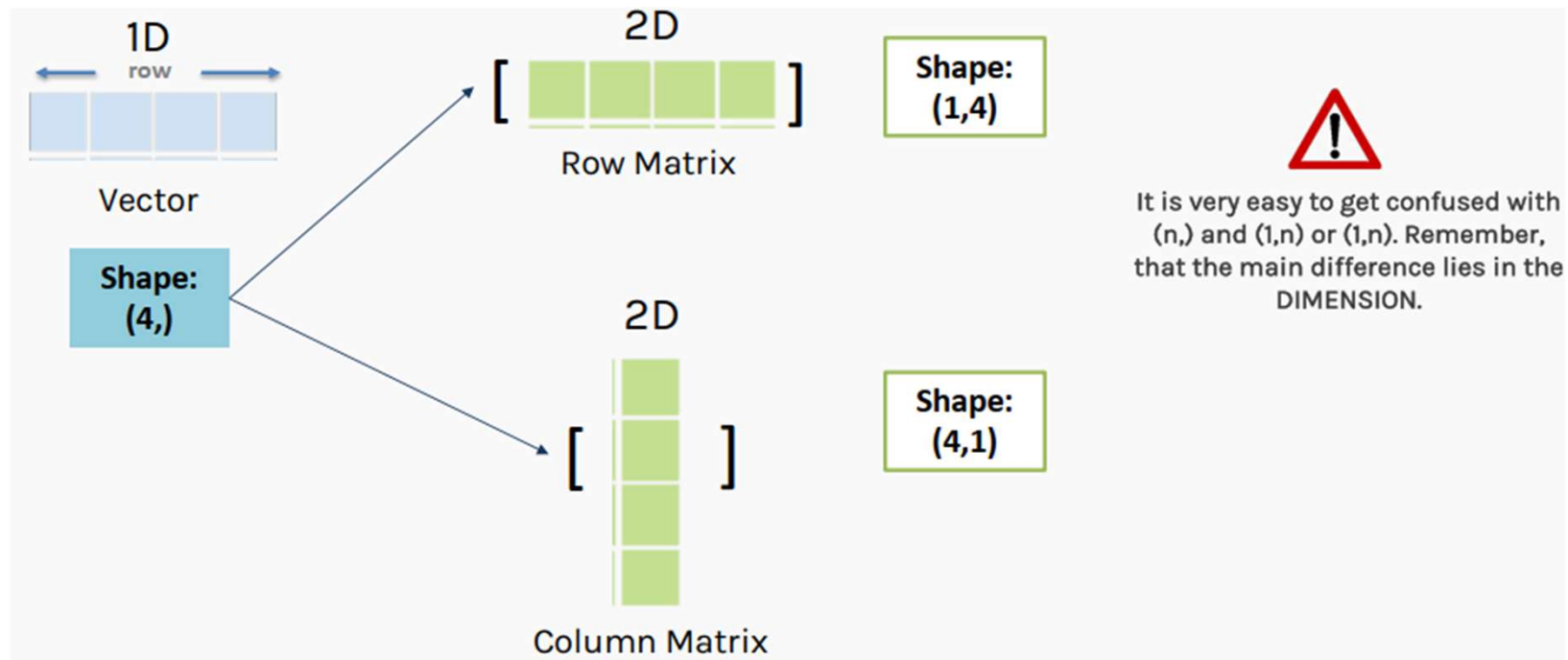
Um tensor de 3 eixos, forma: [3, 2, 5]



The **shape** of the array is the number of elements present in each dimension.

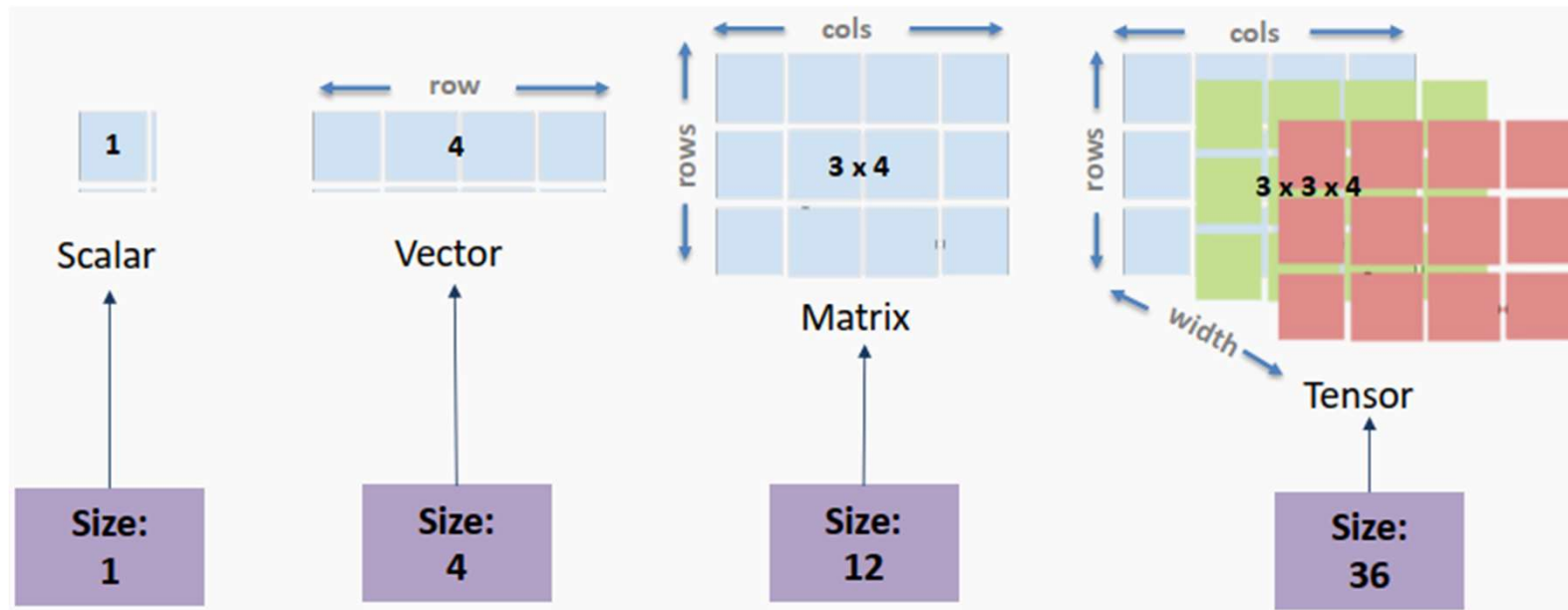
Properties & Attributes

Important to Note! A vector can be converted into a column or row matrix



Properties & Attributes

The `ndarray` is a central datastructure of the Numpy library.



The **size** of the array is the number of elements present. It is the product of elements in all dimensions. `ndarray.size` will tell you the total number of elements of the array.

References

1. Nelli, F. (2023). Python Data Analytics: With Pandas, NumPy, and Matplotlib. Apress.
<https://doi.org/10.1007/978-1-4842-9532-8>
2. Nelli, F. (2018). Python Data Analytics: With Pandas, NumPy, and Matplotlib. Apress.
<https://doi.org/10.1007/978-1-4842-3913-1>
3. Zadeh, R. B., & Ramsundar, B. (2018). TensorFlow for Deep Learning: From Linear Regression to Reinforcement Learning (1 ed.). O'Reilly Media, Inc.
4. Pattanayak, S. (2017). Pro Deep Learning with TensorFlow: A Mathematical Approach to Advanced Artificial Intelligence in Python. Apress. <https://doi.org/10.1007/978-1-4842-3096-1>
5. Internet