Matplotib

1. **Basic Plot**
    - Create a line plot of the following data:

      x = [1, 2, 3, 4, 5]

      y = [2, 4, 6, 8, 10]
    - Add labels for the x-axis and y-axis, and a title to the plot.
2. **Multiple Lines**
    - Plot two lines on the same graph:
        - Line 1: x = [1, 2, 3, 4, 5], y1 = [1, 4, 9, 16, 25]
        - Line 2: x = [1, 2, 3, 4, 5], y2 = [2, 4, 6, 8, 10]
    - Add a legend to distinguish between the two lines.
3. **Bar Chart**
    - Create a bar chart to show the sales of 3 products:

      products = ['Product A', 'Product B', 'Product C']

      sales = [100, 150, 200]
    - Label the bars with their corresponding product names.
4. **Histogram**
    - Create a histogram for the following dataset:

      data = [1, 1, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5]
    - Use 5 bins and add a grid to the plot.

Intermediate Exercises

5. **Scatter Plot**
    - Create a scatter plot with:

      x = [5, 7, 8, 7, 2, 17, 2, 9, 4, 11]

      y = [99, 86, 87, 88, 100, 86, 103, 87, 94, 78]
    - Add labels for x and y axes and a title.
6. **Subplots**

- Create a 1x2 grid of subplots:
  - Plot 1: Line plot of x = [1, 2, 3, 4], y = [10, 20, 25, 30]
  - Plot 2: Bar chart of categories = ['A', 'B', 'C', 'D'], values = [3, 7, 8, 5].

7. **Pie Chart**
   - Create a pie chart for the following data:

     labels = ['Python', 'Java', 'C++', 'JavaScript']

     sizes = [30, 25, 20, 25]
   - Add percentage labels to each slice and set a title.
8. **Customizing Plots**
   - Create a line plot of x = [1, 2, 3, 4, 5], y = [2, 4, 6, 8, 10].
   - Customize it by:
     - Changing the line color to green.
     - Adding markers at each data point.
     - Using a dashed line style.

Case Study Exercise

Sales Data Visualization

- Given the following sales data:

  months = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun']

  product_A = [200, 220, 250, 270, 300, 320]

  product_B = [180, 190, 210, 230, 250, 260]

1. Create:
   - A line plot for the sales of Product A and Product B.
   - A bar chart comparing the total sales of each product over the 6 months.
2. Add:
   - A legend for the products.
   - Titles and axis labels for each plot.

Seaborn

Seaborn exercises designed to enhance your data visualization skills using the Titanic dataset.

Scatter Plot: Age vs. Fare

- Create a scatter plot of Age vs. Fare using sns.scatterplot().
- Use the Survived column to color the points differently for survivors and non-survivors.

Count Plot: Survival by Gender

- Create a count plot to show the number of survivors (survived) for each gender (sex)

Bar Plot: Survival Rate by Class

- Create a bar plot showing the average survival rate for each passenger class (pclass).

Boxplot: Fare Distribution by Class

- Create a boxplot to show the distribution of fares (fare) across passenger classes (pclass).

Violin Plot: Age Distribution by Survival

- Create a violin plot to compare the age distribution for survivors and non-survivors (survived).

Heatmap: Correlation Matrix

- Create a heatmap showing the correlation matrix of the dataset.

Pairplot: Relationships Between Variables

- Use sns.pairplot() to visualize the pairwise relationships between age, fare, and survived.

KDE Plot: Fare Distribution by Survival

- Create a kernel density plot (KDE) comparing the fare distribution for survivors and non-survivors.

Numpy Exercise

Array Creation

- Create a 1D array of integers from 1 to 10.
- Create a 2D array with shape (3, 3) containing random integers between 1 and 20

Basic Operations

- Add, subtract, multiply, and divide two arrays:

Array Properties

- Find the shape, size, and data type of a NumPy array.

Slicing and Indexing

- Extract the first row and last column of a 2D array:

Reshaping Arrays

- Reshape a 1D array of 12 elements into a 2D array with shape (3, 4).

Statistical Functions

- Compute the mean, median, standard deviation, and variance of an array.

Boolean Indexing

- Create an array of numbers from 1 to 20. Filter out numbers divisible

Matrix Operations

- Create two matrices of size (3, 3). Perform matrix multiplication and find the determinant of one matrix.

Create a 3D Array

- Create a 3D array with shape (3, 3, 3) filled with random integers between 1 and 100.
- Print the array and its shape.

Access Elements in a 3D Array

- Access the element in the first row, second column, and third depth of the array created above.
- Slice and print the second "layer" (depth) of the array.

Reshape a 3D Array

- Reshape the (3, 3, 3) array into a 2D array with shape (9, 3).

Mathematical Operations on 3D Arrays

- Create a second 3D array with the same shape as the original one, filled with random integers between 1 and 50.
- Perform element-wise addition and multiplication of the two arrays.