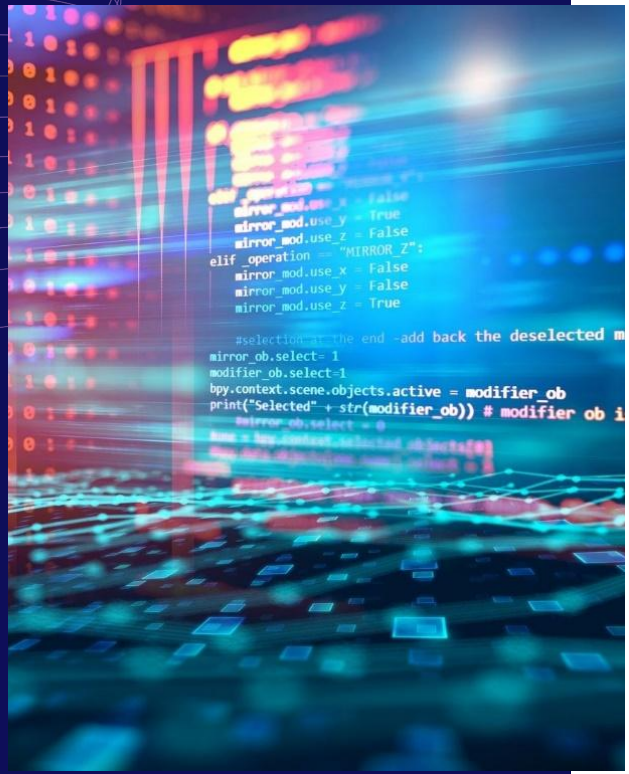
Engineering Tomorrow

Brookhaven National Laboratory

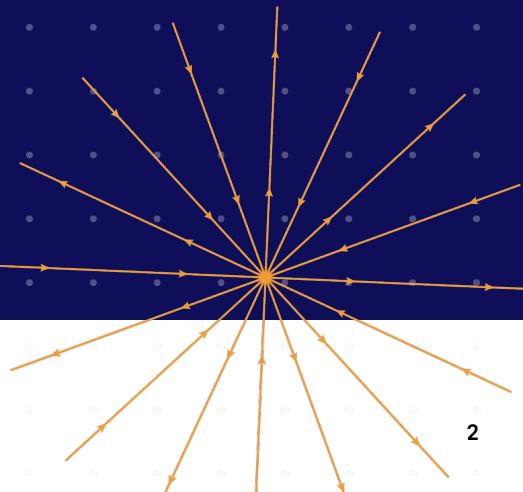


Module 2 - Plotting & Graphing in Python

GOAL

Assessing, understanding, and making decisions with graphical analysis

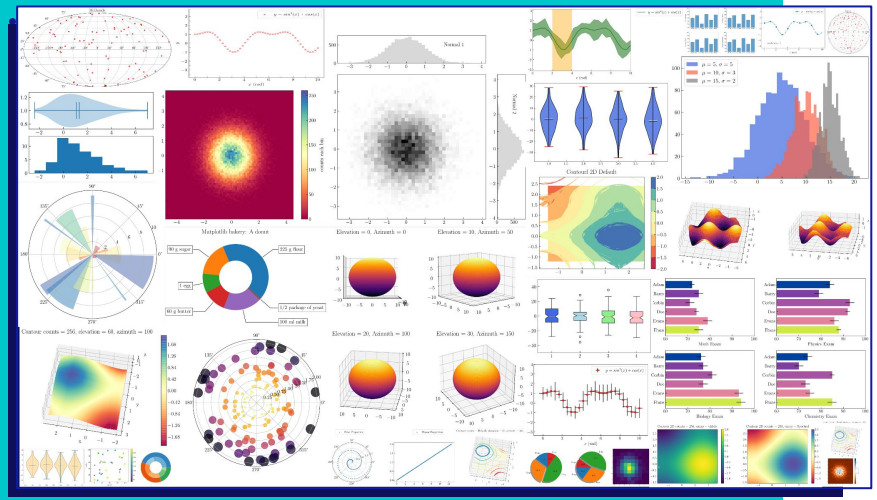
Importing Libraries: matplotlib and NumPy



What are libraries in Python?

- Libraries are **prewritten code** which allow us to implement commands to make our lives easier.
- Libraries **contain functions and capabilities that you can use** without having to actually write the code to perform the tasks at hand!
- We will introduce you to a few libraries today:

Matplotlib: Visualization with Python



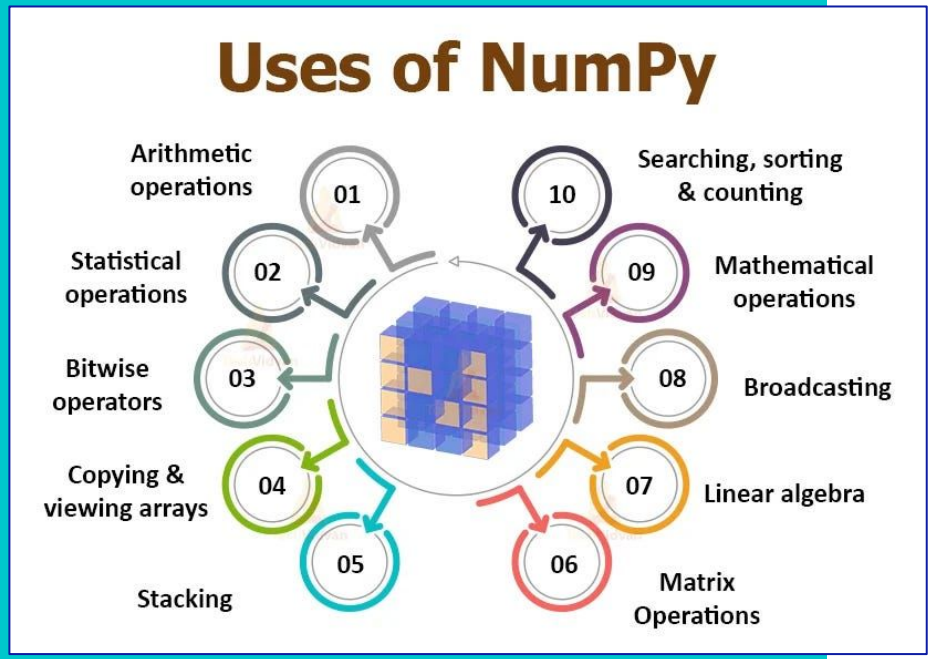
Matplotlib enables **graph creation.**

Matplotlib is a comprehensive library for creating **static, animated, and interactive visualizations** in Python.

- Make interactive figures that can zoom, pan, update.
- Customize visual style and layout.
- Export to many file formats.
- Embed in Graphical User Interfaces (GUIs).
- Use a rich array of third-party packages built on Matplotlib.

https://matplotlib.org

NumPy: Numerical Computing with Python



NumPy enables **efficient numerical calculations.**

NumPy provides support for **large, multi-dimensional arrays and matrices**, along with a collection of mathematical functions to operate on these arrays.

- Perform efficient element-wise operations and broadcasting.
- Handle large data sets with n-dimensional array objects.
- Integrate with a wide range of databases and file formats.
- Facilitate linear algebra, Fourier transforms, and random number generation.
- Serve as a foundation for many scientific and data analysis libraries.

https://numpy.org/

Colab makes importing libraries easy!

- You simply import it on your code box like so:

```
import numpy as np
```

```
1 import matplotlib.pyplot as plt
2
```

- The above lines of code use **aliases np** and **plt** to abbreviate the names of these libraries. In this way, we can simply type **np.function_name() or plt.function_name() t**o use any function from either library (of course, replacing “function_name()” with a real function!)
- These libraries have a lot of functionality that we will not fully cover. You can search on **Google or ask ChatGPT** about these libraries to learn more about their capabilities and extend your own learning!
- Our focus in this module will be on plotting using matplotlib, but we will **first take a look at NumPy arrays!**