

Welcome to the Lecture CoGrammar Classes II

The session will start shortly...

Questions? Drop them in the chat. We'll have dedicated
moderators answering questions.



Co Grammar Classes II

September 2024



Software Engineering Session Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly.

(Fundamental British Values: Mutual Respect and Tolerance)

- No question is daft or silly - **ask them!**
- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions. Moderators are going to be answering questions as the session progresses as well.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: [**Questions**](#)

Software Engineering Session Housekeeping cont.

- For all **non-academic questions**, please submit a query:
www.hyperiondev.com/support
- We would love your **feedback** on lectures: [Feedback on Lectures](#)

Safeguarding & Welfare

We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:



Ian Wyles
Designated Safeguarding
Lead



Simone Botes



Rafiq Manan



Charlotte Witcher



Nurhaan Snyman



Ronald Munodawafa



Tevin Pitts

**Scan to report a
safeguarding concern**



or email the Designated
Safeguarding Lead:
Ian Wyles
safeguarding@hyperiondev.com

Skills Bootcamp Progression Overview

To be eligible for a certificate of completion, students must fulfil three specific criteria. These criteria ensure a high standard of achievement and alignment with the requirements for the successful completion of a Skills Bootcamp.

Criterion 1 - Meeting Initial Requirements

Criterion 1 involves specific achievements within the first two weeks of the program.

To meet this criterion, students need to:

- Attend a minimum of 7-8 hours per week of guided learning (lectures, workshops, or mentor calls) within the initial two-week period, for a total minimum of 15 guided learning hours (GLH), by no later than 15 September 2024.
- Successfully complete the Initial Assessment by the end of the first 14 days, by no later than 15 September 2024.

Skills Bootcamp Progression Overview

Criterion 2 - Demonstrating Mid-Course Progress

Criterion 2 involves demonstrating meaningful progress through the successful completion of tasks within the first half of the bootcamp.

To meet this criterion, students should:

- Complete 42 guided learning hours and the first half of the assigned tasks by the end of week 7, no later than 20 October 2024.

Skills Bootcamp Progression Overview

Criterion 3 - Demonstrating Post-Course Progress

Criterion 3 involves showcasing students' progress after completing the course.
To meet this criterion, students should:

- Complete all mandatory tasks before the bootcamp's end date. This includes any necessary resubmissions, no later than 22 December 2024.
- Achieve at least 84 guided learning hours by the end of the bootcamp, 22 December 2024.

Poll

What is the role of the `__init__` method in a Python class?

- A. It is a destructor method used to clean up resources when an object is deleted.
- B. It is used to define class-level methods that can modify class attributes.
- C. It initialises object attributes when an object is created.

Poll

What is the purpose of the `@staticmethod` in the following code?

```
1 class Math:  
2     @staticmethod  
3     def add(a, b):  
4         return a + b  
5  
6 print(Math.add(3, 5))
```

- a. It allows the method to modify instance attributes.
- b. It allows the method to access class attributes.
- c. It allows the method to be called without creating an instance of the class.

Learning Objectives & Outcomes

- Define inheritance and its role in object-oriented programming.
- Define inheritance key components (base class, subclass, superclass).
- Implement and utilise the principles of inheritance within Python projects.
- Explain and implement method overriding.
- Utilise `super()` to access parent class methods.

Introduction

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Introduction

All Derived from **Basic Vehicle**



Basic Vehicle

1st Gen

2nd Gen

3rd Gen

4th Gen

What is Inheritance

What is Inheritance?

- **Intuition and Definition:**
 - Sometimes we require a class with the same **attributes** and **properties** as another class but we want to **extend** some of the behaviour or add more attributes.
 - **Inheritance** is a fundamental concept in object-oriented programming where a **new class** (the subclass) is derived from an existing class (the superclass or base class), inheriting its **attributes** and methods.
- **Real-world analogy:**
 - Think of **biological inheritance** - children **inheriting** traits from their parents.

Building Better Software: The Advantages of Inheritance

- Why Use Inheritance?
 - **Code Reuse:** Inheritance allows for reuse of code from parent classes.
 - **Organized Structure:** Creates a clear hierarchical relationship between classes.
 - **Extensibility:** Enables easy extension and modification of existing classes without altering their code.

Building Better Software: The Advantages of Inheritance

- Real-world Example: Animal Kingdom
 - **Animal**: Parent class to all animals with common traits (e.g., eat, sleep).
 - **Dog**: Inherits from **Animal**, adding specific **Dog** traits (e.g., bark, breed).
- Advantages of Inheritance:
 - **Code Reuse**: Shared behaviors like **eating** and **sleeping** are defined once in **Animal**.
 - **Organized Structure**: Clear hierarchy (**Animal** → **Dog**) makes relationships easy to follow.
 - **Extensibility**: **Dog** adds unique traits without changing **Animal**.

Key Terms in Inheritance



Key Terminology in Inheritance

- **Superclass (Parent/Base Class)**: The class being inherited from.
- **Subclass (Child/Derived Class)**: The class inheriting from the superclass.
- **Inheritance Hierarchy**: The structure that shows the relationship between the parent and child classes.

Basic Inheritance Syntax in Python

Basic Inheritance Syntax

```
class ParentClass:  
    # Parent class code  
  
class ChildClass(ParentClass):  
    # Child class code
```

Basic Inheritance Example

```
class Animal: # Superclass  
    def __init__(self, number_of_legs):  
        self.number_of_legs = number_of_legs  
  
    def speak(self):  
        return "Animal sound"  
    def eat(self):  
        return "Animal is eating"
```

```
if __name__ == "__main__":  
    print(dog.speak())
```

```
mv dog = Dog(4)
```

Understanding Method Overriding

What is Method Overriding?

- Intuition and Definition:
 - We can override methods in our subclass to either extend or change the behaviour of a method.
 - **Method Overriding** The process of re-implementing a method already implemented in a superclass.
 - To apply method overriding, you simply need to define a method with the same name as the method you would like to override.
- Real-world analogy:
 - Think of the Dog subclass overrides the speak() method from the Animal superclass to provide a specific sound, like barking, instead of a generic sound.

Example of Method Overriding

```
class Animal:  
    def [speak](self):  
        # Base class method: generic sound for any animal  
        return "makes a sound"
```



Unleashing the Power of `super()` in Python

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```
def __init__(self, name, parent):
    self.name = name
    self.parent = parent
    self.children = []
    parent.add_child(self)

def add_child(self, child):
    child.parent = self
    self.children.append(child)

def __str__(self):
    return self.name

class Root:
    def __init__(self):
        self.nodes = []

    def add_node(self, node):
        self.nodes.append(node)

    def __str__(self):
        return "Root"

class Node:
    def __init__(self, name):
        self.name = name
        self.parent = None
        self.children = []

    def add_child(self, child):
        child.parent = self
        self.children.append(child)

    def __str__(self):
        return self.name

root = Root()
root.add_node(Node("A"))
root.add_node(Node("B"))
root.add_node(Node("C"))

node_A = root.nodes[0]
node_B = root.nodes[1]
node_C = root.nodes[2]

node_A.add_child(Node("D"))
node_A.add_child(Node("E"))
node_B.add_child(Node("F"))
node_B.add_child(Node("G"))
node_C.add_child(Node("H"))

print(root)
print(node_A)
print(node_B)
print(node_C)
print(node_A.children)
print(node_B.children)
print(node_C.children)
```

What is `super()`?

- Intuition and Definition:
 - When extending functionality of a **method** we would **first** want to call the **base class method** and then **add** the extended behaviour.
 - When adding more **instance attributes** to the **subclass** we have to call to the base class `__init__()` (**the Constructor**) to avoid having to **redeclare** all our base class attributes.
 - **super()** is a built-in function that allows a subclass to call methods from its superclass.

super(): Constructor Example

```
class Animal:  
    def __init__(self, name, age):  
        self.name = name # Initializes the 'name' attribute  
        self.age = age # Initializes the 'age' attribute
```

When to Use `super()` ?

- **Beyond Constructors:**
 - While `super()` is often used to call a parent class's constructor, its functionality extends beyond this. You can also use `super()` to call any parent class method that has been overridden in the subclass.
- **Why use `super()` with other functions?**
 - **Maintaining Parent Class Behavior:** Call the parent class's method to keep its original functionality.
 - **Avoiding Redundancy:** Reuse common code from the parent class.

super(): Example

```
class Animal:  
    def speak(self):  
        return "makes a sound"  
  
class Dog(Animal):  
    def speak(self):  
        # Calls the parent class's speak method and extends it  
        return super().speak() + " and barks"  
  
# Example usage:  
my_dog = Dog()  
print(my_dog.speak()) # Output: makes a sound and barks
```

Extending from the base class functionality

Calling from the base class

Poll

What will be the output of the following code?

```
1 class Vehicle:  
2     def start(self):  
3         return "Vehicle starting"  
4  
5 class Car(Vehicle):  
6     def start(self):  
7         return "Car starting"  
8  
9 my_car = Car()  
10 print(my_car.start())
```

1. Vehicle starting
2. Error: start() method is not defined
3. None
4. Car starting

Poll

What will be the output of the following code?

```
1 class Animal:
2     def __init__(self, name):
3         self.name = name
4
5 class Dog(Animal):
6     def __init__(self, name, breed):
7         super().__init__(name)
8         self.breed = breed
9
10 my_dog = Dog("Max", "Beagle")
11 print(my_dog.name)
12 print(my_dog.breed)
```

1. Max and Dog
2. Beagle and Dog
3. Max and Beagle
4. Error: super() cannot be used in the constructor

Lesson Conclusion and Recap

Recap the key concepts and techniques covered during the lesson.

- **Inheritance** allows a subclass to inherit attributes and methods from a superclass, enabling code reuse and structured organisation.
- **Superclass and Subclass**: The superclass (parent) provides the inherited properties, while the subclass (child) extends or modifies them.
- **Method Overriding**: Subclasses can override inherited methods to provide specific implementations, allowing customization.
- **super()**: The `super()` function allows subclasses to call methods from the superclass, often used in constructors or overridden methods.
- **Benefits**: Inheritance simplifies code by reusing functionality, enhancing extensibility, and maintaining a clear hierarchy.

Follow-up Activity: Vehicle Rental System

- **Objective:** To create a Vehicle Rental Service using inheritance, where each vehicle type (Car, Bike) can calculate its rental cost based on the number of days rented. The system should handle exceptions such as negative days and invalid input types.
- **Steps to Implement:**
 - **Base Class: Vehicle**
 - **Attributes:** make, model, year
 - Methods
 - `get_details()`
 - `rent()`
 - `calculate_rental_cost(days)`
 - **Subclasses: Car, Bike**
 - Inherit attributes and methods from `Vehicle`
 - Override `rent()` and `calculate_rental_cost()` for specific implementations
 - Handle exceptions for invalid input

Questions and Answers

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Thank you for attending



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