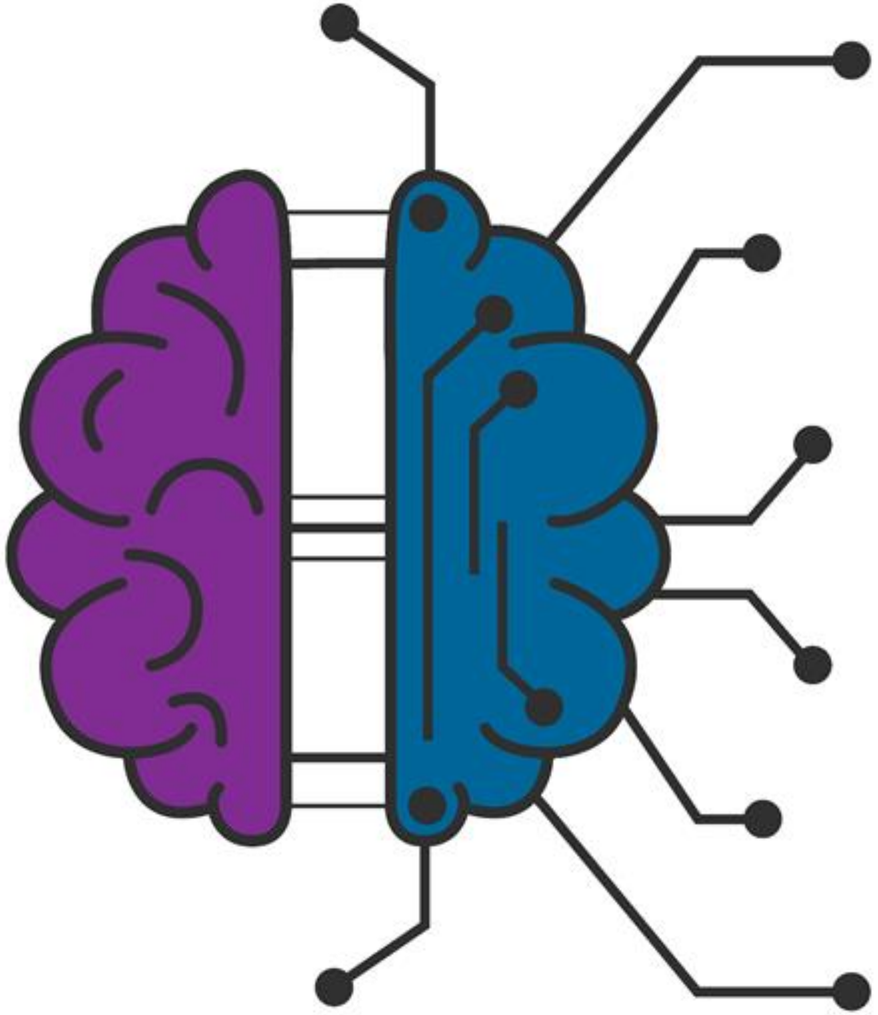

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Introdução à Redes Neurais com Python

Dos primeiros passos até o desenvolvimento avançado em Redes Neurais

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Conteúdo Programático

1. Gestão de pacotes e ambientes em Python
    1. Anaconda
    2. Jupyter Notebook
    3. Google Colab
2. Pacotes essenciais ao desenvolvimento de RNA com Python
    1. Numpy
    2. Pandas
3. Machine Learning
    1. Regressão Linear
    2. Classificação
    3. Clustering (K-means)

Pacotes essenciais ao desenvolvimento de RNA com Python: Numpy

NumPy

O que é o NumPy?

O NumPy é biblioteca aberta para computação científica com um grande suporte para manipulação de vetores multidimensionais. O NumPy fornece grande conjuntos de funções facilitando cálculos numéricos.

Porque utilizar NumPy?

- Utiliza menos memoria que uma implementação em python

- Maior performance (Mais rapido)

- Muitas funcionalidades desenvolvidas para agilizar o calculo numérico.

Biblioteca Numpy

Numpy manipula uma estrutura especial de dados:

Classe **ndarray:**

- Estrutura parecida com as Listas
- Classe possui diversos atributos e funções.

Primeiros passos

❑Importanto a biblioteca:

```
import numpy as np
```

❑Verificando a dimensão de um vetor:

Ex: Matriz A: m x n

```
A.shape
```

❑Verificar o tipo de dados do vetor:

```
A.Dtype
```

Ex: int32, float64

❑Converter uma lista para vetor numpy:

```
np.array(var_list)
```

Criando arrays

❑Criando vetores inicializado com valor um ou zero:

```
np.ones((3,4))
np.zeros((2,3,4))
```

❑Identidade:

```
np.identity(3,2)
```

❑Criar um vetor com valores aleatórios:

```
np.random.random(3,2)
```

❑Criar uma matriz de valores com espaçamento uniforme:

```
np.arange(10, 25, 5)
```

Operação com arrays

Por padrão as operações são realizadas elemento a elemento.

```
A = np.array([[1, 1],
              [0, 1]])
B = np.array([[2, 0],
              [3, 4]])

C = A * B
```

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 0 \\ 3 & 4 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix}$$

Para realizar multiplicação matricial utilizamos o operador @ ou o método np.dot

```
D = A @ B
D = np.dot(A,B)
```

$$D = \begin{bmatrix} 5 & 4 \\ 3 & 4 \end{bmatrix}$$

Hora da prática

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Python For Data Science *Cheat Sheet*

NumPy Basics

Learn Python for Data Science Interactively at www.DataCamp.com

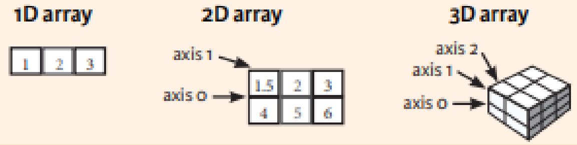
NumPy

The **NumPy** library is the core library for scientific computing in Python. It provides a high-performance multidimensional array object, and tools for working with these arrays.

Use the following import convention:

```
>>> import numpy as np
```

NumPy Arrays



Creating Arrays

```
>>> a = np.array([1,2,3])
>>> b = np.array([(1.5,2,3), (4,5,6)], dtype = float)
>>> c = np.array([[(1.5,2,3), (4,5,6)], [(3,2,1), (4,5,6)]],
                 dtype = float)
```

Initial Placeholders

`>>> np.zeros((3,4))`	Create an array of zeros
`>>> np.ones((2,3,4),dtype=np.int16)`	Create an array of ones
`>>> d = np.arange(10,25,5)`	Create an array of evenly spaced values (step value)
`>>> np.linspace(0,2,9)`	Create an array of evenly spaced values (number of samples)
`>>> e = np.full((2,2),7)`	Create a constant array
`>>> f = np.eye(2)`	Create a 2X2 identity matrix
`>>> np.random.random((2,2))`	Create an array with random values
`>>> np.empty((3,2))`	Create an empty array

I/O

Saving & Loading On Disk

```
>>> np.save('my_array', a)
>>> np.savez('array.npz', a, b)
>>> np.load('my_array.npy')
```

Saving & Loading Text Files

```
>>> np.loadtxt("myfile.txt")
>>> np.genfromtxt("my_file.csv", delimiter=',')
>>> np.savetxt("myarray.txt", a, delimiter=" ")
```

Data Types

`>>> np.int64`	Signed 64-bit integer types
`>>> np.float32`	Standard double-precision floating point
`>>> np.complex`	Complex numbers represented by 128 floats
`>>> np.bool`	Boolean type storing `TRUE` and `FALSE` values
`>>> np.object`	Python object type
`>>> np.string_`	Fixed-length string type
`>>> np.unicode_`	Fixed-length unicode type

Inspecting Your Array

`>>> a.shape`	Array dimensions
`>>> len(a)`	Length of array
`>>> b.ndim`	Number of array dimensions
`>>> e.size`	Number of array elements
`>>> b.dtype`	Data type of array elements
`>>> b.dtype.name`	Name of data type
`>>> b.astype(int)`	Convert an array to a different type

Asking For Help

```
>>> np.info(np.ndarray.dtype)
```

Array Mathematics

Arithmetic Operations

`>>> g = a - b`
`array([[-0.5,  0. ,  0. ],`
`       [-3. , -3. , -3. ]])`
	Subtraction

`>>> np.subtract(a,b)`	Subtraction

`>>> b + a`
`array([[ 2.5,  4. ,  6. ],`
`       [ 5. ,  7. ,  9. ]])`
	Addition

`>>> np.add(b,a)`	Addition

`>>> a / b`
`array([[ 0.66666667, 1.        , 1.        ],`
`       [ 0.25      , 0.4       , 0.5       ]])`
	Division

`>>> np.divide(a,b)`	Division

`>>> a * b`
`array([[  1.5,   4. ,   9. ],`
`       [  4. ,  10. ,  18. ]])`
	Multiplication

`>>> np.multiply(a,b)`	Multiplication
`>>> np.exp(b)`	Exponentiation
`>>> np.sqrt(b)`	Square root
`>>> np.sin(a)`	Print sines of an array
`>>> np.cos(b)`	Element-wise cosine
`>>> np.log(a)`	Element-wise natural logarithm

`>>> e.dot(f)`
`array([[ 7.,  7.],`
`       [ 7.,  7.]])`
	Dot product

Comparison

`>>> a == b`
`array([[False,  True,  True],`
`       [False, False, False]], dtype=bool)`
	Element-wise comparison

`>>> a < 2`
`array([True, False, False], dtype=bool)`
	Element-wise comparison

`>>> np.array_equal(a, b)`	Array-wise comparison

Aggregate Functions

`>>> a.sum()`	Array-wise sum
`>>> a.min()`	Array-wise minimum value
`>>> b.max(axis=0)`	Maximum value of an array row
`>>> b.cumsum(axis=1)`	Cumulative sum of the elements
`>>> a.mean()`	Mean
`>>> b.median()`	Median
`>>> a.corrcoef()`	Correlation coefficient
`>>> np.std(b)`	Standard deviation

Copying Arrays

`>>> h = a.view()`	Create a view of the array with the same data
`>>> np.copy(a)`	Create a copy of the array
`>>> h = a.copy()`	Create a deep copy of the array

Sorting Arrays

`>>> a.sort()`	Sort an array
`>>> c.sort(axis=0)`	Sort the elements of an array's axis

Subsetting, Slicing, Indexing

Also see Lists

Subsetting

`>>> a[2]`
`3`
		Select the element at the 2nd index

`>>> b[1,2]`
`6.0`
		Select the element at row 1 column 2 (equivalent to `b[1][2]`)

Slicing

`>>> a[0:2]`
`array([1, 2])`
		Select items at index 0 and 1

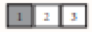
`>>> b[0:2,1]`
`array([ 2.,  5.])`
		Select items at rows 0 and 1 in column 1

`>>> b[:1]`
`array([[1.5, 2., 3.]])`
		Select all items at row 0 (equivalent to `b[0:1, :]`)

`>>> c[1,...]`
`array([[[ 3.,  2.,  1.],`
`        [ 4.,  5.,  6.]]])`
		Same as `[1,:,:]`

`>>> a[ : :-1]`
`array([3, 2, 1])`
		Reversed array `a`

Boolean Indexing

`>>> a[a<2]`
`array([1])`
		Select elements from `a` less than 2

Fancy Indexing

`>>> b[[1, 0, 1, 0],[0, 1, 2, 0]]`
`array([ 4. , 2. , 6. , 1.5])`
	Select elements `(1,0)`,`(0,1)`,`(1,2)` and `(0,0)`

`>>> b[[1, 0, 1, 0]][:,[0,1,2,0]]`
`array([[ 4. ,5. , 6. , 4. ],`
`       [ 1.5, 2. , 3. , 1.5],`
`       [ 4. , 5. , 6. , 4. ],`
`       [ 1.5, 2. , 3. , 1.5]])`
	Select a subset of the matrix's rows and columns

Array Manipulation

Transposing Array

`>>> i = np.transpose(b)`	Permute array dimensions
`>>> i.T`	Permute array dimensions

Changing Array Shape

`>>> b.ravel()`	Flatten the array
`>>> g.reshape(3,-2)`	Reshape, but don't change data

Adding/Removing Elements

`>>> h.resize((2,6))`	Return a new array with shape (2,6)
`>>> np.append(h,g)`	Append items to an array
`>>> np.insert(a, 1, 5)`	Insert items in an array
`>>> np.delete(a,[1])`	Delete items from an array

Combining Arrays

`>>> np.concatenate((a,d),axis=0)`
`array([ 1,  2,  3, 10, 15, 20])`
	Concatenate arrays

`>>> np.vstack((a,b))`
`array([[ 1. ,  2. ,  3. ],`
`       [ 1.5,  2. ,  3. ],`
`       [ 4. ,  5. ,  6. ]])`
	Stack arrays vertically (row-wise)

`>>> np.r_[e,f]`	Stack arrays vertically (row-wise)

`>>> np.hstack((e,f))`
`array([[ 7.,  7.,  1.,  0.],`
`       [ 7.,  7.,  0.,  1.]])`
	Stack arrays horizontally (column-wise)

`>>> np.column_stack((a,d))`
`array([[ 1, 10],`
`       [ 2, 15],`
`       [ 3, 20]])`
	Create stacked column-wise arrays

`>>> np.c_[a,d]`	Create stacked column-wise arrays

Splitting Arrays

`>>> np.hsplit(a,3)`
`[array([1]),array([2]),array([3])]`
	Split the array horizontally at the 3rd index

`>>> np.vsplit(c,2)`
`[array([[[ 1.5,  2. ,  1. ],`
`        [ 4. ,  5. ,  6. ]]]),`
` array([[[ 3.,  2.,  3.],`
`        [ 4.,  5.,  6.]]])]`
	Split the array vertically at the 2nd index

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OBRIGADO!

Repositório GitHub:
https://github.com/Skyzenho/ArtIEEEficiais

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