

Understanding Numpy

What is NumPy, and why is it important in the Python ecosystem? Provide a detailed explanation.

Discuss the history and development of NumPy. How has it evolved over time?

Describe the core features of NumPy. How do these features benefit scientific and mathematical computing efforts?

Explain the concept of ndarrays. How do ndarrays differ from standard Python lists?

What are universal functions (ufuncs) in NumPy? Give examples and explain their significance.

Describe various mathematical operations that can be performed using NumPy. Provide examples for each.

Explain the concept of aggregation in NumPy. How does it differ from simple summation or multiplication?

Provide examples of different aggregation functions available in NumPy and their practical applications.

Importance of NumPy in Python

Efficiency and Performance:

Discuss the importance of NumPy in the context of efficiency and performance in scientific computing.

How does NumPy improve computational performance in Python? Provide a detailed explanation with examples.

Interoperability:

Explain how NumPy interacts with other Python libraries. Why is this interoperability important for data science and machine learning?

Comparison: Python List vs NumPy

Memory Consumption:

Compare the memory consumption between Python lists and NumPy arrays. Why is there a difference?

Performance:

Conduct a performance analysis between Python lists and NumPy arrays for basic operations (addition, multiplication, etc.). Why does NumPy outperform Python lists?

Speed:

Discuss the speed difference between operations performed on Python lists and those on NumPy arrays. Provide reasons for any disparities observed.

Practical Application: Reading and Manipulating CSV Data with NumPy**Reading CSV Data:**

How can you read a CSV file in Python without using external libraries? Write a script that reads a CSV file using `csv.reader` and converts it into a list.

Data Conversion and Manipulation:

Once you have your data in a list format, convert this data into a NumPy array. Why might this conversion be beneficial for further operations?

Applying Universal Functions and Aggregations:

Apply universal functions on the NumPy array derived from your CSV data. Explain what each function does and why it might be useful for data analysis.

Perform aggregation operations on your dataset. Use aggregation functions and explain the insights they could provide about your dataset.

Explain the following with appropriate examples:

- i. `np.empty`
- ii. `np.arange`
- iii. `np.i`
- iv. `np.linspace`
- v. Shape vs reshape
- vi. Broadcasting
- vii. Numpy stacking
- viii. `np.block`
- ix. `np.hsplit`
- x. `np.vsplit`
- xi. `np.dsplit`
- xii. `np.searchsorted`(explain parameters)
- xiii. `np.sort` and `argsort`
- xiv. `np.flatten` vs `np.ravel`
- xv. `np.shuffle`
- xvi. `np.unique`

- xvii. np.resize
- xviii. Transpose
- xix. Swapaxes
- xx. Inverse
- xxi. Power
- xxii. determinant