Python Programming Fundamentals

Introduction to Python

Python is a high-level, interpreted programming language created by Guido van Rossum and first released in 1991. It emphasizes code readability with its notable use of significant indentation.

Python supports multiple programming paradigms including procedural, object-oriented, and functional programming. It has a comprehensive standard library and a large ecosystem of third-party packages.

Python is widely used in web development, data science, artificial intelligence, scientific computing, automation, and many other fields. Its simplicity makes it an excellent choice for beginners.

Python Data Types

Python has several built-in data types. Numbers include integers (int), floating-point numbers (float), and complex numbers. Python 3 integers can be arbitrarily large.

Strings in Python are sequences of Unicode characters. They can be created using single quotes, double quotes, or triple quotes for multi-line strings. Strings are immutable in Python.

Lists are ordered, mutable sequences that can contain elements of different types. Tuples are similar to lists but immutable. Dictionaries are key-value pairs, and sets are unordered collections of unique elements.

Functions and Classes

Functions in Python are defined using the 'def' keyword. They can accept positional arguments, keyword arguments, default values, and variable-length arguments using *args and **kwargs.

Python supports object-oriented programming with classes. Classes are defined using the 'class' keyword and can have methods, attributes, inheritance, and special methods like __init__ and __str__.

Python also supports functional programming features including lambda functions, map(), filter(), reduce(), and list comprehensions for concise data transformations.

Popular Python Libraries

NumPy is the fundamental package for scientific computing in Python. It provides support for large multi-dimensional arrays and matrices, along with mathematical functions to operate on them.

Pandas provides data structures and data analysis tools. Its DataFrame object is particularly useful for handling tabular data with labeled rows and columns.

Matplotlib and Seaborn are popular libraries for data visualization. For machine learning, scikit-learn provides simple and efficient tools, while TensorFlow and PyTorch are used for deep learning.