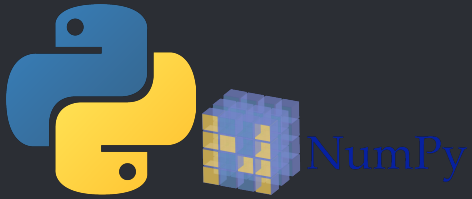
FACULTAD DE INGENIERIA
Universidad de Buenos Aires

Procesamiento de señales, fundamentos

Maestría en sistemas embebidos
Universidad de Buenos Aires
MSE 5Co2020

Introducción a Python y NumPy



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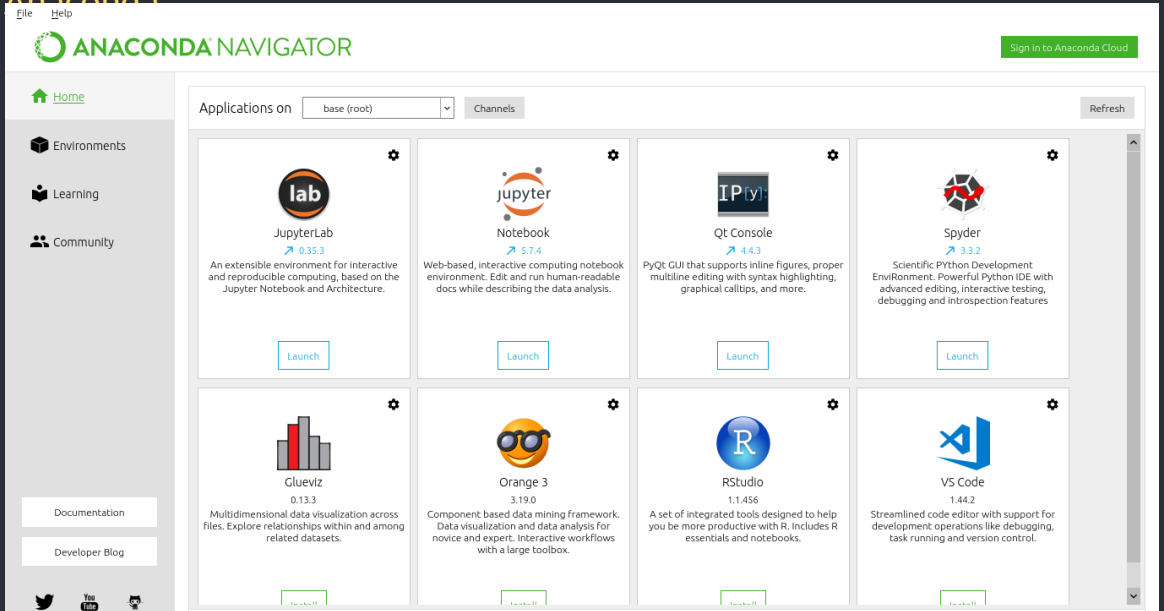
Anaconda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0.35.3
An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.
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Notebook
5.7.4
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
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Qt Console
4.4.3
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
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Spyder
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Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
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Glueviz
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Multidimensional data visualization across files. Explore relationships within and among related datasets.
Orange 3
3.19.0
Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.
RStudio
1.1.456
A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks.
VS Code
1.44.2
Streamlined code editor with support for development operations like debugging, task running and version control.

Anaconda

jupyter-notebook

Engineered Arts Cha | (1) WhatsApp | Home | Untitled

localhost:8889/notebooks/Untitled.ipynb?kernel_name=python3# 110%

jupyter Untitled Last Checkpoint: 5 minutes ago (unsaved changes)

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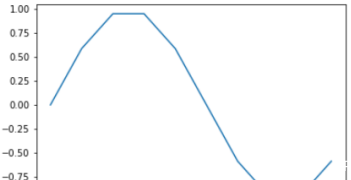
Trusted | Python 3

Run | Markdown

Esto es un notebook

In [9]:

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 t=np.arange(0,1,0.1)
5 signal=np.sin(2*np.pi*t)
6
7 plt.plot(t,signal)
8 plt.show()
9
```



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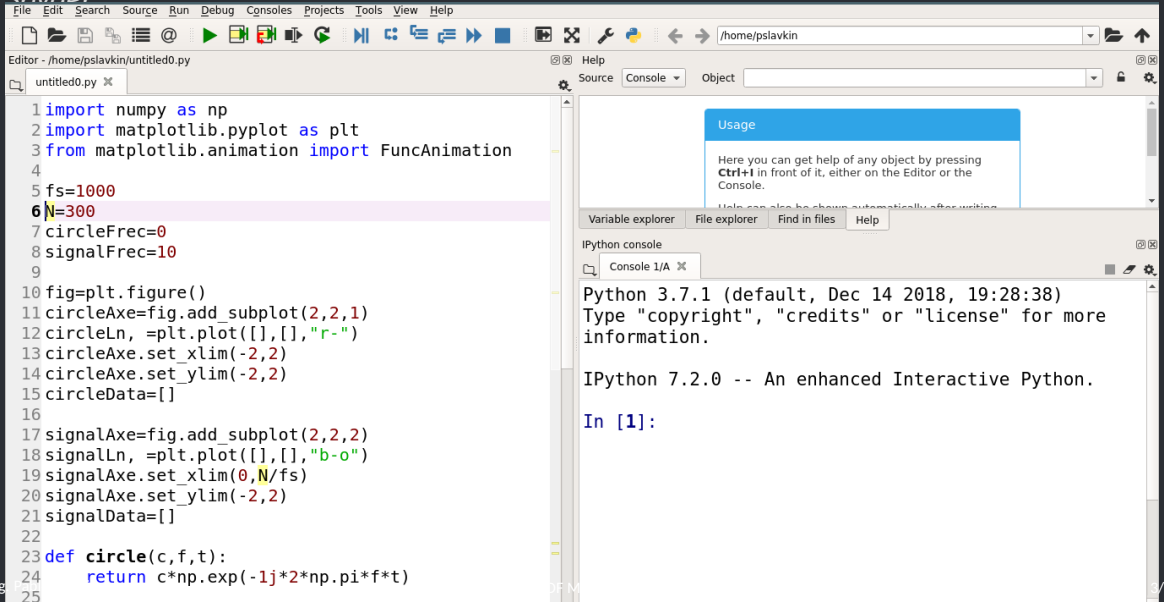
Spyder



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Ipython

```
pslavkin@work1:/h/p/m/clases$ ipython3
/usr/local/lib/python3.7/site-packages/IPython/core/history.py:226: UserWar
ning: IPython History requires SQLite, your history will not be saved
  warn("IPython History requires SQLite, your history will not be saved")
Python 3.7.3 (default, Nov  5 2019, 00:08:28)
Type 'copyright', 'credits' or 'license' for more information
IPython 7.9.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: a=[1,2,3]

In [2]: print(a)
[1, 2, 3]

In [3]:
```

python

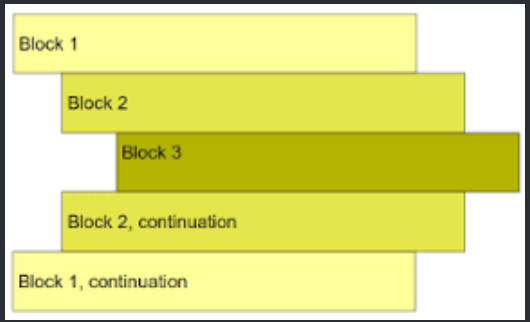
python

```
pslavkin@work1:/h/pslavkin$ python3
Python 3.7.3 (default, Dec 20 2019, 18:57:59)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> a="soy python"
>>> print(a)
soy python
>>>
```

Introducción

- Lenguaje Interpretado
- Tipado dinámico: El tipo se define en tiempo de ejecución
- Fuertemente tipado: Durante las operaciones se chequea el tipo

Indentación




```
mi_variable = 27
mi_flag     = True

if mi_flag:
    while mi_variable > 0:
        print(mi_variable)
        mi_variable-=1
```

Números

- Enteros: Con signo, sin límite
- Punto flotante
- Complejos
- Booleanos

```
nint     = 27
nfloat   = 3.14
ncomplex = 1+2j

print(type(nint))
print(type(nfloat))
print(type(ncomplex))
------------------------
>> <class 'int'>
>> <class 'float'>
>> <class 'complex'>

flag1 = True
flag2 = False

print(type(flag1))
print(flag2)

if flag1:
    print("verdadero!")
------------------------
>> <class 'bool'>
>> False
>> verdadero!
```

Cadenas

- Strings: se guardan codificadas. Ej. UTF8 y son inmutables
- Byte array: sin codificar, raw, son mutables

```
msg = "Hola mundo"
msg = 'Hola mundo'

print(msg)
print(msg[2])
print(msg[5:10])
-----------------------------
>> Hola mundo
>> l
>> mundo

b = bytearray()
b.append(0x02)
b.append(0x10)
b.append(0x05)
b.append(0x10)
b.append(0x03)
print(b)
print(b[3])
print(len(b))
-----------------------------
>> bytearray(b'\x02\x10\x05\x10\x03')
>> 16
>> 5
```

Listas

```
l = [1, 2, 3, 4, 5 ];
print(l)
for i in l:
    print(i)
----------------------
>>
[1, 2, 3, 4, 5]
1
2
3
4
l = [1, 2, 3, "casa", 5.2 ];
print(l[2])
print(l[-1])
print(l[1:4])
----------------------
>> 3
>> 5.2
>> [2, 3, "casa"]
l.append(6)
l.remove(2) #por valor
print(l)
----------------------
>> [1, 3, "casa" , 5.2, 6]
lista = [1, 2, 3, 4, 5 ];
cantidad_elementos = len(lista)
print(cantidad_elementos)
----------------------
>> 5
```

funciones

```
def miFuncion(arg1,arg2,arg3=1):
    print(arg1)
    print(arg2)
    print(arg3)
    return 5,6,7

cinco,seis,siete = miFuncion(1,2)
miFuncion("hola",arg2=2+1j,arg3=3)
```

NumPy

arrays

```
a=np.array([1,2,3])
print(type(a))
print(a)
print(a+1)
-----------------------------
>>numpy.ndarray
>>[1 2 3]
>>[2 3 4]
```

NumPy

linspace, arange

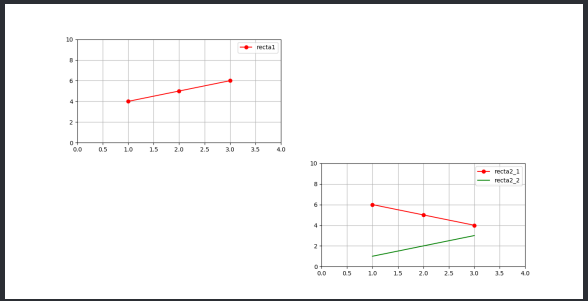
```
import numpy as np

a=np.linspace(0,1,10)
print(a)
b=np.linspace(0,1,10,endpoint=False)
print(b)
c=np.arange(0,1,0.1)
print(c)
print(c[:2])
print(c[2:])
print(c[2:2])
print(c[::2])
print(c[::-1])
print(c[2])
print(c[-2])
for i in c:
    print(i)
------------------------------
```

```
>>[0. 0.11111111 0.22222222 0.33333333 0.44444444
     0.55555556 0.66666667 0.77777778 0.88888889 1.]
>>[0.  0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9]
>>[0.  0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9]
>>[0.  0.1]
>>[0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9]
>>[]
>>[0.  0.2 0.4 0.6 0.8]
>>[0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0. ]
>>0.2
>>0.8
>>0.0
>>0.1
>>0.2
>>0.30000000000000004
>>0.4
>>0.5
>>0.6000000000000001
>>0.7000000000000001
>>0.8
>>0.9
```

matplotlib

pyplot

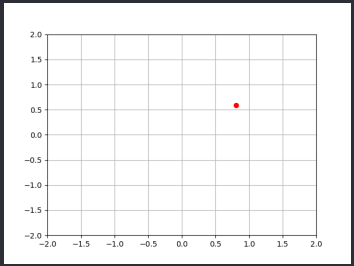
```
import matplotlib.pyplot as plt

fig      = plt.figure()

graph1Axe = fig.add_subplot(2,2,1)
graph1Ln1, = plt.plot([1,2,3],[4,5,6],'r-o')

graph1Axe.grid                    ( True     )
graph1Axe.set_xlim                ( 0,4      )
graph1Axe.set_ylim                ( 0,10     )
graph1Ln1.set_label               ( "recta1" )
graph1legendLn    = graph1Axe.legend (         )

data2_1=[6,5,4]
data2_2=[1,2,3]
t=[1,2,3]
graph2Axe           = fig.add_subplot(2,2,4)
graph2Ln1,graph2Ln2 = plt.plot(t,data2_1,'r-o', t,data2_2,'g-',)

graph2Axe.grid                    ( True       )
graph2Axe.set_xlim                ( 0,4        )
graph2Axe.set_ylim                ( 0,10       )
graph2Ln1.set_label               ( "recta2_1" )
graph2Ln2.set_label               ( "recta2_2" )
graph2legendLn    = graph2Axe.legend (           )

plt.show ( )
```

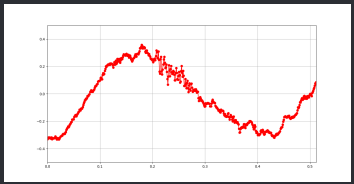


FuncAnimation

Animation

```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.animation import FuncAnimation

fig       = plt.figure ( )
fs        = 10
N         = 10
circleAxe = fig.add_subplot(1,1,1)
circleLn, = plt.plot([],[],'ro')
circleAxe.grid(True)
circleAxe.set_xlim(-2,2)
circleAxe.set_ylim(-2,2)
circleFrec = 1
circle  = lambda c,f,n: c*np.exp(-1j*2*np.pi*f*n*1/fs)

def update(n):
    circleLn.set_data(np.real(circle(1 ,circleFrec ,n)) ,np.
         imag(circle(1 ,circleFrec ,n)))
    return circleLn,

ani=FuncAnimation(fig,update,N,interval=1000 ,blit=False,
      repeat=True)
plt.show()
```





Módulos y paquetes

Módulos:

defino un archivo:

```
mi_modulo.py
# en minuscula
def func1():
    print("f1")
def func2():
    print("f2")
-----------------
import mi_modulo
mi_modulo.func1()
-----------------
>>f1
```

Paquetes:

```
|-- paquete
|   |-- __init__.py
|   |-- mi_modulo1
|   |   |-- mod1_file1.py
|   |-- mi_modulo2
|   |   |-- __init__.py
-------------------------
lo invoco como:
-------------------------
from paquete.mi_modulo1 import mod1_file1
    as m1
m1.mod1_file1_func1()
```