# 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

```
import numpy as np
import matplotlib.pyplot as plt
```

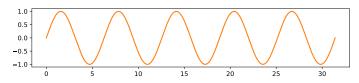
## 2 Prepare

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

### 3 Render

```
fig, ax = plt.subplots()
ax.plot(X, Y)
plt.show()
```

## 4 Observe

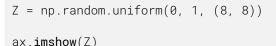


### Choose

Matplotlib offers several kind of plots (see Gallery):

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







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

ax.contourf(Z)

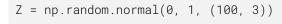
```
Z = np.random.uniform(0, 1, 4)
```

ax.pie(Z)



ax.hist(Z)

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

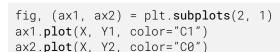


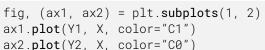
ax.boxplot(Z)

### Organize

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

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











A Sine wave



## **Tweak**

You can modify pretty much anything in a plot, including limits, colors, markers, line width and styles, ticks and ticks labels, titles, etc.

```
X = np.linspace(0, 10, 100)
Y = np.sin(X)
ax.plot(X, Y, color="black")
```

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

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

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



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)

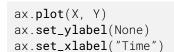
fig.savefig("my-first-figure.png", dpi=300) fig.savefig("my-first-figure.pdf")



Matplotlib 3.7.4 handout for beginners. Copyright (c) 2021 Matplotlib Development Team. Released under a CC-BY 4.0 International License. Supported by NumFOCUS.



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





## **Explore**