NUMPY
Modulo en python

POR: Guillermo Andres De Mendoza Corrales

Listas – Matrices

Ejemplo matriz 3x3

```python
matriz = [[1,2,3],[4,5,6],[7,8,9]]
print(matriz)
```

```
[[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

Listas – Matrices

Ejemplo matriz 3x3

```
matriz = [[1,2,3],[4,5,6],[7,8,9]]
print(matriz)
```

```
[[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

Listas – Matrices

$$\texttt{matriz = [}\overbrace{[\underbrace{1}_{0},\underbrace{2}_{1},\underbrace{3}_{2}]}^{0},\overbrace{[\underbrace{4}_{0},\underbrace{5}_{1},\underbrace{6}_{2}]}^{1},\overbrace{[\underbrace{7}_{0},\underbrace{8}_{1},\underbrace{9}_{2}]}^{2}\texttt{]}$$

Obtener elemento individual

```
print(matriz[1][1])
```

```
5
```

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

Listas – Matrices

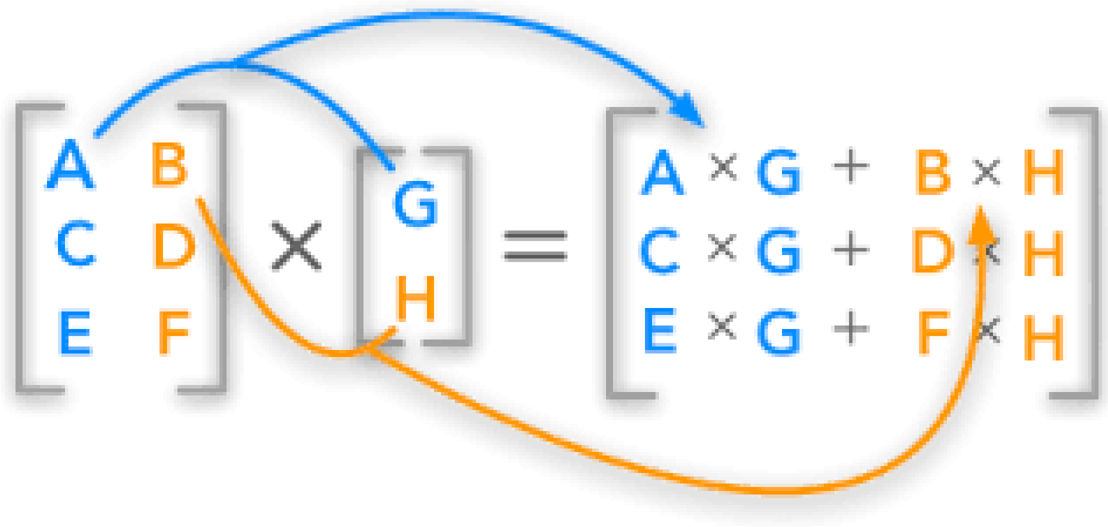
Imprimir todos los elementos

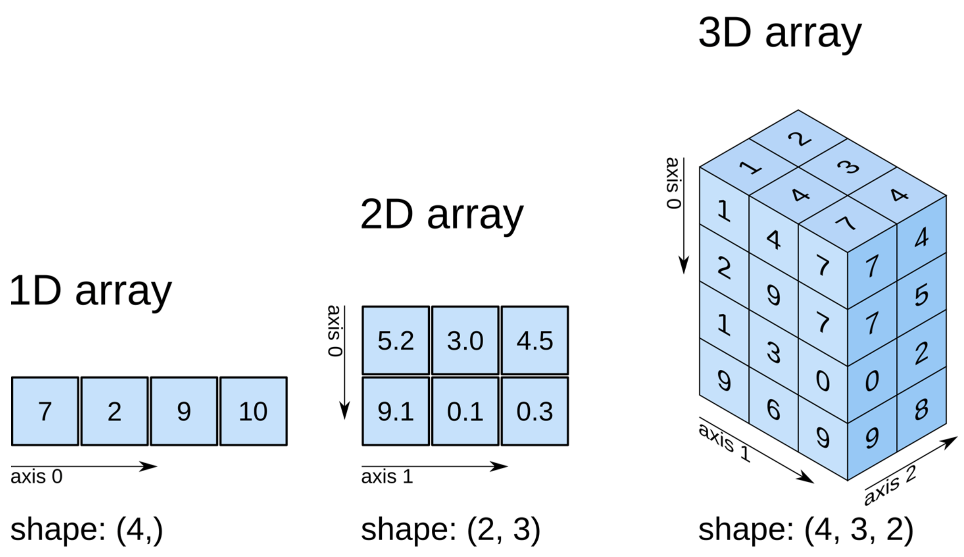
```
for fila in range(0,len(matriz)):
    for columna in range(0,len(matriz[fila])):
        print("[%d][%d] = %d"%(fila,columna,matriz[fila][columna]))
```

```
[0][0] = 1
[0][1] = 2
[0][2] = 3
[1][0] = 4
[1][1] = 5
[1][2] = 6
[2][0] = 7
[2][1] = 8
[2][2] = 9
```

Libreria

Numpy: https://numpy.org/doc/stable/reference/generated/numpy.ndarray.html#numpy.ndarray





Libreria

Numpy: https://numpy.org/doc/stable/reference/generated/numpy.ndarray.html#numpy.ndarray

```
import numpy as np
```

Numpy – crear matriz desde una lista

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
M2 = np.array( [[1,0,0],[0,1,0],[0,0,1]] )
print(M2)
```

```
[[1 0 0]
 [0 1 0]
 [0 0 1]]
```

*las listas y los numpy se comportan igual pero son objetos diferentes

Numpy – crear matriz automatica

filas columnas

```python
M3 = np.zeros( [3,4] )
print(M3)
```

```
[[0. 0. 0. 0.]
 [0. 0. 0. 0.]
 [0. 0. 0. 0.]]
```

Numpy – crear matriz automatica

filas columnas

```
M3 = np.ones( [3,4] )
print(M3)
```

```
[[1. 1. 1. 1.]
 [1. 1. 1. 1.]
 [1. 1. 1. 1.]]
```

Numpy – shape

```
M3 = np.zeros( [3,4] )
print(M3)
```

```
[[0. 0. 0. 0.]
 [0. 0. 0. 0.]
 [0. 0. 0. 0.]]
```

```
M3.shape
```

```
(3, 4)
```

Numpy – sumar

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
M2 = np.array( [[1,0,0],[0,1,0],[0,0,1]] )
print(M2)
```

```
[[1 0 0]
 [0 1 0]
 [0 0 1]]
```

```
Msuma = M1 + M2
print(Msuma)
```

```
[[ 2  2  3]
 [ 4  6  6]
 [ 7  8 10]]
```

Numpy – multiplicar

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
M2 = np.array( [[1,0,0],[0,1,0],[0,0,1]] )
print(M2)
```

```
[[1 0 0]
 [0 1 0]
 [0 0 1]]
```

```
Mmultiplicacion = np.dot(M1, M2)
print(Mmultiplicacion)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

Numpy – multiplicar

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
Mmultiplicacion = 3 * M1
print(Mmultiplicacion)
```

```
[[ 3  6  9]
 [12 15 18]
 [21 24 27]]
```

Numpy – determinante

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
M1determinante = np.linalg.det(M1)
print(M1determinante)
```

```
-9.51619735392994e-16
```

Numpy – invertir

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
M1invertida = np.linalg.inv(M1)
print(M1invertida)
```

```
[[ 3.15251974e+15 -6.30503948e+15  3.15251974e+15]
 [-6.30503948e+15  1.26100790e+16 -6.30503948e+15]
 [ 3.15251974e+15 -6.30503948e+15  3.15251974e+15]]
```

Numpy – transpuesta

```
M1 = np.array( [[1,2,3],[4,5,6],[7,8,9]] )
print(M1)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
M1transpuesta = M1.T
print(M1transpuesta)
```

```
[[1 4 7]
 [2 5 8]
 [3 6 9]]
```

Numpy – modify value

```
M1 = np.array([[1, 2, 3], [4, 5, 6], [7,8,9]])
M1[1][1] = 0
print(M1)
```

```
[[1 2 3]
 [4 0 6]
 [7 8 9]]
```

Numpy – generar samples X

Init End Samples

```
X = np.linspace(-1,1,50)
print(X)
```

```
[-1.         -0.95918367 -0.91836735 -0.87755102 -0.83673469 -0.79591837
 -0.75510204 -0.71428571 -0.67346939 -0.63265306 -0.59183673 -0.55102041
 -0.51020408 -0.46938776 -0.42857143 -0.3877551  -0.34693878 -0.30612245
 -0.26530612 -0.2244898  -0.18367347 -0.14285714 -0.10204082 -0.06122449
 -0.02040816  0.02040816  0.06122449  0.10204082  0.14285714  0.18367347
  0.2244898   0.26530612  0.30612245  0.34693878  0.3877551   0.42857143
  0.46938776  0.51020408  0.55102041  0.59183673  0.63265306  0.67346939
  0.71428571  0.75510204  0.79591837  0.83673469  0.87755102  0.91836735
  0.95918367  1.        ]
```

Numpy – generar samples FNormal

Distribución normal: of mean 0 and variance 1

```
M = np.random.randn(10)
print(M)
```

```
[ 1.17226855 -0.15268709  0.98457968  0.17050347 -0.86151484  0.2404382
  0.87838827  0.07127004  0.43030506  1.0120156 ]
```

Numpy – contiene multiples distribuciones

```
np.random.
```

f	beta	function
f	binomial	function
m	bit_generator	module
c	BitGenerator	class
f	bytes	function
f	chisquare	function
f	choice	function
f	default_rng	function
f	dirichlet	function
f	exponential	function

```
np.random.
```

f	hypergeometric	function
f	laplace	function
f	logistic	function
f	lognormal	function
f	logseries	function
c	MT19937	class
m	mtrand	module
f	multinomial	function
f	multivariate_normal	function
f	negative_binomial	function

Numpy – generar samples FNormal

Distribución normal: of mean 0 and variance 1

```
M = np.random.randn(3,3)
print(M)
```

```
[[ 1.61582641  1.10031642 -0.4840879 ]
 [ 0.73353939 -1.76448134  2.08425915]
 [-0.90475599 -1.12374196 -0.20284926]]
```

Numpy – append

vector

```
arr = np.array([1, 2, 3])
arr_nuevo = np.append(arr, 4)
print(arr_nuevo)
```

```
[1 2 3 4]
```

matrix

```
M = np.array([[1, 2, 3], [4, 5, 6]])
M_nueva = np.append(M, [[7, 8, 9]], axis=0)
print(M_nueva)
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

Numpy – insert

```
M = np.array([[1, 2, 3], [4, 5, 6]])
M_nueva = np.insert(M, 1, [[7, 8, 9]], axis=0)
print(M_nueva)
```

```
[[1 2 3]
 [7 8 9]
 [4 5 6]]
```

Numpy – eliminar

```
M = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]])
M_new = np.delete(M, 1, axis=0)
print(M_new)
```

```
[[1 2 3]
 [7 8 9]]
```