Nonlinear Dynamics and Chaos

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Crash course on Python

Python is a high-level, interpreted programming language.

It uses indentation to define code blocks.

In Python, **everything is an object.** Objects are at the code of the language and are self-contained containers.

Object-Oriented Programming (OOP) is a method for designing software that organises the code into containers that group both data (attributes) and functions (methods) that operate on that data into a single unit.

The data and the functions that manipulate that data are tightly bundled together within an object.

Objects in Python

Mutable Objects: objects whose state can be changed after they are created. We can modify, add, or remove elements from these objects without creating a new object in memory).

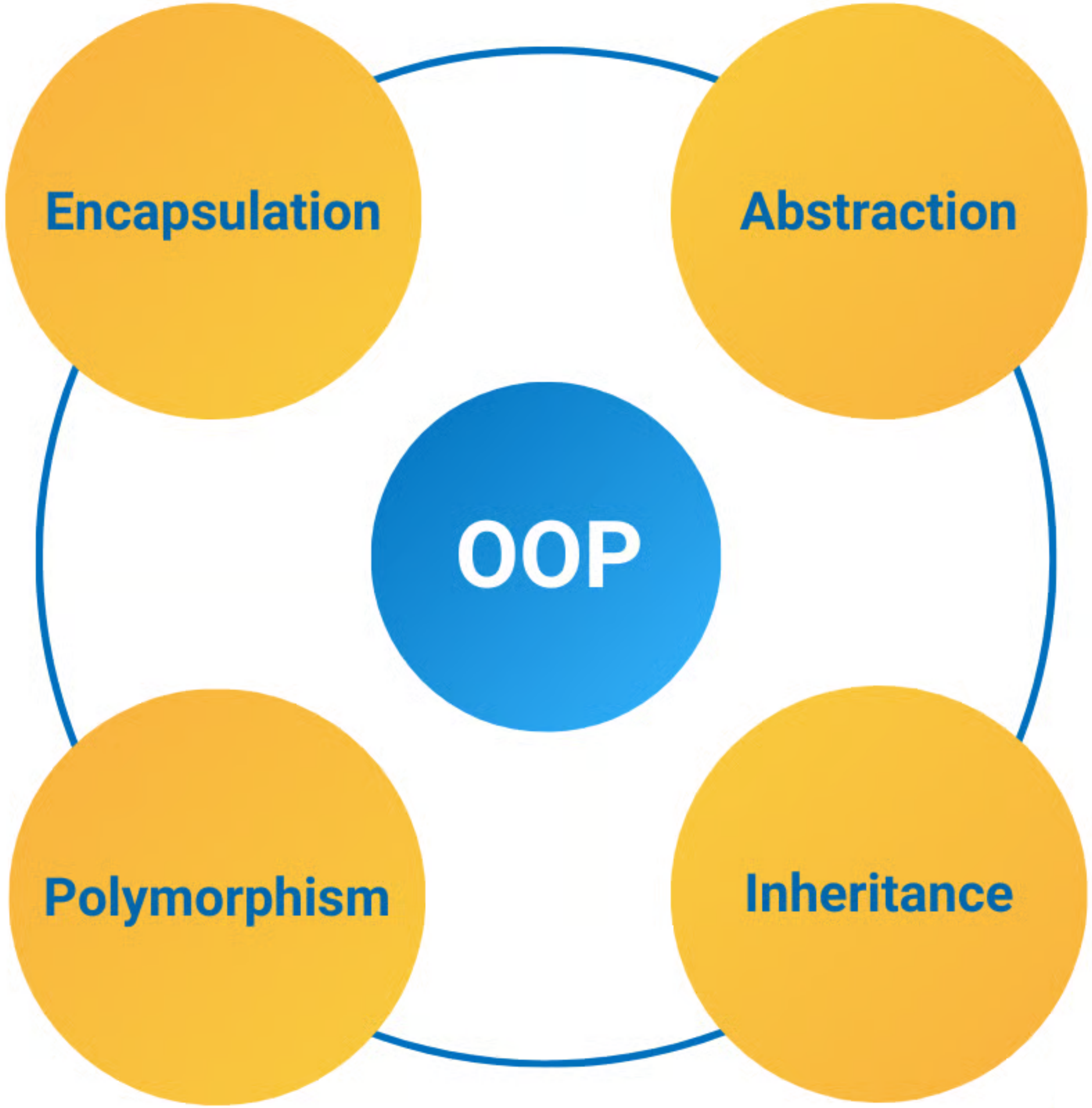
Examples: list, dict, set

Immutable Objects: objects whose state cannot be changed after they are created. Any operation that appears to modify an immutable object actually creates a new object in memory.

Examples: int, float, str, tuple, function, class

OOP helps to create modular, reusable, and more maintainable code. It makes it easier to manage large, complex programs by breaking them down into smaller, self-contained components.

Object-oriented Programming (OOP)



Encapsulation: Merging data **(attributes)** and the functions **(methods)** that operate on that data into a single unit (an object). This hides the internal state of an object from the outside world.

Abstraction: Hiding complex implementation details and showing only the essential features of an object. This simplifies the user's interaction with the object.

Polymorphism: The ability of objects of different classes to respond to the same method call in their own unique way. The word "polymorphism" means "many forms.”

Inheritance: A mechanism where a new class (**derived class**) can inherit properties and behaviours from an existing class (**main class**). This promotes code reuse.

Tutorial Time:

You should go to the course GitHub repository and click on **Python Crash Course**.

https://github.com/MSc-Fundamental-Physics/nonlinear-dynamics-chaos