

Engineering programming

Plotting and Visualization

Thibault Thétier - thibault.thetier@vub.be

Tom Godden - tgodden@vub.be

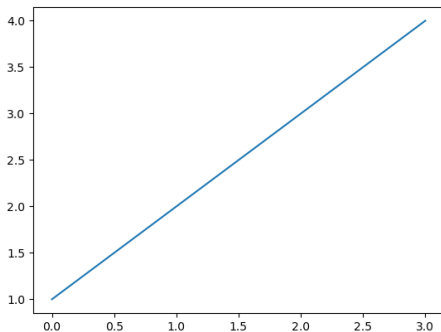
1ste semester 2021

- ▶ Making informative visualizations (plots) is one of the most important tasks in data analysis
- ▶ Python has many add-on libraries for making static or dynamic visualizations
- ▶ Matplotlib : desktop plotting package for creating (mostly 2D) publication-quality plots
- ▶ Import convention:
 - ▶ `import matplotlib.pyplot as plt`

PLOT DATA

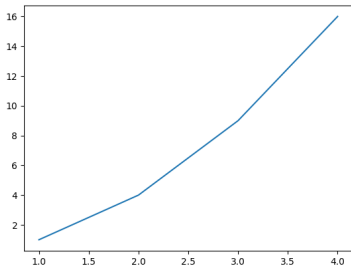
Making a graph is very easy:

```
1 import matplotlib.pyplot as plt
2 plt.plot([1, 2, 3, 4])
```



PLOT DATA

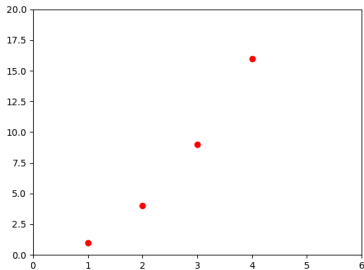
```
1 x = [1, 2, 3, 4]
2 y = [1, 4, 9, 16]
3 plt.plot(x, y)
```



STYLE

There are a lot of layout possibilities for a graph

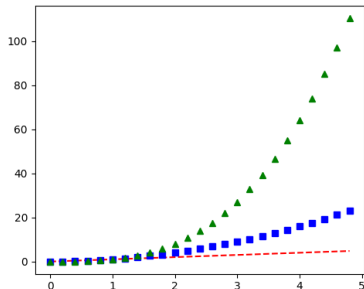
```
1 plt.plot([1, 2, 3, 4], [1, 4, 9, 16], 'r.', label='first plot')
2 plt.plot([1, 2, 3, 4], [2, 3, 10, 15], 'g*', label='second plot')
3 plt.axis([0, 6, 0, 20])
4 plt.legend()
```



NUMPY ARRAYS IN A GRAPH

Numpy arrays can be plotted

```
1 import numpy as np
2 t = np.arange(0., 5., 0.2)
3 # red dashes, blue squares and green triangles
4 plt.plot(t, t, 'r--', t, t**2, 'bs', t, t**3, 'g^')
```



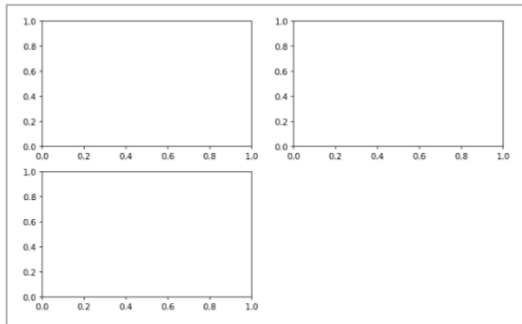
FIGURES AND SUBPLOTS

Plots in matplotlib reside within a Figure object:

► `fig = plt.figure()`

You have to create one or more subplots:

```
1 # add_subplot(nrows,ncols,index)  
2 ax1 = fig.add_subplot(2, 2, 1)  
3 ax2 = fig.add_subplot(2, 2, 2)  
4 ax3 = fig.add_subplot(2, 2, 3)
```



PLOT TYPES

Different types of plots are also available.

- 1 `ax1.hist(np.random.randn(100), bins=20, color='k', alpha=0.3)`
- 2 `ax2.scatter(np.arange(30), np.arange(30) + 3 * np.random.randn(30))`
- 3 `ax3.plot(np.random.randn(50).cumsum(), 'k--')`

