BHARATHIDASAN UNIVERSITY

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Unit II : Data Types and Structures

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Python Data Structures and Visualization

This presentation explores fundamental Python data types, structures, and visualization techniques, providing a foundation for data analysis and scientific computing.

Basic Data Types

Numeric Types

- int: Integers (e.g., 5, -10)
- float: Floating-point (decimal) values (e.g., 5.0, -10.5)
- complex: Complex numbers (e.g., 3+4j)

Sequence Types

- str: Strings (e.g., "Hello, World!")
- list: Ordered, mutable sequences (e.g.,\ [1, 2, 3\ ])
- tuple: Ordered, immutable sequences (e.g., (1, 2, 3))
- range: Sequences of numbers (e.g., range(0, 10))

Mapping and Boolean Types

Mapping Types

- dict: Unordered collections of key-value pairs (e.g., {"name": "Alice", "age": 25})

Boolean Type

- bool: Represents True or False

None Type and Strings

None Type

- NoneType: Represents the absence of a value (e.g., None)

Strings

The basic data type for text in Python is the string. Strings are defined using single or double quotes or by converting other objects using the str function.

Basic Data Structures

Tuple

An immutable, ordered collection of elements. Tuples are efficient and used for storing multiple items in a single variable.

List

A mutable, ordered collection of elements. Lists are flexible and powerful for storing and manipulating data.

Dict

A collection of key-value pairs, where each key is unique and maps to a specific value.

Set

An unordered collection of unique objects.

Tuples in Detail

1 **Immutable**

Elements cannot be changed, added, or removed.

2 **Ordered**

Elements maintain their defined order.

3 **Heterogeneous**

Can store elements of different data types.

4 **Efficient**

Consume less memory than lists, making them faster for certain operations.

Lists in Detail

1 **Mutable**

Elements can be changed, added, or removed.

2 **Ordered**

Elements maintain their defined order.

3 **Heterogeneous**

Can store elements of different data types.

4 **Flexible**

Provide a wide range of methods for manipulating data.

Python Dictionaries

1 **Key-Value Pairs**

Data is stored in the format key: value.

2 **Mutable**

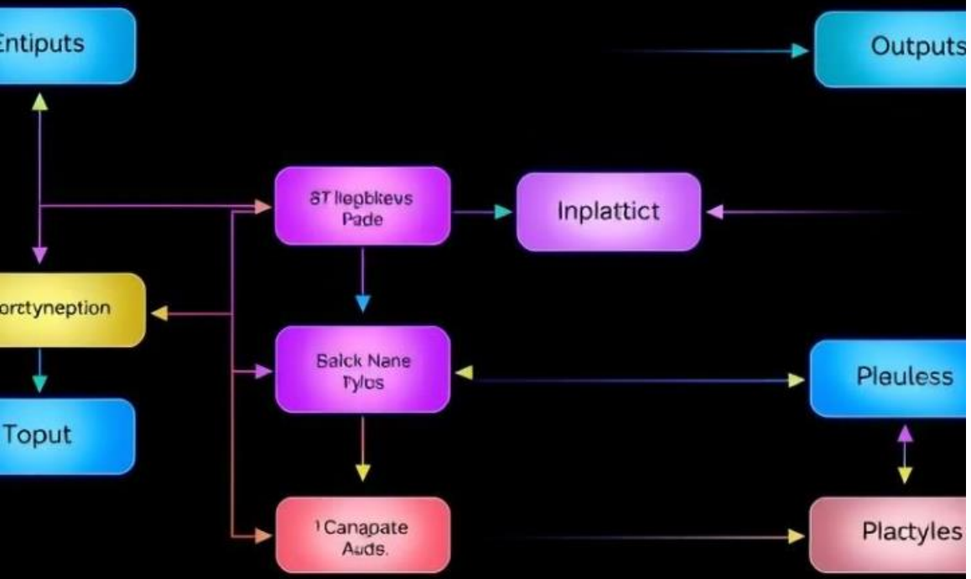
Values can be changed, added, or removed.

3 **Immutable Keys**

Keys must be of an immutable type (strings, numbers, tuples).

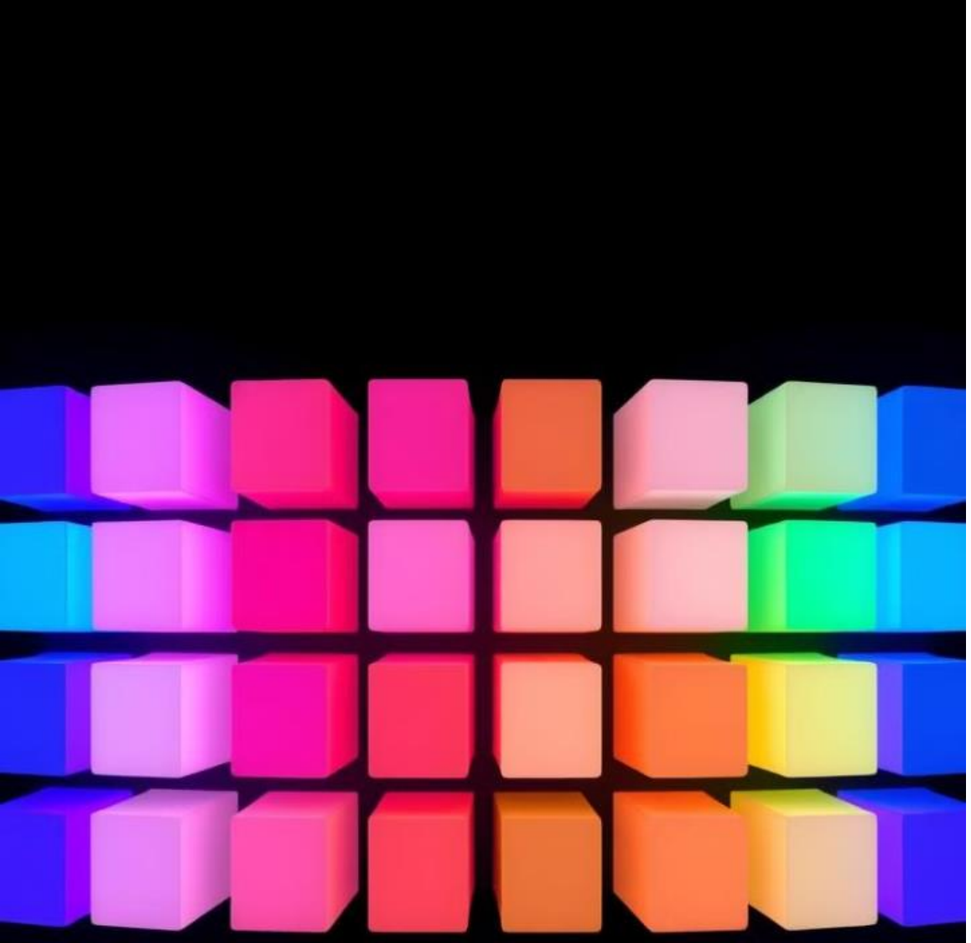
4 **Dynamic**

Can store heterogeneous data and vary in size dynamically.



Functional Programming in Python

Python supports functional programming concepts like filter, map, and reduce, which operate on entire sets of inputs (lists). These tools enhance code readability and efficiency.



NumPy Data Structures

NumPy is a powerful library for numerical computing. It provides efficient arrays for mathematical operations, multi-dimensional support, and a rich set of functions for mathematical and statistical analysis.