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

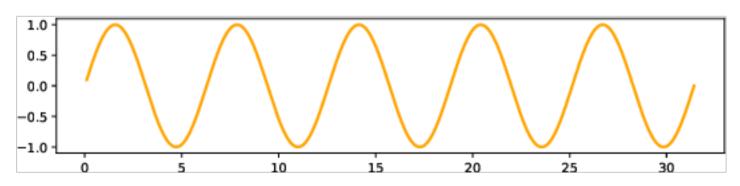
```
X = np.linspace(0, 4*np.pi, 1000)

Y = np.sin(X)
```

3 Render

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

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

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

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



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

ax.hist(Z)

ax.pie(Z)

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

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.

```
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="--")

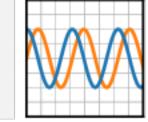
X = np.linspace(0, 10, 100) Y = np.sin(X)ax.plot(X, Y, linewidth=5)

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

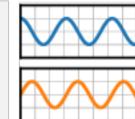


You can plot several data on the the same figure, but you can also split a figure in several subplots (named Axes):

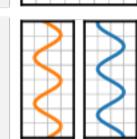
```
X = np.linspace(0, 10, 100)
Y1, Y2 = np.sin(X), np.cos(X)
ax.plot(X, Y1, X, Y2)
```



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



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



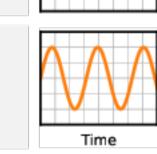
Label (everything)

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



A Sine wave

```
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)

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

Matplotlib 3.4.2 handout for beginners. Copyright (c) 2021 Matplotlib Development Team. Released under a CC-BY 4.0 International License. Supported by NumFOCUS.