PHOT 110: Introduction to programming
LECTURE 09: Plots and visualizations (Ch. 5)

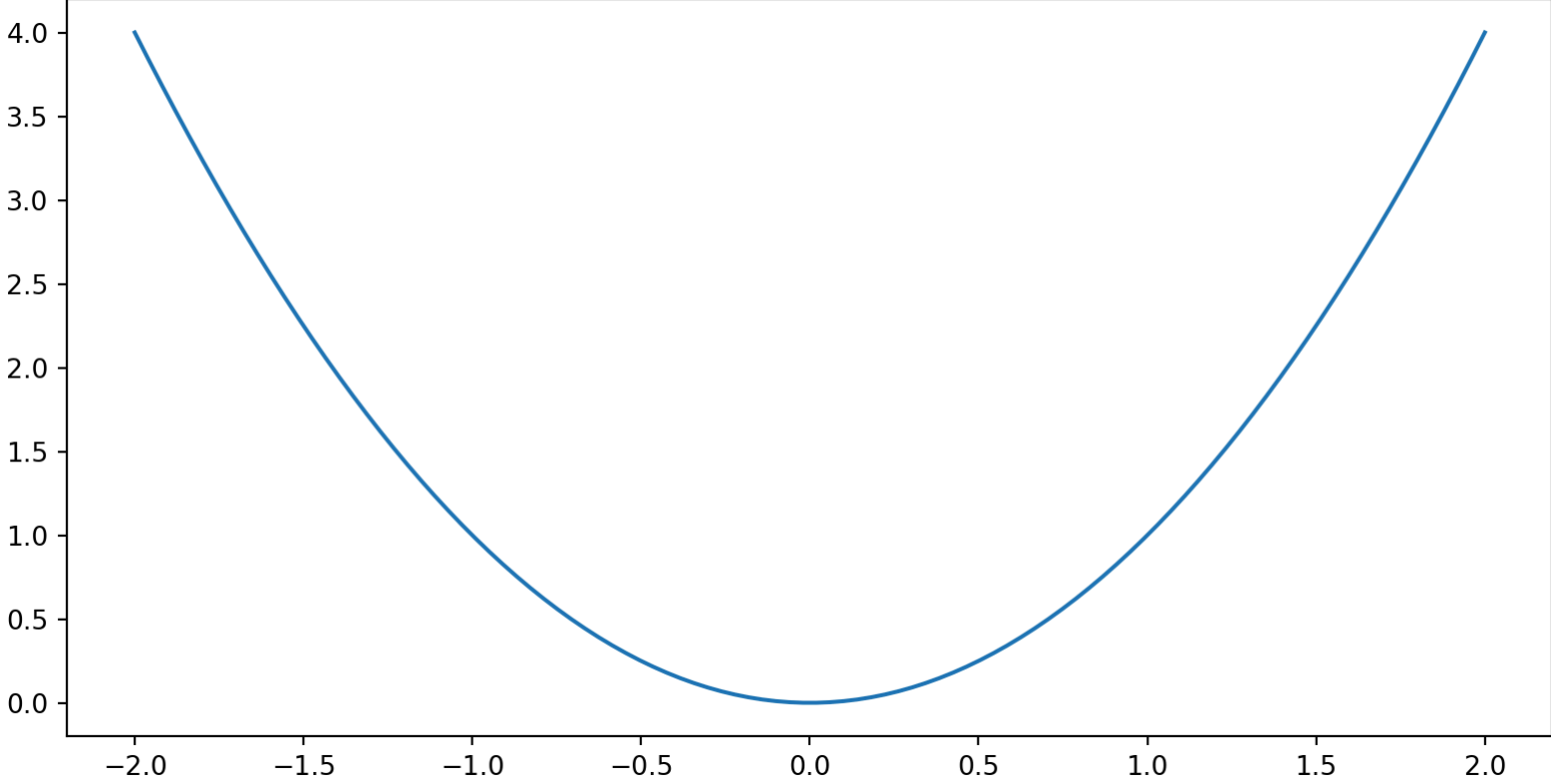Michaël Barbier, Spring semester (2023-2024)

PLOTTING WITH MATPLOTLIB

BASIC PLOTTING

```python
1  # Import library for plotting and numerics
2  import numpy as np
3  import matplotlib.pyplot as plt
4
5  # Define x and y coordinates
6  x = np.linspace(-2, 2, 100)
7  y = x**2
8
9  # Plot a line between the coordinates
10 plt.plot(x, y)
```
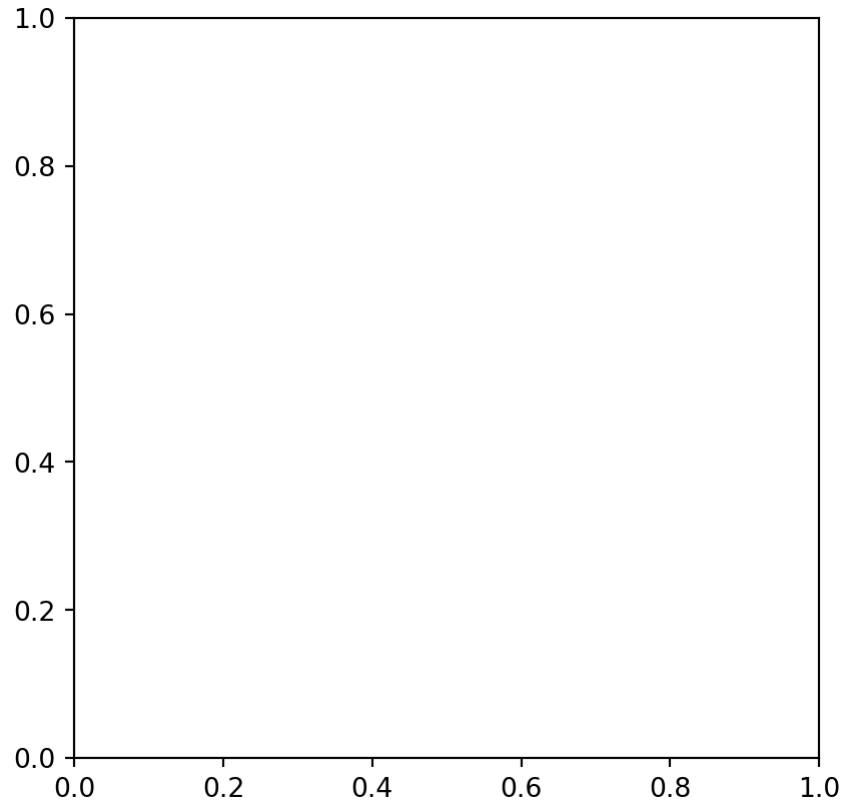
BASIC PLOTTING

A MATPLOTLIB FIGURE

- Figure handle

- Figure size

- Subplots

```python
1  import matplotlib.pyplot as plt
2
3  fig, ax = plt.subplots(figsize=(5,5))
4  plt.show()
```
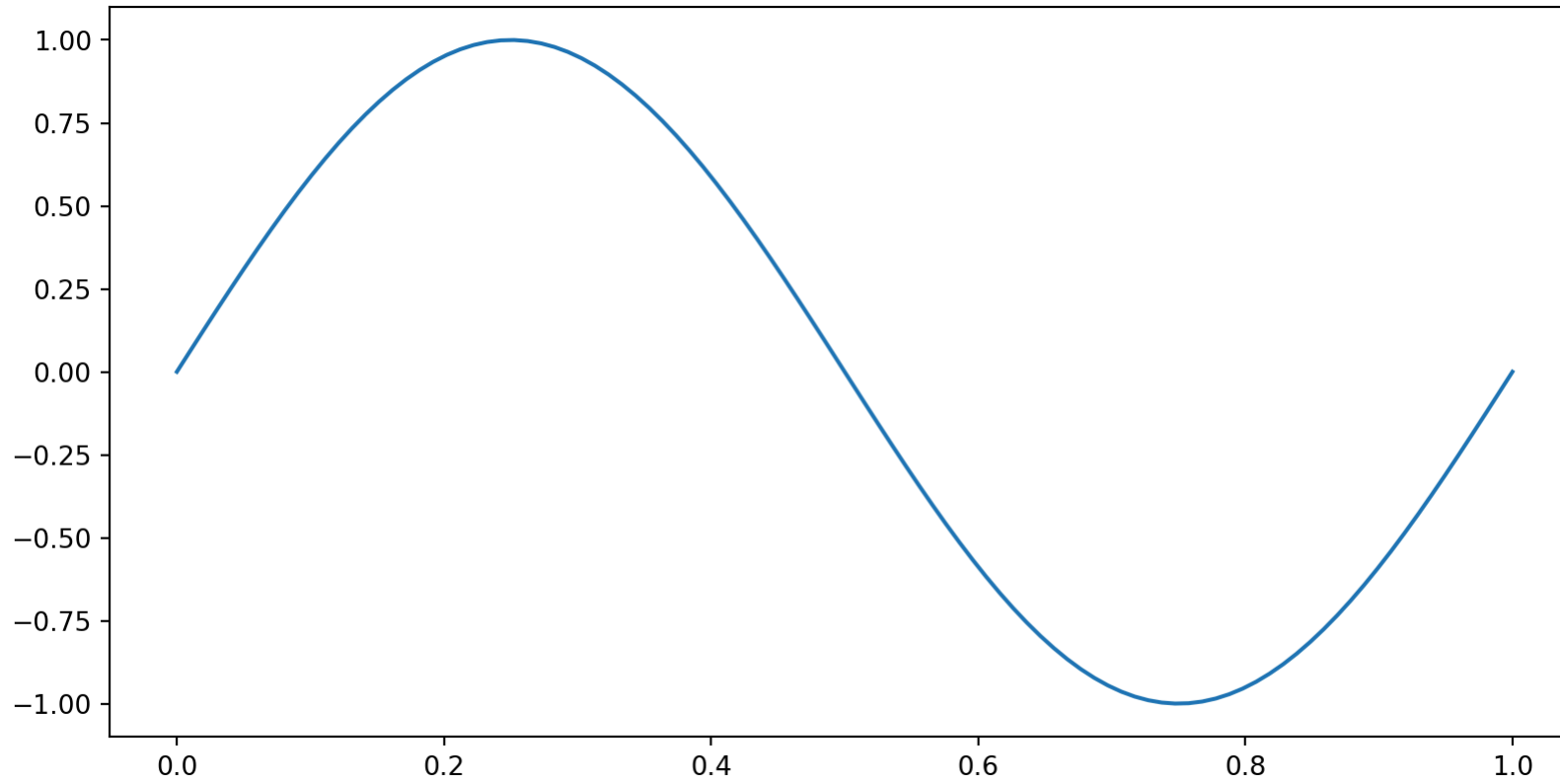
A MATPLOTLIB FIGURE

A MATPLOTLIB FIGURE

Creating a curve in the axes

```python
1  import matplotlib.pyplot as plt
2  import numpy as np
3
4  x = np.linspace(0, 1, 100)
5  y = np.sin(2*np.pi*x)
6  fig, ax = plt.subplots()
7  ax.plot(x, y)
8  plt.show()
```
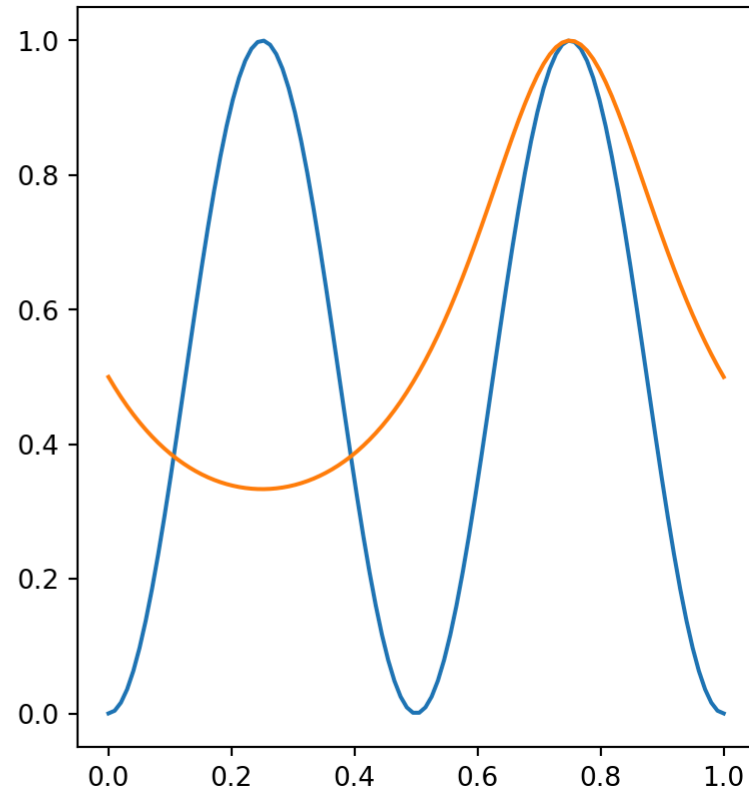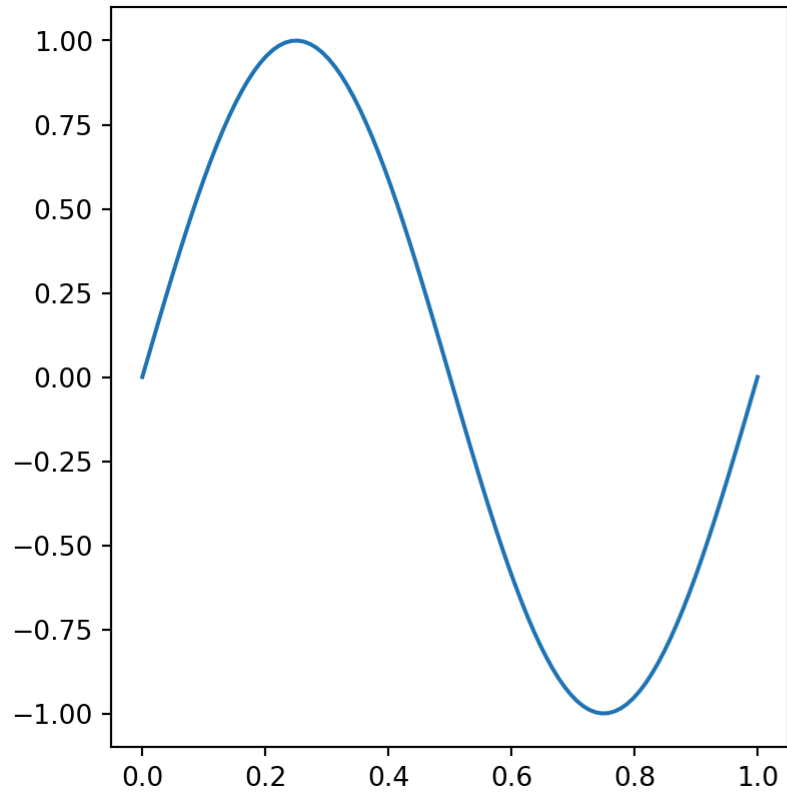
A MATPLOTLIB FIGURE

A MATPLOTLIB FIGURE

- Multiple plots

- Multiple curves in a single axes

```python
1  import matplotlib.pyplot as plt
2  import numpy as np
3
4  x = np.linspace(0, 1, 100)
5  y = np.sin(2*np.pi*x)
6
7  fig, ax = plt.subplots(1, 2) # Two columns
8  ax[0].plot(x, y)
9  ax[1].plot(x, y**2)
10 ax[1].plot(x, 1/(y+2))
11 plt.show()
```
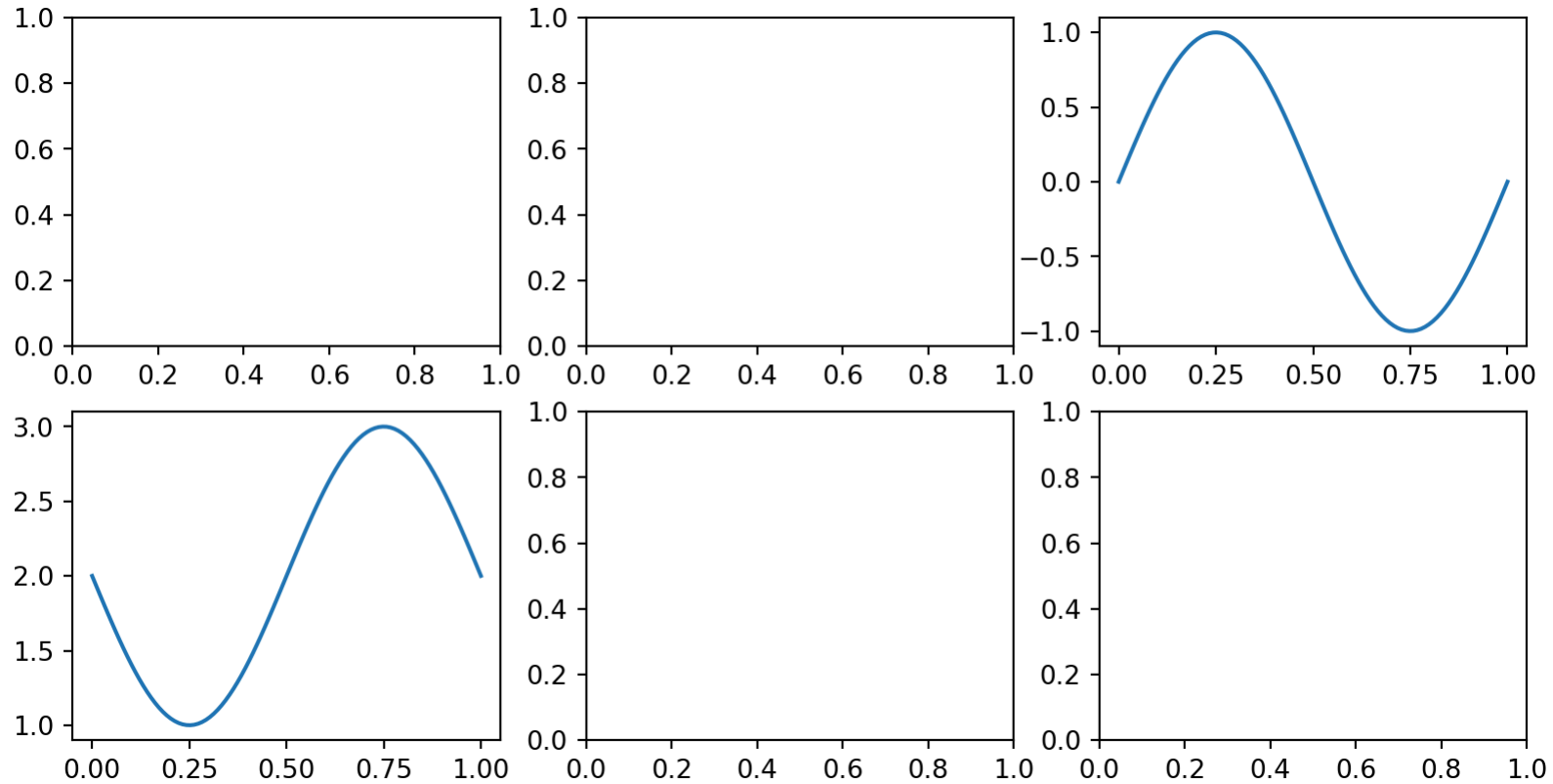
A MATPLOTLIB FIGURE

A MATPLOTLIB FIGURE

Subplots: multiple rows and columns

```python
 1  import matplotlib.pyplot as plt
 2  import numpy as np
 3
 4  # Data for the plots
 5  x = np.linspace(0, 1, 100)
 6  y = np.sin(2*np.pi*x)
 7
 8  # Plotting
 9  fig, ax = plt.subplots(2, 3)   # 2 rows, 3 cols
10  ax[0, 2].plot(x, y)
11  ax[1, 0].plot(x, 2-y)
12  plt.show()
```

A MATPLOTLIB FIGURE

PARTS OF A PLOT

- Actual data:
  - Curves, points,
  - surfaces, etc.
- Axes, limits, aspect ratio
- Grids and thickmarks
- Title, Axis labels
- Legend
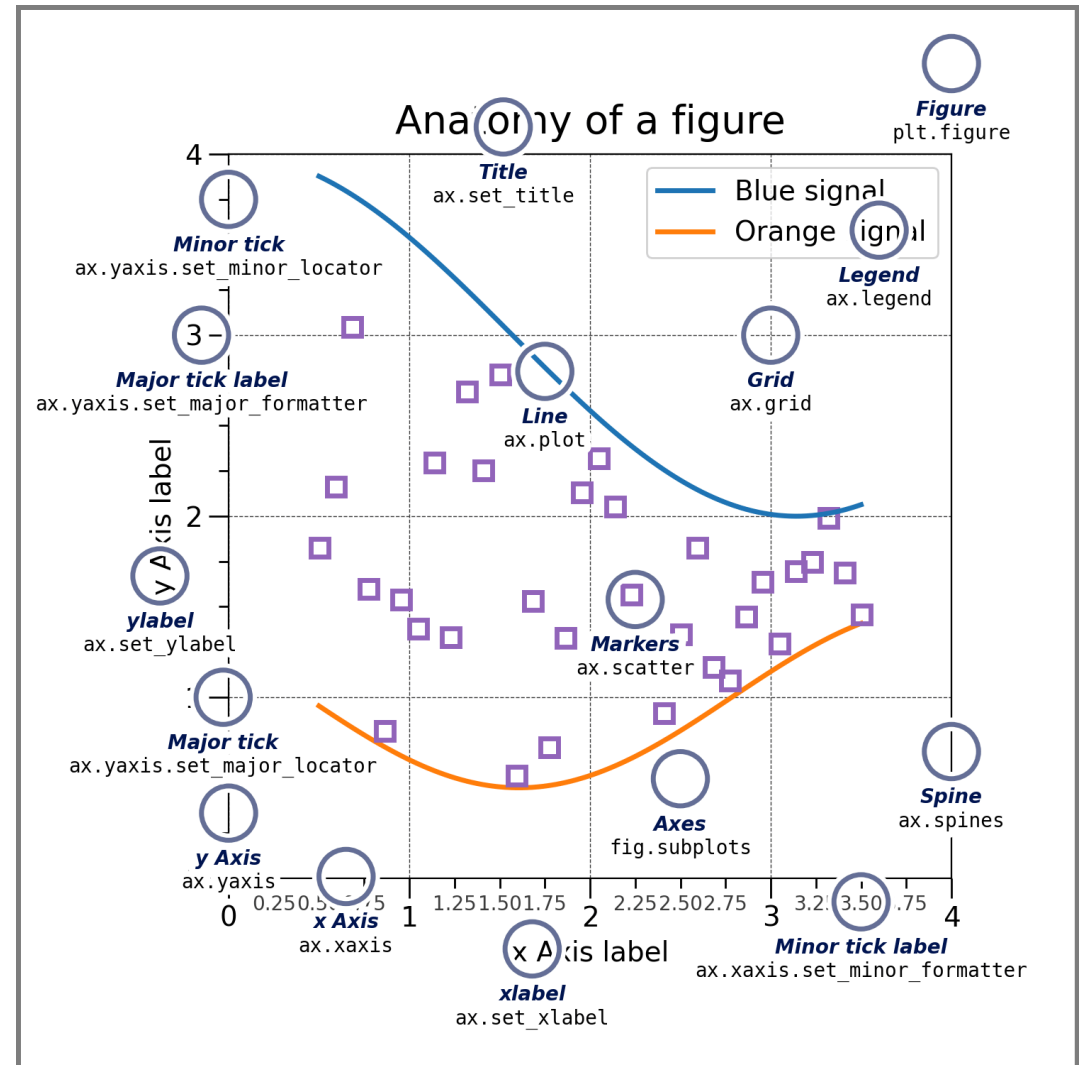
START FROM MATPLOTLIB.ORG

There are many options !

- Different plot types.

- Many plot characteristics that can be changed.

- Animations.

- Good starting points: the Matplotlib website

Starting with Matplotlib

Matplotlib plot types

Lecture 09: Plots and visualizations (Ch. 5)