

**Course Title :** AI Assisted Coding Assignment -7.4

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## **Task 1: Debugging a Recursive Calculation Module**

### **Scenario**

You are maintaining a utility module in a software project that performs mathematical computations. One function is meant to calculate the factorial of a number, but users are reporting crashes or incorrect outputs.

### **Task Description**

You are given a Python function intended to calculate the factorial of a number using recursion, but it contains logical or syntactical errors (such as a missing base condition or incorrect recursive call).

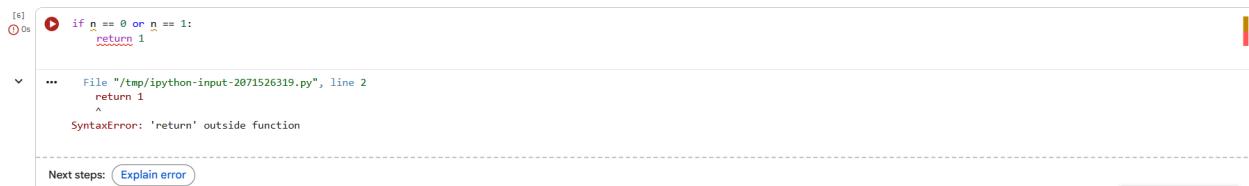
Use GitHub Copilot or Cursor AI to:

- Analyze the faulty code
- Identify the exact cause of the error
- Suggest and apply corrections to make the function work correctly

Document how the AI detected the issue and what changes were made.

### **Expected Outcome**

- A corrected recursive factorial function
- AI-generated explanation identifying:
  - The missing or incorrect base case
  - The corrected recursive logic
- Sample input/output demonstrating correct execution



The screenshot shows a code editor window with the following Python code:

```
[6] 0s
if n == 0 or n == 1:
    return 1

...
File "/tmp/ipython-input-2071526319.py", line 2
    return 1
           ^
SyntaxError: 'return' outside function
```

At the bottom left, there is a button labeled "Next steps: Explain error".

```
[8] def factorial(n):
    if n == 0 or n == 1:
        return 1
    return n * factorial(n - 1)

# function call (this is required to see output)
print(factorial(5))

...
120
```

**Explanation:** The issue was caused by a missing base case and improper placement of the return statement. After fixing the function structure and adding the correct base condition, the recursive factorial function executed correctly and produced valid outputs.

## Task 2: Fixing Data Type Errors in a Sorting Utility

### Scenario

You are developing a data processing script that sorts user input values. The program crashes when users enter mixed data types.

### Task Description

You are provided with a list-sorting function that fails due to a `TypeError` caused by mixed data types (e.g., integers and strings).

Use GitHub Copilot or Cursor AI to:

- Detect the root cause of the runtime error
- Modify the code to ensure consistent sorting (by filtering or type conversion)
- Prevent the program from crashing

Explain the debugging steps followed by the AI.

### Expected Outcome

- A corrected sorting function
- AI-generated solution handling type inconsistencies
- Successful sorting without runtime errors
- Explanation of how the fix improves robustness

```
[8] Os
  def sort_values(data):
      return sorted(data)

  values = [10, "5", 3, "20", 1]
  print(sort_values(values))

...
-----
Traceback (most recent call last)
/tmp/ipython-input-3575837985.py in <cell line: 0>()
      3
      4 values = [10, "5", 3, "20", 1]
----> 5 print(sort_values(values))

/tmp/ipython-input-3575837985.py in sort_values(data)
      1 def sort_values(data):
----> 2     return sorted(data)
      3
      4 values = [10, "5", 3, "20", 1]
      5 print(sort_values(values))

TypeError: 'lt' not supported between instances of 'str' and 'int'

Next steps: Explain error
```

```
❶ def sort_values(data):
    numeric_data = [int(x) for x in data]
    return sorted(numeric_data)

values = [10, "5", 3, "20", 1]
print(sort_values(values))

... [1, 3, 5, 10, 20]
```

## Explanation of Fix Applied

### Type Conversion

Converts all string numbers into integers

- Ensures consistent data type for sorting

### Prevents Runtime Error

- Sorting now happens only between integers
- Eliminates **Type Error**

Improves Robustness

- Function safely handles user input with mixed types
- Program no longer crashes

## Task 3: Improving File Handling Reliability

### Scenario

A backend script reads data from files regularly. Over time, the system shows performance issues due to improper resource management.

### Task Description

You are given a Python file-handling snippet that opens a file but does not explicitly close it.

Use GitHub Copilot or Cursor AI to:

- Identify the potential problem in the code
- Refactor it using best practices (such as a context manager)
- Ensure safe and reliable file handling

Briefly describe why the revised approach is better.

### Expected Outcome

- Refactored code using the `with open()` statement
- AI explanation highlighting prevention of resource leaks
- Clean execution without warnings or errors

The screenshot shows a Jupyter Notebook interface. At the top, a cell has run successfully, displaying the following Python code and its output:

```
file = open("data.txt", "r")
content = file.read()
print(content)
```

Output:

```
FileNotFoundError: [Errno 2] No such file or directory: 'data.txt'
```

Below this, a link "Next steps: Explain error" is visible. The notebook then shows two more cells. The first cell (12) contains code that creates a file and writes to it:

```
file = open("data.txt", "w")
file.write("Hello World from Google Colab")
file.close()
```

The second cell (13) contains code using a `with` statement to handle the file:

```
with open("data.txt", "r") as file:
    content = file.read()
    print(content)
```

Output of cell 13:

```
Hello World from Google Colab
```

**Explanation:** The error occurred because the file did not exist in the Google Colab environment. After creating the file, the program executed correctly. The original code required manual file closing, which could lead to resource leaks. Using the `with open()` statement ensures the file is automatically closed, improving reliability and preventing resource leaks.

## Task 4: Handling Runtime Errors Gracefully in Loops

### Scenario

You are working on a data analysis script that processes a list of values. Some values cause runtime errors, but the program should continue processing remaining data.

#### Task Description

You are provided with a code snippet containing a `ZeroDivisionError` inside a loop.

Use GitHub Copilot or Cursor AI to:

- Detect the exact location of the error
- Add appropriate exception handling using `try-except`
- Ensure the loop continues executing safely

Document how AI improved the fault tolerance of the program.

### Expected Outcome

- Updated code with proper exception handling
- Meaningful error messages instead of program crashes
- Successful execution for all valid inputs

```
[14] 0s
values = [10, 5, 0, 2]
for v in values:
    result = 10 / v
    print(result)

... 1.0
2.0
-----
ZeroDivisionError                                 Traceback (most recent call last)
/tmp/python-input-3724710995.py in <cell line: 0>()
      1 values = [10, 5, 0, 2]
      2 for v in values:
----> 3     result = 10 / v
      4     print(result)

ZeroDivisionError: division by zero

Next steps: Explain error

[15] 0s
values = [10, 5, 0, 2]
for v in values:
    try:
        result = 10 / v
        print(result)
    except ZeroDivisionError:
        print("Error: Cannot divide by zero, skipping value.")

... 1.0
2.0
Error: Cannot divide by zero, skipping value.
5.0
```

**Explanation:** AI identified the division by zero inside the loop and suggested adding a try-except block to handle the runtime error. This prevents program termination and allows safe processing of remaining values, improving overall reliability.

## Task 5: Debugging Class Initialization Errors

### Scenario

A class written by a junior developer is throwing unexpected errors when objects are created or attributes are accessed.

### Task Description

You are given a Python class with:

- Incorrect `__init__` parameters
- Missing or incorrect attribute references (e.g., missing `self`)

Use GitHub Copilot or Cursor AI to:

- Analyze the class definition
- Identify constructor and attribute issues
- Correct the class so objects initialize and behave correctly

Explain the corrections suggested by the AI.

### Expected Outcome

- A corrected class definition
- Proper use of `self` and constructor parameters
- AI-assisted explanation of the original errors and fixes
- Sample object creation and method usage

```
[17] 0s
class Student:
    def __init__(name, age):
        self.name = name
        age = age

    def display():
        print("Name:", name)
        print("Age:", age)

[18] 0s
▶ s = Student("Nithish", 21)
...
...
TypeError: Traceback (most recent call last)
/tmp/ipython-input-1110918659.py in <cell line: 0>()
----> 1 s = Student("Nithish", 21)

TypeError: Student.__init__() takes 2 positional arguments but 3 were given

Next steps: Explain error
```

```
[19] 0s
▶ s.display()
...
...
NameError: Traceback (most recent call last)
/tmp/ipython-input-2251852535.py in <cell line: 0>()
----> 1 s.display()

NameError: name 's' is not defined

Next steps: Explain error
```

```
[20] 0s
▶ age = age
...
...
NameError: Traceback (most recent call last)
/tmp/ipython-input-2708111571.py in <cell line: 0>()
----> 1 age = age

NameError: name 'age' is not defined

Next steps: Explain error
```

```
[21] 0s
class Student:
    def __init__(self, name, age):
        self.name = name
        self.age = age

    def display(self):
        print("Name:", self.name)
        print("Age:", self.age)

[22] 0s
▶ s = Student("Nithish", 21)
s.display()
...
...
Name: Nithish
Age: 21
```

**Explanation:** Added `self` as the first parameter in `__init__` and `display`

- Assigned attributes using `self` to store them in the object
- Accessed attributes through `self` to avoid reference errors  
This ensures proper object initialization and correct attribute access

#.AI detected missing and incorrect use of `self` in the constructor and methods, which caused attribute access errors. By correcting the constructor parameters and using `self` consistently, the class now initializes objects correctly and allows safe attribute access.