

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

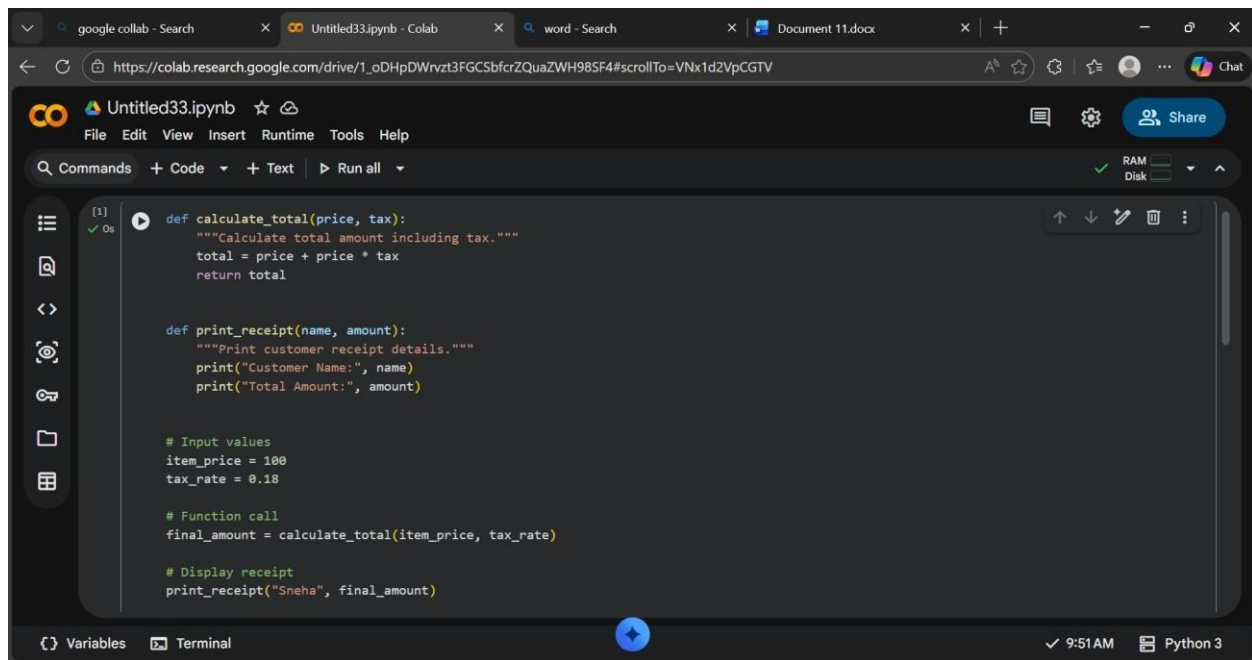
Use an AI tool (GitHub Copilot / Cursor AI) to:

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

Expected Outcome

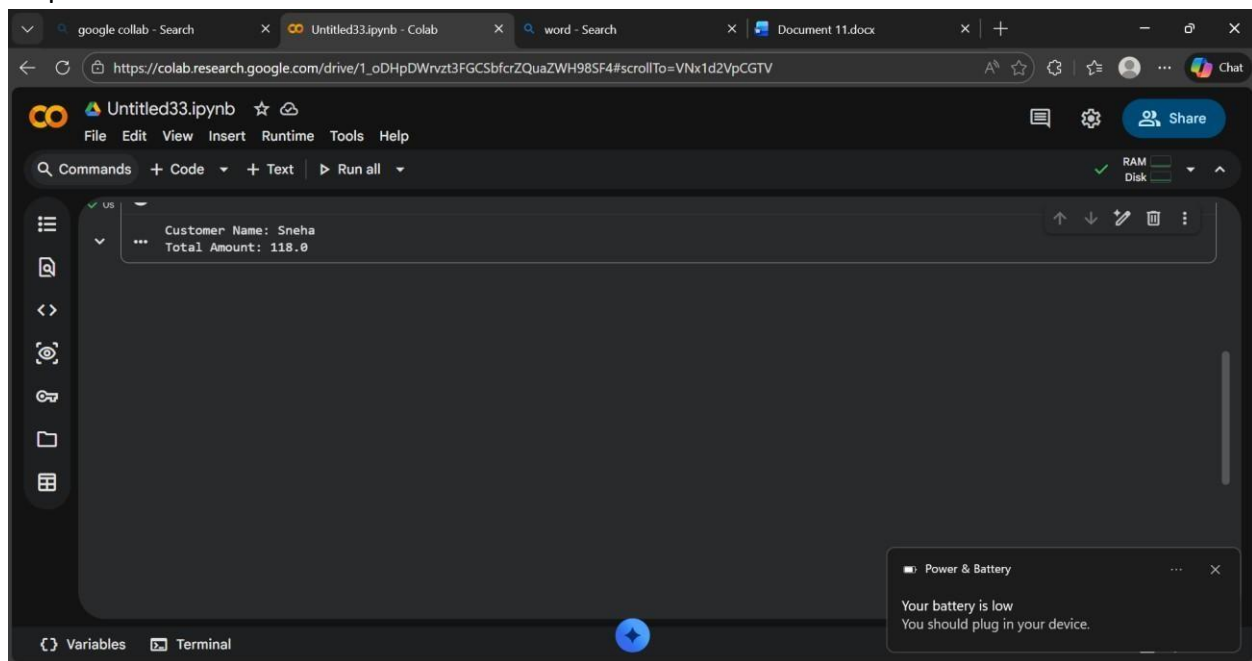
- Fully corrected and executable Python code
- AI-generated explanation describing: o Syntax fixes o Naming corrections

o Structural improvements • Clean,
readable version of the script Code:



```
[1] 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)
```

Output:



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

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

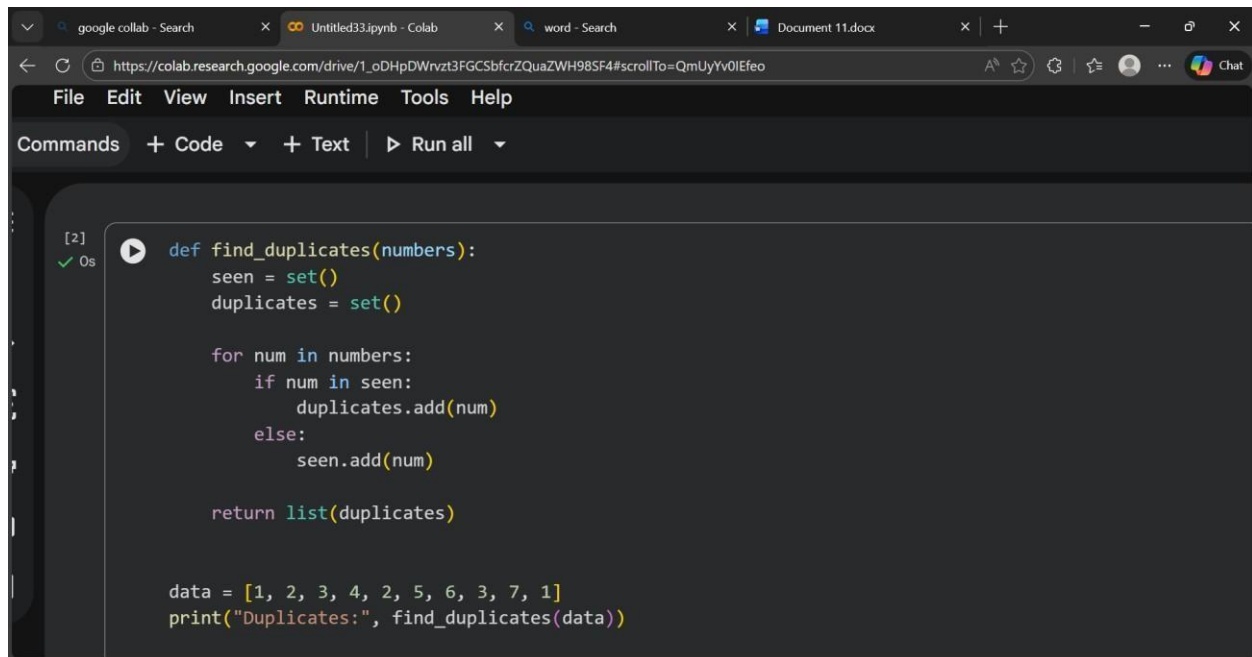
You are provided with a function that identifies duplicate values in a list using inefficient nested loops.

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

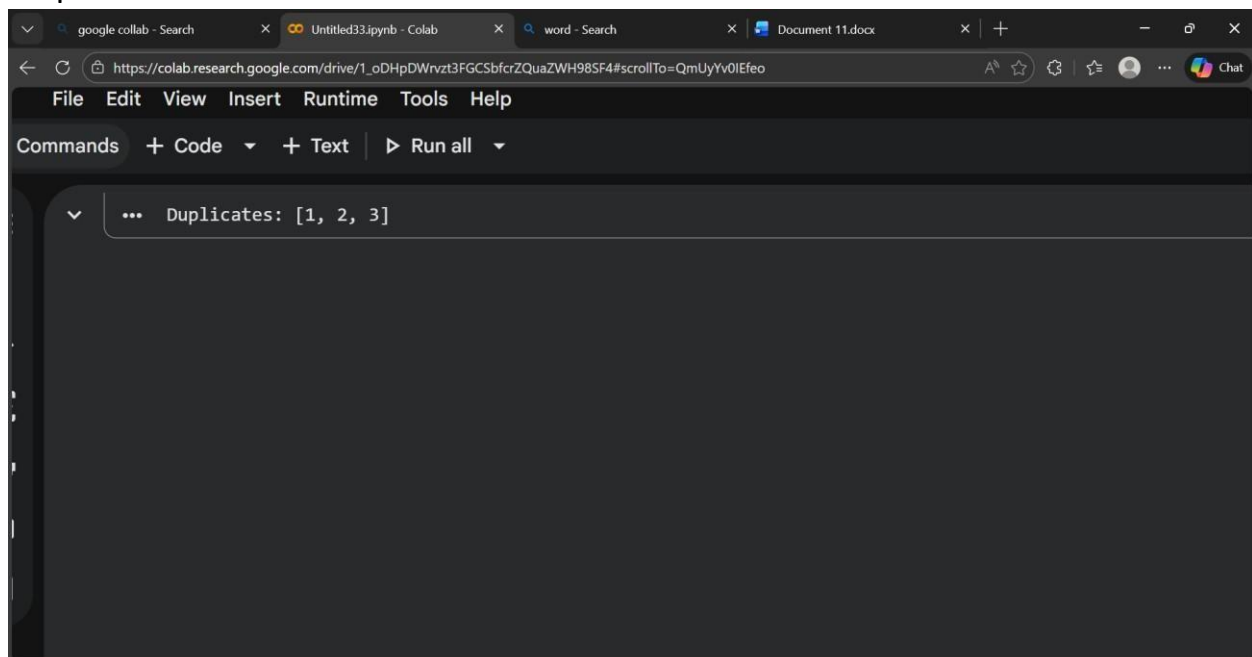
- Optimized duplicate-detection logic (e.g., using sets or hash- based structures)
- Improved time complexity
- AI explanation of performance improvement
- Clean, readable implementation Code:



The screenshot shows a Google Colab notebook interface. The top bar includes tabs for 'google colab - Search', 'Untitled33.ipynb - Colab', 'word - Search', and 'Document 11.docx'. The address bar shows the URL 'https://colab.research.google.com/drive/1_oDHpDWrvzt3FGCSbfczQQuaZWH98SF4#scrollTo=QmUyYv0IEfeo'. The menu bar includes 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. Below the menu bar is a toolbar with 'Commands', '+ Code', '+ Text', and 'Run all'. The main code cell is labeled '[2]' and shows the following Python code:

```
[2] 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 notebook interface as the previous image. The main code cell is now collapsed, and the output is displayed below it. The output is a text box with the text '... 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

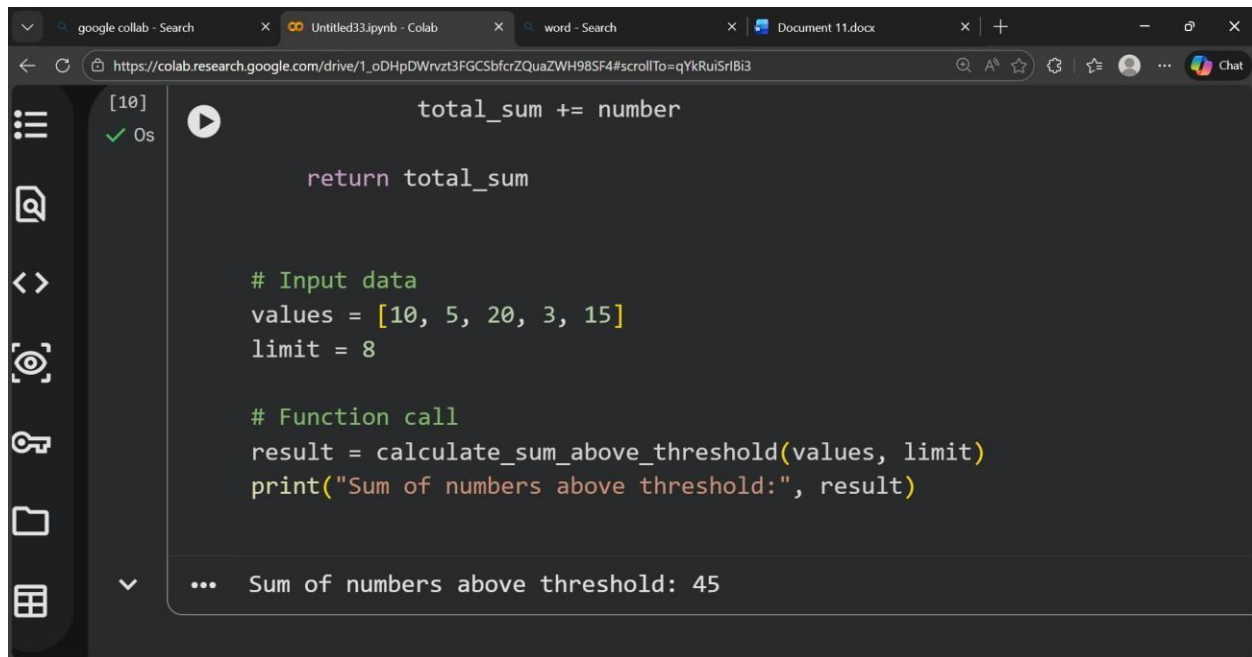
- Docstrings explaining the function purpose
- AI explanation of readability improvements Code:

The image displays two screenshots of a Google Colab notebook interface. The top screenshot shows a Python function definition with a detailed docstring. The bottom screenshot shows the same function being called with sample data, demonstrating its use.

```
[10] 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
```

```
[10] 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  
  
    # 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)
```

Output:



The screenshot shows a Google Colab notebook interface. The top bar displays several tabs: 'google collab - Search', 'Untitled33.ipynb - Colab', 'word - Search', and 'Document 11.docx'. The main editor area contains the following 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)
```

On the left sidebar, the output of the code is shown as a list containing the value 45, with a green checkmark and '0s' indicating execution time. At the bottom of the notebook, the output is displayed as '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:

google collab - Search x Untitled33.ipynb - Colab x word - Search x Document 11.docx x + -

https://colab.research.google.com/drive/1_oDHpDWrvzt3FGCSbfcZQuaZWH98SF4#scrollTo=aoTRnqGAKFXB

Untitled33.ipynb ☆ ☁

File Edit View Insert Runtime Tools Help

Commands + Code + Text ▶ Run all

RAM Disk

```
[29] 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
```

Variables Terminal 10:26 AM Python 3

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https://colab.research.google.com/drive/1_oDHpDWrvzt3FGCSbfcZQuaZWH98SF4#scrollTo=aoTRnqGAKFXB

Untitled33.ipynb ☆ ☁

File Edit View Insert Runtime Tools Help

Commands + Code + Text ▶ Run all

RAM Disk

```
        return None

    try:
        conn = sqlite3.connect("users.db")
        cursor = conn.cursor()

        # Parameterized query prevents SQL injection
        query = "SELECT * FROM users WHERE username = ?"
        cursor.execute(query, (username,))

        result = cursor.fetchone()
        return result

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

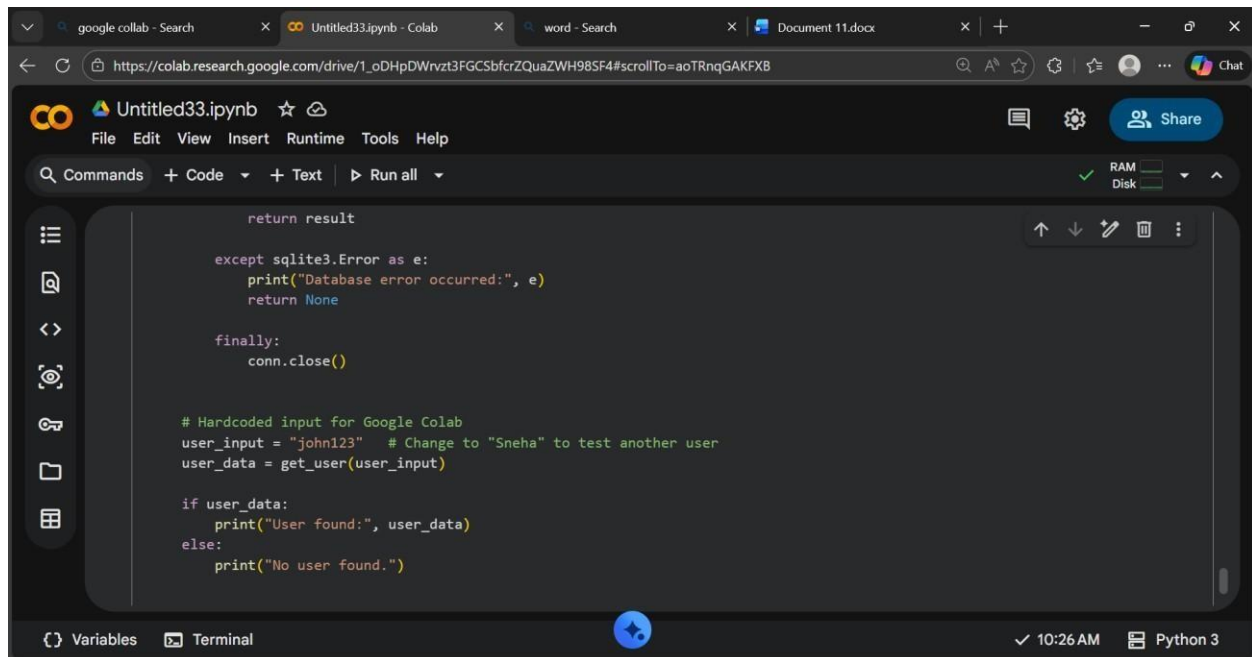
    finally:
        conn.close()
```

Variables Terminal

Snipping Tool

Screenshot copied to clipboard
Automatically saved to screenshots folder.

Markup and share



The screenshot shows a Google Colab notebook titled 'Untitled33.ipynb'. The code is written in Python and includes a function `get_user` that interacts with a database. The code uses string concatenation to build SQL queries, which is insecure. The code is as follows:

```
return result

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

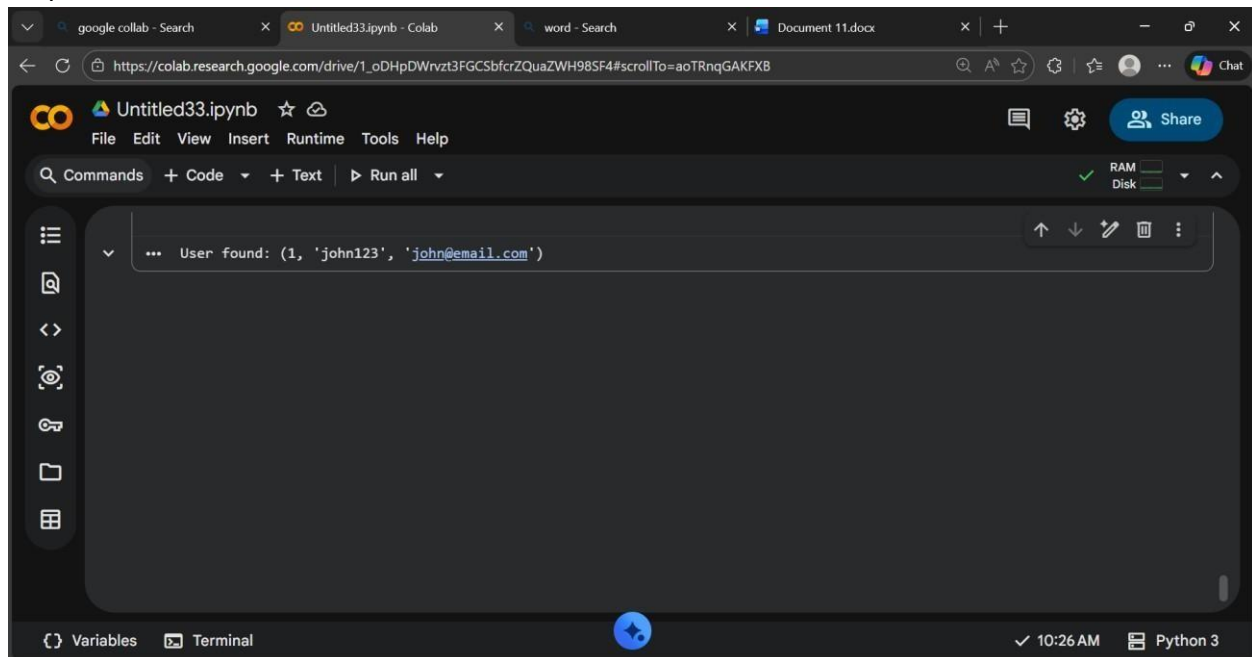
finally:
    conn.close()

# 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 shows the 'Run all' button and the status bar at the bottom indicates 'Python 3'.

Output:



The screenshot shows the same Google Colab notebook, but now the output of the code is visible. The output is a tuple representing a user found in the database:

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

The notebook interface shows the 'Run all' button and the status bar at the bottom indicates '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

Maintainability

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

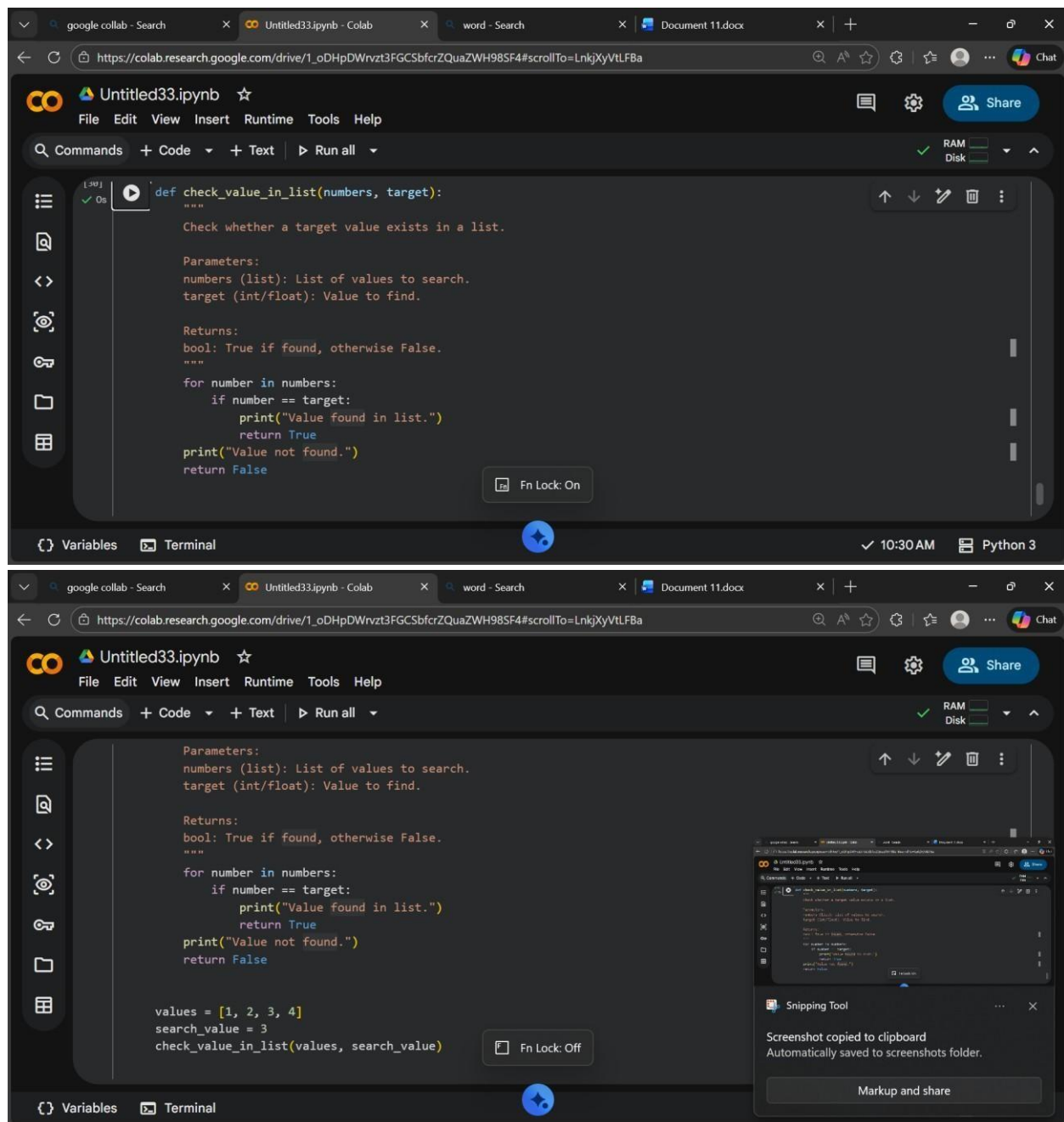
Expected Outcome

- AI-generated review report including:
 - o Identified quality issues
 - o Risk areas
 - o Code smell detection
 - o Improvement

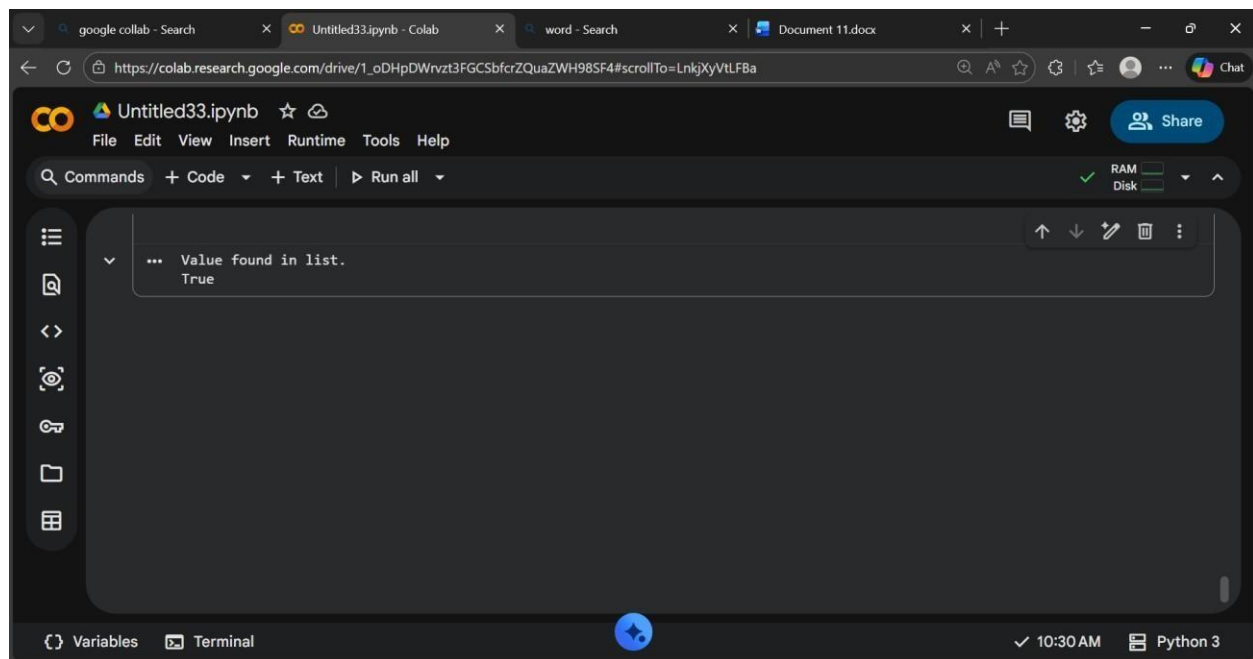
suggestions • Optional improved version of

the code

Code:



Output:



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.