

Assignment-1 (Python Libraries & Data Visualization)

Q.1 Create a NumPy array x of 400 values evenly spaced from 0 to 4π .

- Compute $y_1 = \sin(x)$ and $y_2 = \cos(x/2)$.
- Plot both curves on one set of axes (sin: solid blue, cos/2: dashed red), add axis labels, a legend, and the title “Sin vs. Cos2”.
- Save the figure as PNG.

Q.2 Download the Iris CSV from <https://raw.githubusercontent.com/mwaskom/seaborn-data/master/iris.csv>.

- Load it with pandas and compute the mean sepal length for each species.
- Plot the three means as a vertical bar chart; species names on the x-axis.
- Annotate every bar with the exact mean rounded to two decimals.

Q.3 Using the Spotify Top-50 dataset

(<https://raw.githubusercontent.com/CarlHatoum/Spotify-TOP-50-songs/master/top50.csv>):

- Load the file with pandas.
- With seaborn, create a pairplot of the numeric features danceability, energy, valence, and instrumentalness.
- Colour points by the Genre column and set the seaborn style to “darkgrid”.

Q.4 Simulate 1000 random draws from each distribution:

- $A \sim \mathcal{N}(0, 1)$
- $B \sim \mathcal{N}(2, 1.5)$

Create a 2×1 subplot figure:

- Top panel: overlapping histograms (30 bins) of A and B; semi-transparent fill; legend.
- Bottom panel: side-by-side box-and-whisker plots of A and B.

Add a super-title “Comparing Two Normal Distributions” and adjust layout.

Q.5 Using the built-in Gapminder sample from plotly.express:

- Filter the dataframe to the year 2007.
- Compute average life expectancy and GDP per capita for every continent.
- Create an interactive bubble chart with plotly.express where:
 - x-axis = GDP per capita, y-axis = life expectancy,
 - bubble size = population, colour = continent, hover = country name.
- Add a dropdown or animation control that lets the user select any year from 1960 to 2007 and updates the plot.