

Python Advanced Assignment-23

Q1. If you have any, what are your choices for increasing the comparison between different figures on the same graph?

Ans.

To increase comparison between different figures on the same graph, you can use the following techniques:

1. Use different colors or line styles for each figure.
2. Add labels and legends to distinguish between different datasets or figures.
3. Use subplots to present multiple figures in a grid, side by side.
4. Standardize scales and units on both axes to ensure comparisons are fair and intuitive.
5. Use dual axes (twin axes) if comparing datasets with vastly different ranges on the same plot.

Q2. Can you explain the benefit of compound interest over a higher rate of interest that does not compound?

Ans.

The main benefit of compound interest over a higher rate of simple interest is that compound interest earns interest on both the initial principal and the accumulated interest over time. This results in exponential growth, as each period's interest is added to the total balance and reinvested. Even if a simple interest rate is higher, compounding typically results in a greater total return in the long run because it leverages the power of growth over time.

Q3. What is a histogram, exactly? Name a NumPy method for creating such a graph.

Ans.

A histogram is a graphical representation of the distribution of numerical data. It divides the data into bins (intervals) and shows how many data points fall into each bin, giving a visual impression of the frequency distribution.

In NumPy, you can create a histogram using the method:

- ``np.histogram(data, bins)``: This function returns the counts of data points in each bin.

For visualization, you can use ``plt.hist(data, bins)`` from Matplotlib.

Q4. If necessary, how do you change the aspect ratios between the X and Y axes?

Ans.

To change the aspect ratio between the X and Y axes in Matplotlib, you can use:

- `plt.gca().set_aspect('auto')` for automatic scaling.
- `plt.gca().set_aspect('equal')` for equal scaling between the X and Y axes.
- `plt.gca().set_aspect(aspect_ratio)` where `aspect_ratio` is a numerical value specifying the ratio of the Y-axis to the X-axis.

Additionally, you can control axis scaling with `plt.axis()`.

Q5. Compare and contrast the three types of array multiplication between two NumPy arrays: dot product, outer product, and regular multiplication of two NumPy arrays.

Ans.

- Dot product (`np.dot(A, B)` or `A @ B`): This is a matrix multiplication or vector dot product. For 1D arrays, it returns the inner product. For 2D arrays, it performs matrix multiplication. It results in a scalar or a matrix, depending on the dimensions.
- Outer product (`np.outer(A, B)`): It creates a matrix where each element is the product of elements from `A` and `B`. If `A` and `B` are vectors, the result is a matrix of all pairwise multiplications.
- Element-wise multiplication (`A * B`): This multiplies the corresponding elements of two arrays. The arrays must have the same shape or be broadcastable. The result is an array where each element is the product of the corresponding elements.

Q6. Before you buy a home, which NumPy function will you use to measure your monthly mortgage payment?

Ans.

To calculate monthly mortgage payments, you can use `np.pmt(rate, nper, pv)`:

- `rate`: The monthly interest rate.
- `nper`: The number of periods (e.g., total months of the loan).
- `pv`: The present value, or loan amount.

This function computes the fixed monthly payment required to pay off a loan or mortgage.

Q7. Can string data be stored in NumPy arrays? If so, list at least one restriction that applies to this data.

Ans.

Yes, string data can be stored in NumPy arrays. However, there are some restrictions:

- Fixed length: All strings in a NumPy array must have the same length. If a string longer than the allowed length is assigned, it will be truncated to fit within the array's fixed length for strings (defined at array creation). For example, if you allocate an array of dtype ``S5`` (5-character strings), any string longer than 5 characters will be truncated.