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, 4*np.pi, 100)
   Y = np.sin(X)
   ```

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

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

   Choose
   Matplotlib offers several kind of plots (see Gallery):
   ```python
   X = np.random.uniform(0, 1, 100)
   Y = np.random.uniform(0, 100)
   ax.scatter(X, Y)
   ```

   Organize
   ```python
   X = np.linspace(0, 10, 100)
   Y1, Y2 = np.sin(X), np.cos(X)
   fig, (ax1, ax2) = plt.subplots((1,2))
   ax1.plot(X, Y1, color="C1")
   ax2.plot(X, Y2, color="C0")
   ```

   Label (everything)
   ```python
   fig.suptitle("A Sine wave")
   ax.set_title("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.
   ```python
   Y1, Y2 = np.sin(X), np.cos(X)
   fig, (ax1, ax2) = plt.subplots((2,1))
   ax1.plot(X, Y1, color="C1")
   ax2.plot(Y2, X, color="C0")
   ```

   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.
   ```python
   fig.suptitle("A Sine wave")
   ax.set_title("A Sine wave")
   ```

   Save (bitmap or vector format)
   ```python
   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.