

## Assignment 10.4 Ai Assisted Coding

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### Task 1: AI-Assisted Syntax and Code Quality Review

#### Scenario

You join a development team and are asked to review a junior developer's Python script that fails to run correctly due to basic coding mistakes. Before deployment, the code must be corrected and standardized.

#### Task Description

You are given a Python script containing:

- Syntax errors
- Indentation issues
- Incorrect variable names
- Faulty function calls

Use an AI tool (GitHub Copilot / Cursor AI) to:

- Identify all syntactic and structural errors
- Correct them systematically
- Generate an explanation of each fix made

#### Expected Outcome

- Fully corrected and executable Python code
- AI-generated explanation describing:
  - Syntax fixes
  - Naming corrections
  - Structural improvements
- Clean, readable version of the script

## Code:

The screenshot shows a Google Colab notebook titled "Untitled33.ipynb". The code cell contains the following Python script:

```
def calculate_total(price, tax):
    """Calculate total amount including tax."""
    total = price + price * tax
    return total

def print_receipt(name, amount):
    """Print customer receipt details."""
    print("Customer Name:", name)
    print("Total Amount:", amount)

# Input values
item_price = 100
tax_rate = 0.18

# Function call
final_amount = calculate_total(item_price, tax_rate)

# Display receipt
print_receipt("Sneha", final_amount)
```

The code defines two functions: `calculate_total` and `print_receipt`. It then uses these functions to calculate the total amount for an item priced at 100 with a tax rate of 0.18, and prints a receipt for a customer named "Sneha".

## Output:

The screenshot shows the execution output of the code in the previous image. The output pane displays the results of the `print_receipt` function call:

```
Customer Name: Sneha
Total Amount: 118.0
```

A battery status message is also visible at the bottom right of the screen.

## Explanation:

- >AI fixed syntax mistakes and indentation errors in the script.
- >It corrected wrong function calls and mismatched variable names.
- >Naming was standardized using proper Python conventions.
- >The code structure was cleaned and organized properly.
- >The final program runs correctly without errors.

## Task 2:

### Performance-Oriented Code Review

#### Scenario

A data processing function works correctly but is inefficient and slows down the system when large datasets are used.

#### Task Description

You are provided with a function that identifies duplicate values in a list using inefficient nested loops.

Using AI-assisted code review:

- Analyze the logic for performance bottlenecks
- Refactor the code for better time complexity
- Preserve the correctness of the output Ask the AI to explain:
  - Why the original approach was inefficient
  - How the optimized version improves performance

#### Expected Outcome

- Optimized duplicate-detection logic (e.g., using sets or hash-based structures)
- Improved time complexity
- AI explanation of performance improvement
- Clean, readable implementation Code:

The screenshot shows a Google Colab interface with a dark theme. In the top bar, there are tabs for "google colab - Search", "Untitled3.ipynb - Colab", "word - Search", and "Document 11.docx". The main area displays the following Python code:

```
[2] 0s
▶ def find_duplicates(numbers):
    seen = set()
    duplicates = set()

    for num in numbers:
        if num in seen:
            duplicates.add(num)
        else:
            seen.add(num)

    return list(duplicates)

data = [1, 2, 3, 4, 2, 5, 6, 3, 7, 1]
print("Duplicates:", find_duplicates(data))
```

Output:

The screenshot shows the same Google Colab interface. The output pane at the bottom displays the result of running the code:

```
... Duplicates: [1, 2, 3]
```

Explanation:

- >The original code used **nested loops**, comparing each element with every other element.
- >This caused  **$O(n^2)$  time complexity**, making it slow for large lists.
- >The optimized version uses a **set** for quick lookup of seen elements.
- >Set operations work in  **$O(1)$  time**, allowing duplicates to be found in one pass.

-->This reduces overall complexity to **O(n)**, improving performance while keeping correct results.

### Task 3:

#### Readability and Maintainability Refactoring

##### Scenario

A working script exists in a project, but it is difficult to understand due to poor naming, formatting, and structure. The team wants it rewritten for long-term maintainability.

##### Task Description

You are given a poorly structured Python function with:

- Cryptic function names
- Poor indentation
- Unclear variable naming
- No documentation

Use AI-assisted review to:

- Refactor the code for clarity
- Apply PEP 8 formatting standards
- Improve naming conventions
- Add meaningful documentation

##### Expected Outcome

- Clean, well-structured code
- Descriptive function and variable names
- Proper indentation and formatting

- Docstrings explaining the function purpose
- AI explanation of readability improvements Code:

The screenshot shows a Google Colab notebook titled "Untitled33.ipynb". A code cell contains the following Python function:

```
def calculate_sum_above_threshold(numbers, threshold):
    """
    Calculate the sum of numbers greater than a given threshold.

    Parameters:
    numbers (list): List of numeric values.
    threshold (int or float): The minimum value to include in the sum.

    Returns:
    int or float: Sum of numbers greater than the threshold.
    """
    total_sum = 0

    for number in numbers:
        if number > threshold:
            total_sum += number

    return total_sum
```

Below the code cell, the AI-generated readability improvement is shown:

```
int or float: Sum of numbers greater than the threshold.
"""
total_sum = 0

for number in numbers:
    if number > threshold:
        total_sum += number

return total_sum
```

## Output:

The screenshot shows the same Google Colab notebook. The code cell now contains the AI-generated readability improvement, which includes input data and a function call:

```
# Input data
values = [10, 5, 20, 3, 15]
limit = 8

# Function call
result = calculate_sum_above_threshold(values, limit)
print("Sum of numbers above threshold:", result)
```

The screenshot shows a Google Colab interface with a dark theme. On the left is a sidebar with various icons for file operations. The main area contains Python code:

```
total_sum += number

return total_sum

# Input data
values = [10, 5, 20, 3, 15]
limit = 8

# Function call
result = calculate_sum_above_threshold(values, limit)
print("Sum of numbers above threshold:", result)

... Sum of numbers above threshold: 45
```

Explanation:

-->The original code was hard to understand due to unclear function and variable names, poor formatting, and no documentation.

--> The refactored version improves readability by using a descriptive function name and meaningful variable names.

-->Proper indentation and spacing were applied following PEP 8 standards. A docstring was added to explain the function's purpose, parameters, and return value.

--> These changes make the code easier to read, maintain, and modify in the future.

#### Task 4:

##### Secure Coding and Reliability Review

###### Scenario

A backend function retrieves user data from a database but has security vulnerabilities and poor error handling, making it unsafe for production deployment.

###### Task Description

You are given a Python script that:

- Uses unsafe SQL query construction
- Has no input validation • Lacks exception handling Use AI tools to:
- Identify security vulnerabilities
- Refactor the code using safe coding practices
- Add proper exception handling
- Improve robustness and reliability

Expected Outcome

- Secure SQL queries using parameterized statements
- Input validation logic
- Try-except blocks for runtime safety
- AI-generated explanation of security improvements
- Production-ready code structure Code:

The screenshot shows a Google Colab notebook titled "Untitled33.ipynb". The code cell contains the following Python script:

```
[29] ✓ 0s
import sqlite3

def get_user(username):
    """
    Retrieve user details safely from the database.

    Parameters:
    username (str): Username entered by the user.

    Returns:
    tuple or None: User record if found, otherwise None.
    """

    # Input validation
    if not username.isalnum():
        print("Invalid username. Only letters and numbers allowed.")
        return None
```

The status bar at the bottom indicates "10:26 AM" and "Python 3".

## Output:

The screenshot shows the same Google Colab notebook "Untitled33.ipynb". The code cell has been run, and the output is displayed below it:

```
return None
```

The status bar at the bottom indicates "10:26 AM" and "Python 3". A "Snipping Tool" window is visible in the background, showing a screenshot of the Colab interface.

The screenshot shows a Google Colab notebook titled "Untitled33.ipynb". The code in the cell is as follows:

```
        return result

    except sqlite3.Error as e:
        print("Database error occurred:", e)
        return None

    finally:
        conn.close()

# Hardcoded input for Google Colab
user_input = "john123" # Change to "Sneha" to test another user
user_data = get_user(user_input)

if user_data:
    print("User found:", user_data)
else:
    print("No user found.")
```

The notebook interface includes tabs for "Variables" and "Terminal". The status bar at the bottom right shows "10:26 AM" and "Python 3".

Output:

The screenshot shows the same Google Colab notebook. The output of the code cell is displayed in the terminal tab:

```
... User found: (1, 'john123', 'john@email.com')
```

The notebook interface includes tabs for "Variables" and "Terminal". The status bar at the bottom right shows "10:26 AM" and "Python 3".

Explanation:

-->The original code was insecure because it built SQL queries using string concatenation, which could lead to SQL injection attacks.

-->The refactored version uses parameterized queries (?) to safely pass user input to the database.

--> Input validation was added to ensure only alphanumeric usernames are accepted, reducing the risk of malicious input.

--> Try-except blocks were introduced to handle database errors without crashing the program.

--> A finally block ensures the database connection is always closed, improving reliability and making the code safe for production use.

## Task 5:

### AI-Based Automated Code Review Report

#### Scenario

Your team uses AI tools to perform automated preliminary code reviews before human review, to improve code quality and consistency across projects.

#### Task Description

You are provided with a poorly written Python script.

Using AI-assisted review:

- Generate a structured code review report that evaluates:

o Code readability o Naming

conventions o Formatting and style

consistency o Error handling o

Documentation quality o

Maintainability

The task is not just to fix the code, but to analyze and report on quality issues.

#### Expected Outcome

- AI-generated review report including:

o Identified quality issues o Risk areas o

Code smell detection o Improvement

suggestions • Optional improved version

of the code

Code:

A screenshot of the Google Colab interface. The main area shows a code cell with the following Python function:

```
def check_value_in_list(numbers, target):
    """
    Check whether a target value exists in a list.

    Parameters:
    numbers (list): List of values to search.
    target (int/float): Value to find.

    Returns:
    bool: True if found, otherwise False.
    """
    for number in numbers:
        if number == target:
            print("Value found in list.")
            return True
    print("Value not found.")
    return False
```

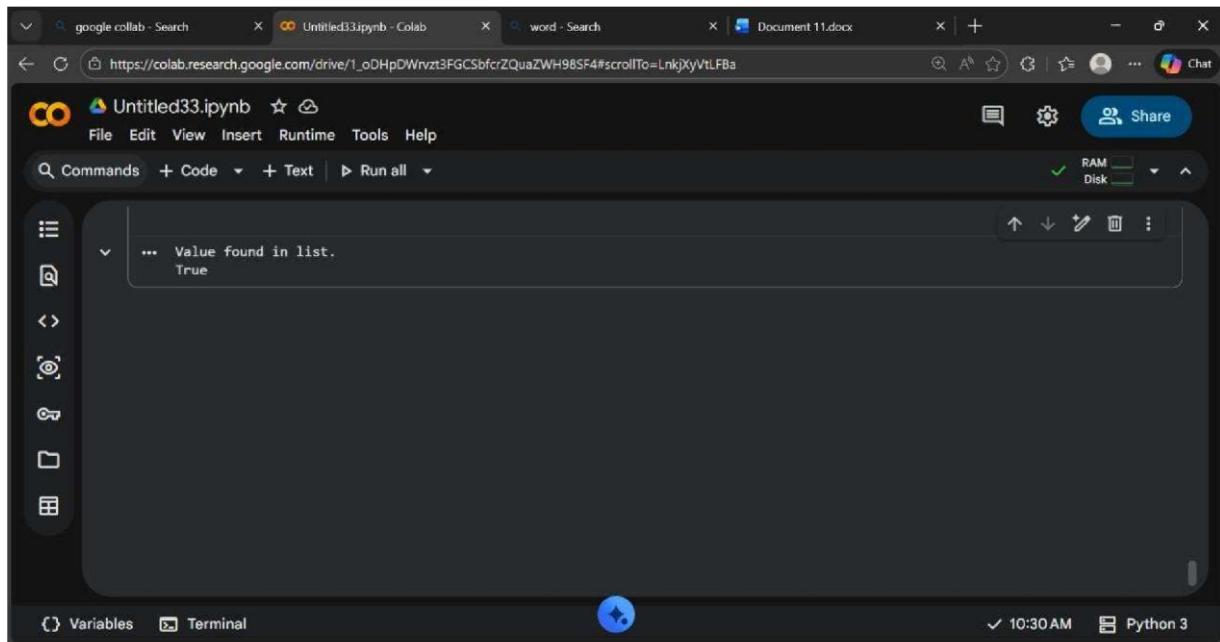
The code cell has a status bar at the bottom indicating "Fn Lock On". Below the code cell, there are buttons for "Variables" and "Terminal". At the bottom right, it shows the time as "10:30 AM" and the Python version as "Python 3".

## Output:

A screenshot of the Google Colab interface showing the execution output of the previous code cell. The output is:

```
Value not found.
```

The code cell now has a status bar at the bottom indicating "Fn Lock Off". Below the code cell, there are buttons for "Variables" and "Terminal". At the bottom right, it shows a message: "Screenshot copied to clipboard" and "Automatically saved to screenshots folder".



### Explanation:

-->In this task, AI was used as a code reviewer to analyze code quality instead of just fixing errors.

-->The AI identified issues related to poor readability, unclear naming, bad formatting, missing documentation, and lack of error handling.

-->It also detected code smells such as unused variables and unnecessary statements. Based on this analysis, improvement suggestions were provided to make the code more maintainable and professional.

-->This demonstrates how AI helps teams perform faster and more consistent preliminary code reviews before human evaluation.