

Week 12: Agenda

- Term Project
- OOP + Animations
- Recursion + Animations

OOP: What you need to know


- The idea behind OOP
- Class vs Object
- Functions vs Methods
- How to define a class
- How to use a class
- Inheritance
- Code Tracing

```
1  ✓ class A(object):
2      def __init__(self):
3          self.b = "sparkling"
4
5      def f(self):
6          return self.g()
7
8      def g(self):
9          return "apple"
10
11     def h(self, s):
12         print(f"{self.b} {s}")
13         return self.f()
14
15     def __repr__(self):
16         return f'A {self.f()}'
17
18
19  ✓ class B(A):
20
21     def __init__(self, s):
22         super().__init__()
23         self.b = s
24
25     def f(self):
26         s=self.g()
27         return f"pine{s}"
28
29     def g(self):
30         return super().g()
31
```

```
32  ✓ def ct3():
33     b = B("still")
34     print(b.h("water"))
35     print(type(b) == A)
36     print(isinstance(b, B))
37     print(isinstance(b, A))
38     return b
39
40     print(ct3())
```

Why GUIs Are Complex

- Multiple interacting elements (buttons, windows, events)
- Need for state management
- User-driven flow (vs. linear scripts)
- Challenge: Keeping things modular, reusable, and testable



First name	John
Last name	Smith
Birth date	21-03-1973
Higher education	<input checked="" type="checkbox"/>
Age	34
SSN	1234567890
Remarks	
<input type="button" value="Accept"/> <input type="button" value="Cancel"/>	

OOP is very helpful

- **Encapsulation** (grouping data + behavior)
- **Abstraction** (hide details, expose interface)
- **Inheritance** (reuse GUI components)
- **Polymorphism** (flexible, dynamic behavior)

GUIs = Hierarchies of objects -> OOP matches this structure

- A Button is an object.
- A Window is an object.
- A EntryField is an object.

A Window has a list of UI elements.

Encapsulation in Action

A LoginForm class encapsulates:

- Username field
- Password field
- Submit logic

Changing internal layout doesn't affect other code.

Inheritance for Reuse

- PasswordField extends EntryField
- Override methods: drawContent

Username:

Password:

Login

Polymorphism for Flexibility

Same **interface**, different behavior:

Common Widget methods on Button, EntryField, ...

- draw, isClicked, onClick, onKey,

Event-handling: all widgets implement these methods