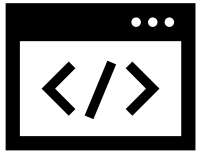
Imperial College London



BIOE50010 – Programming 2

Computer Lab 6

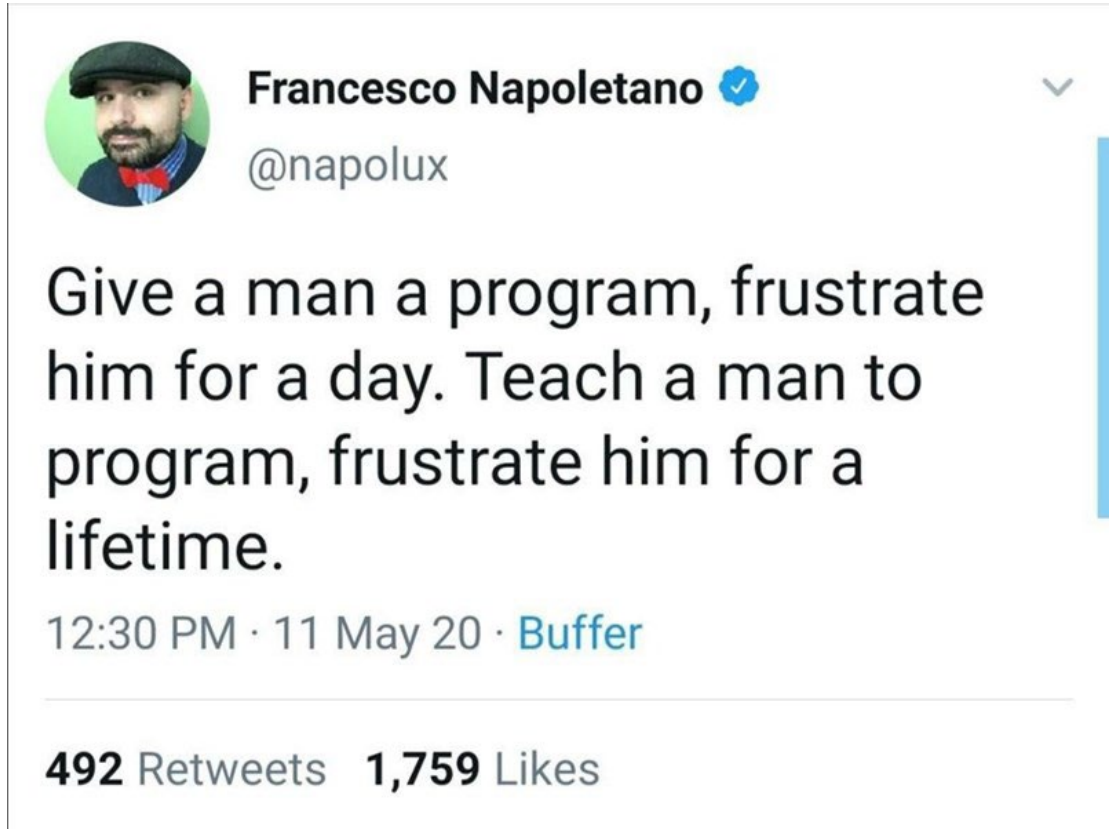
Binghuan Li | *Department of Chemical Engineering*

binghuan.li19@imperial.ac.uk

November 13, 2023

Imperial College London

Meme of the week ☺



Source: https://cheezburger.com/13971461/programming-memes-for-frustrated-coders

The Cookie Cutter Metaphor

Cookie cutter

Cookies

Source: Starting Out with Python, 4th Ed.

A ***cookie cutter*** can be used to make several ***cookies***.

⇕

A ***class*** can be used to make several ***objects***.

… is a collection of

- data (***attributes***)
- procedures (***methods***)

Imperial College London

Four Pillars of OOP

1) ***Abstraction*** focuses on the essential characteristics of an object relative to the perspective of the viewer.

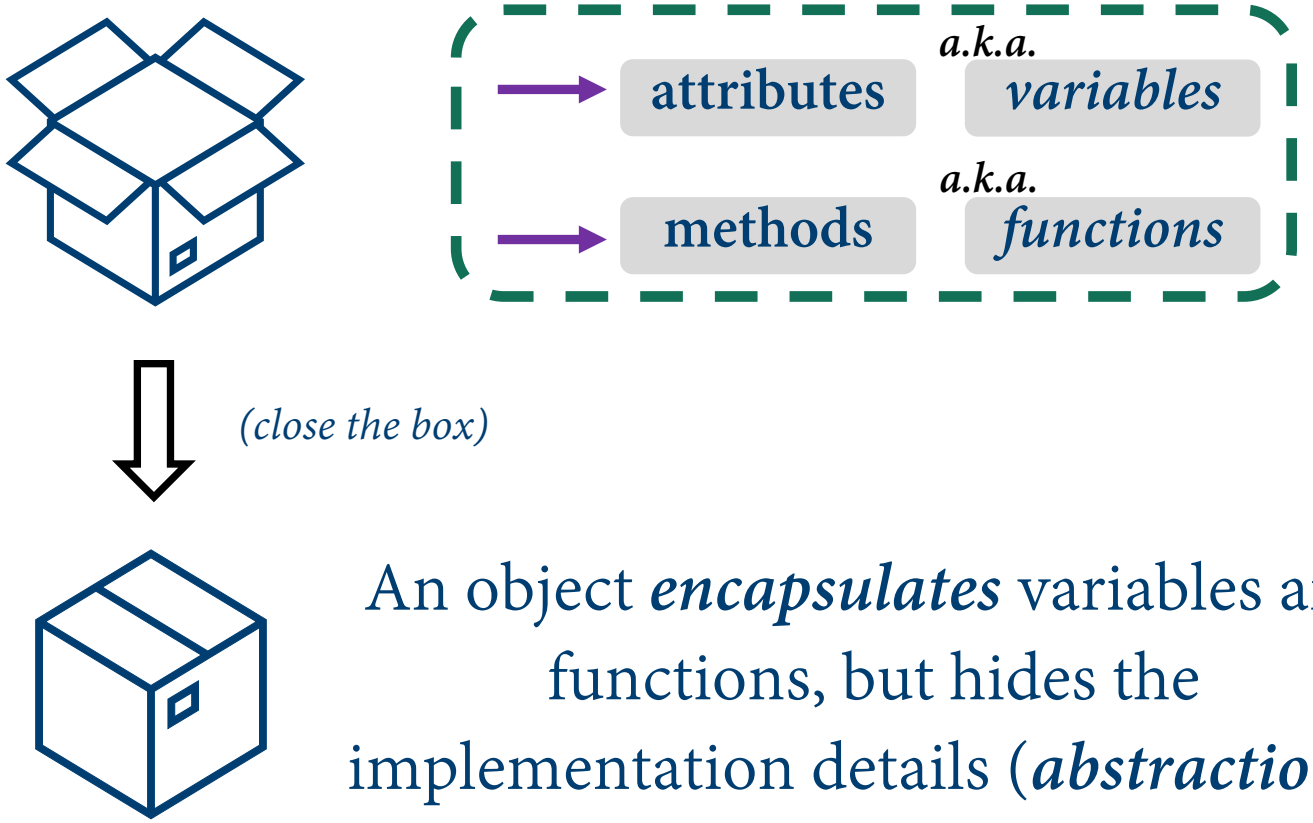
2) ***Encapsulation*** hides the details of the implementation of an object.

3) ***Inheritance*** allows for a derived object type to inherit features from another object type.

4) ***Polymorphism*** allows for overriding any inherited method by creating your own method within it's own class.

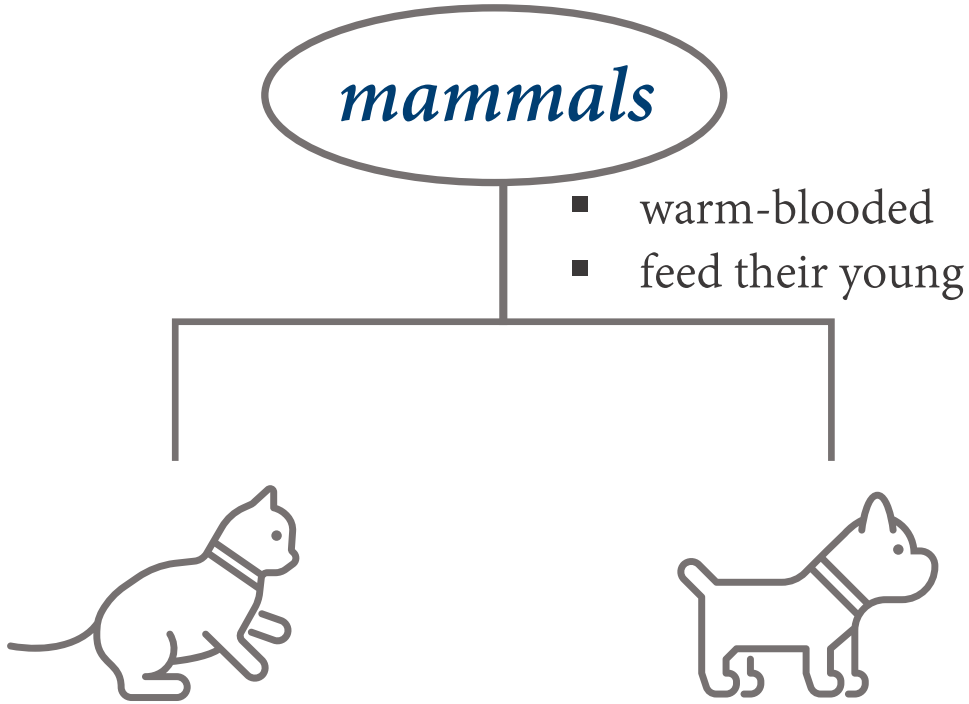
Source: https://www.reddit.com/r/ProgrammerHumor/comments/gu4k3y/oops/

Abstraction & Encapsulation



An object ***encapsulates*** variables and functions, but hides the implementation details (***abstraction***) !

Inheritance (1/)



Common characteristics in a (parent) category

keeping **common** characteristics while deriving new **unique** characteristics.

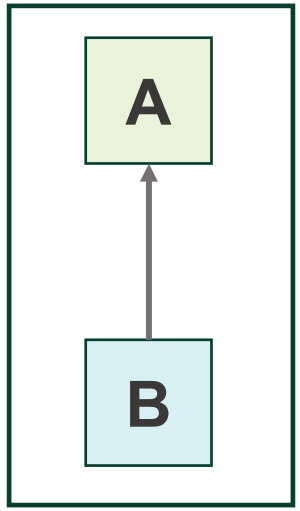
Unique characteristics in a sub-categories

Imperial College London

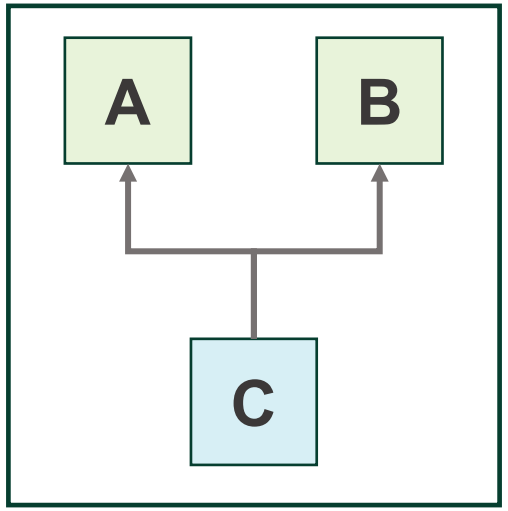
Inheritance (2/)

Super class

subclass

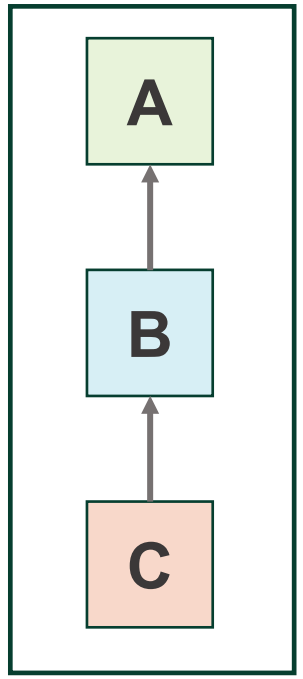


single inheritance



multiple inheritance

probably will not be covered in this module…



parent class

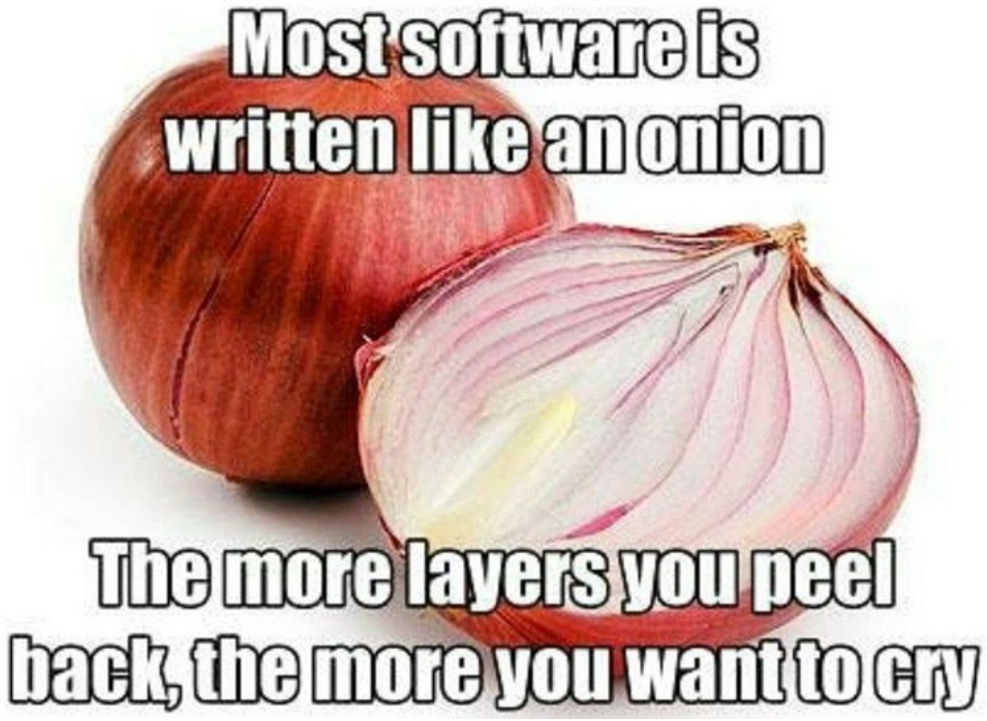
child class

grand child class

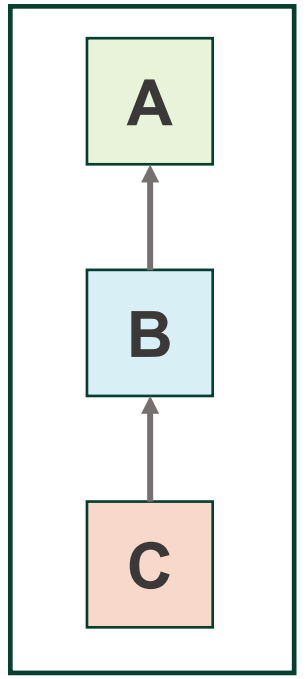
multilevel inheritance

is this really a good practice?

Inheritance (2/)



a.k.a. **the yo-yo problem**



parent class

child class

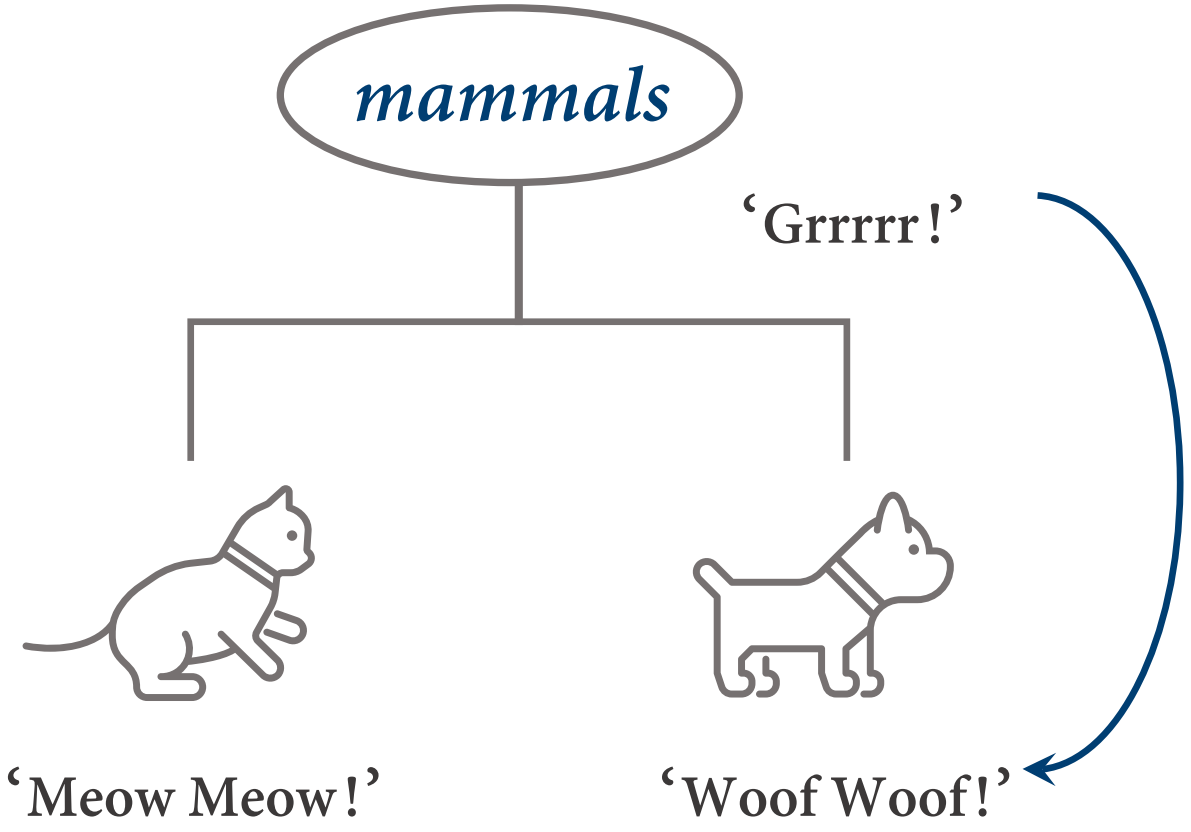
grand child class

multilevel inheritance

is this really a good practice?

Source: https://cheezburger.com/13971461/programming-memes-for-frustrated-coders

Polymorphism



- Deriving new characteristics that overrides the old (inherited) characteristics.
- "***having many forms***"
- This type of polymorphism is specifically called ***subtyping*** (*a.k.a.* inclusion)

Imperial College London

Your task today

- Bioinformatics (DNA database) with *object-oriented* programming.
  - Object initialisation, concatenation, indexing, and read from a `.fna` file.
- Read the sample code and console output carefully before you start.
  - To kick off, revise the ***special methods*** you have encountered in your last lab task.
  - **Hint**: the Python built-in function **`upper()`** converts a string with all characters in upper case.

Example

```
myStr = "heyy welcome to Prog2"
print(myStr)
print(myStr.upper())
```

Console

```
heyy welcome to Prog2
HEYY WELCOME TO PROG2
```

Imperial College London

Questions?

That's it for now.

You may now proceed to the Lab 6 exercises.