# **Matplotlib** for beginners

Matplotlib is a library for making 2D plots in Python. It is designed with the philosophy that you should be able to create simple plots with just a few commands:

### 1 Initialize

```python
import numpy as np
import matplotlib.pyplot as plt
```
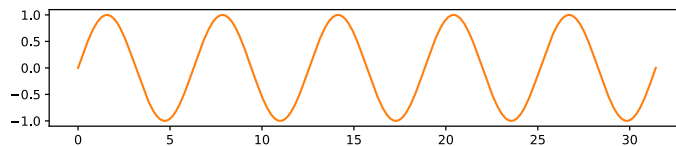
### 2 Prepare

```python
X = np.linspace(0, 10*np.pi, 1000)
Y = np.sin(X)
```

### 3 Render

```python
fig, ax = plt.subplots()
ax.plot(X, Y)
plt.show()
```
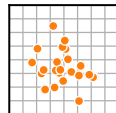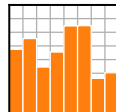
### 4 Observe



## Choose

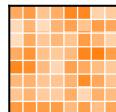Matplotlib offers several kind of plots (see Gallery):

```python
X = np.random.uniform(0, 1, 100)
Y = np.random.uniform(0, 1, 100)
ax.scatter(X, Y)
```



```python
X = np.arange(10)
Y = np.random.uniform(1, 10, 10)
ax.bar(X, Y)
```
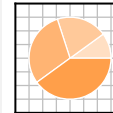


```python
Z = np.random.uniform(0, 1, (8, 8))

ax.imshow(Z)
```
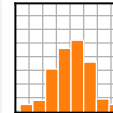


```python
Z = np.random.uniform(0, 1, (8, 8))

ax.contourf(Z)
```
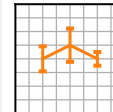


```python
Z = np.random.uniform(0, 1, 4)

ax.pie(Z)
```
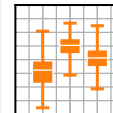


```python
Z = np.random.normal(0, 1, 100)

ax.hist(Z)
```



```python
X = np.arange(5)
Y = np.random.uniform(0, 1, 5)
ax.errorbar(X, Y, Y/4)
```
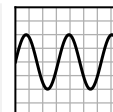


```python
Z = np.random.normal(0, 1, (100, 3))

ax.boxplot(Z)
```
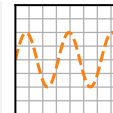


## Tweak

You can modify pretty much anything in a plot, including limits, colors, markers, line width and styles, ticks and ticks labels, titles, etc.
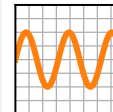
```python
X = np.linspace(0, 10, 100)
Y = np.sin(X)
ax.plot(X, Y, color="black")
```
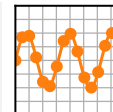


```python
X = np.linspace(0, 10, 100)
Y = np.sin(X)
ax.plot(X, Y, linestyle="--")
```



```python
X = np.linspace(0, 10, 100)
Y = np.sin(X)
ax.plot(X, Y, linewidth=5)
```
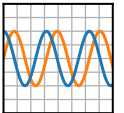


```python
X = np.linspace(0, 10, 100)
Y = np.sin(X)
ax.plot(X, Y, marker="o")
```
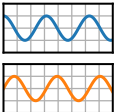


## Organize

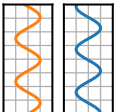You can plot several data on the same figure, but you can also split a figure in several subplots (named *Axes*):

```python
X = np.linspace(0, 10, 100)
Y1, Y2 = np.sin(X), np.cos(X)
ax.plot(X, Y1, X, Y2)
```



```python
fig, (ax1, ax2) = plt.subplots(2, 1)
ax1.plot(X, Y1, color="C1")
ax2.plot(X, Y2, color="C0")
```
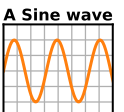


```python
fig, (ax1, ax2) = plt.subplots(1, 2)
ax1.plot(Y1, X, color="C1")
ax2.plot(Y2, X, color="C0")
```
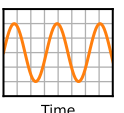


## Label (everything)

```python
ax.plot(X, Y)
fig.suptitle(None)
ax.set_title("A Sine wave")
```



```python
ax.plot(X, Y)
ax.set_ylabel(None)
ax.set_xlabel("Time")
```



## Explore

Figures are shown with a graphical user interface that allows to zoom and pan the figure, to navigate between the different views and to show the value under the mouse.

## Save (bitmap or vector format)

```python
fig.savefig("my-first-figure.png", dpi=300)
fig.savefig("my-first-figure.pdf")
```