

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

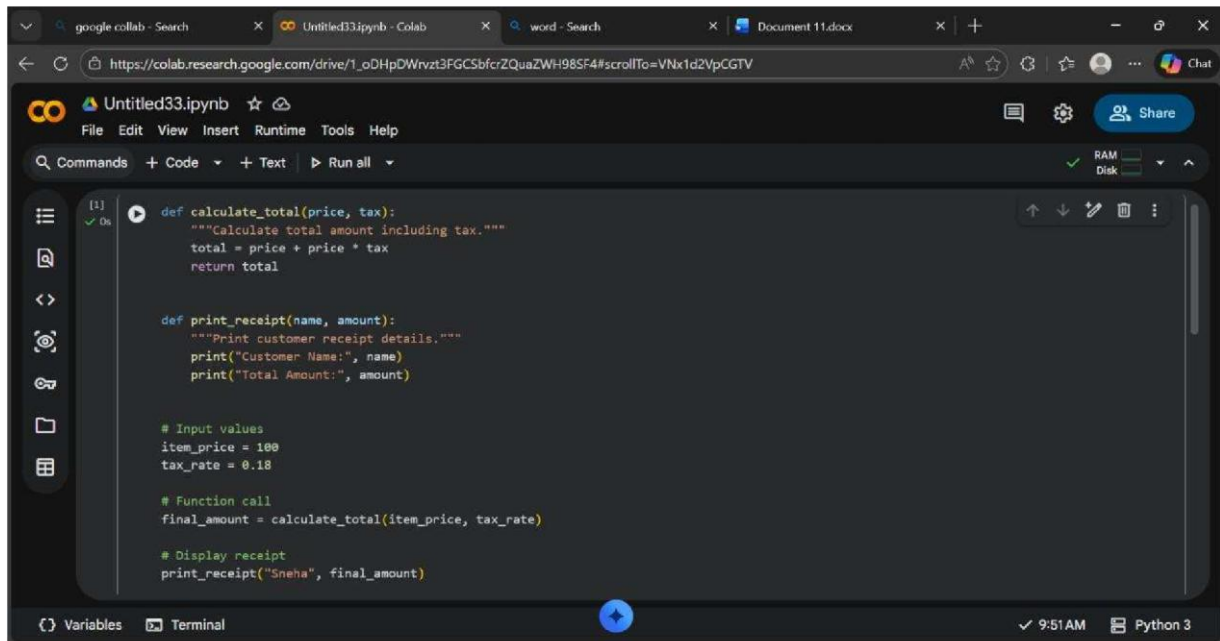
Use an AI tool (GitHub Copilot / Cursor AI) to:

- 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

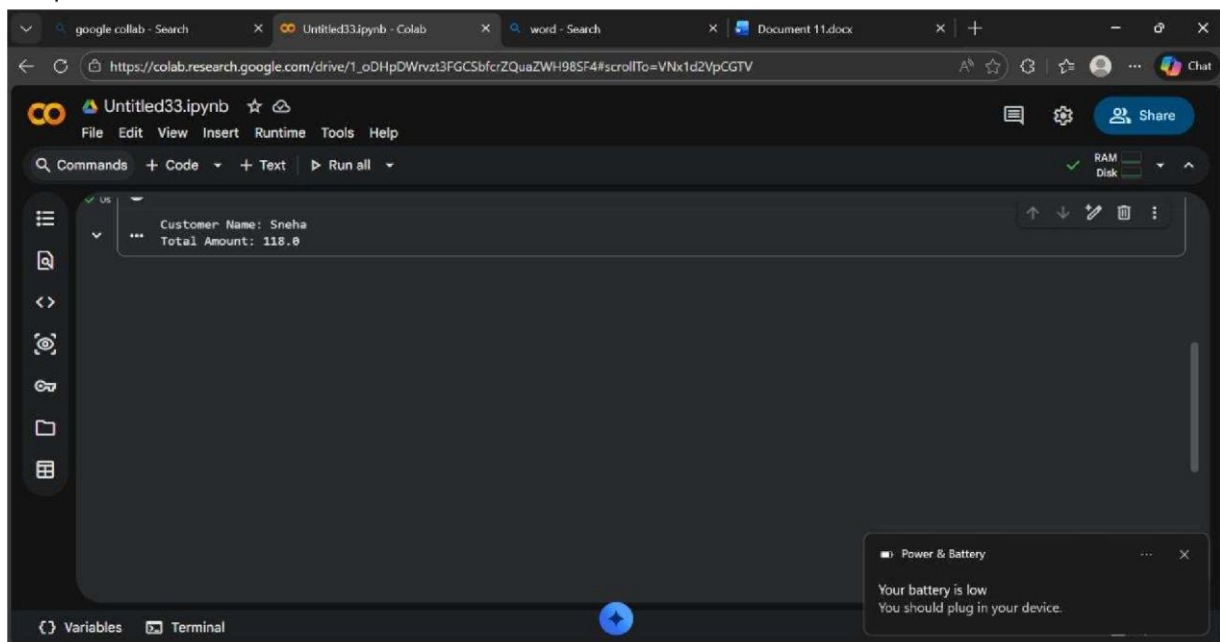
Code:



The screenshot shows a Google Colab notebook titled 'Untitled33.ipynb'. The code is as follows:

```
[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:



The screenshot shows the same Google Colab notebook after execution. The output is displayed in a cell:

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

A system notification in the bottom right corner reads: "Power & Battery: Your battery is low. You should plug in your device."

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

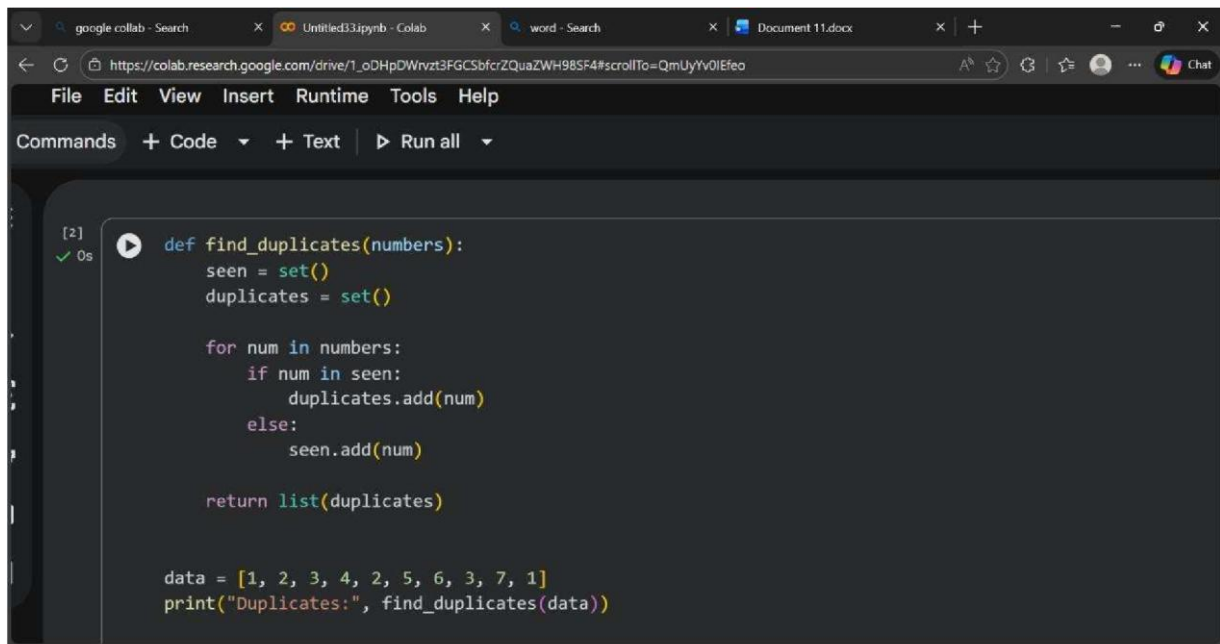
You are provided with a function that identifies duplicate values in a list using inefficient nested loops.

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

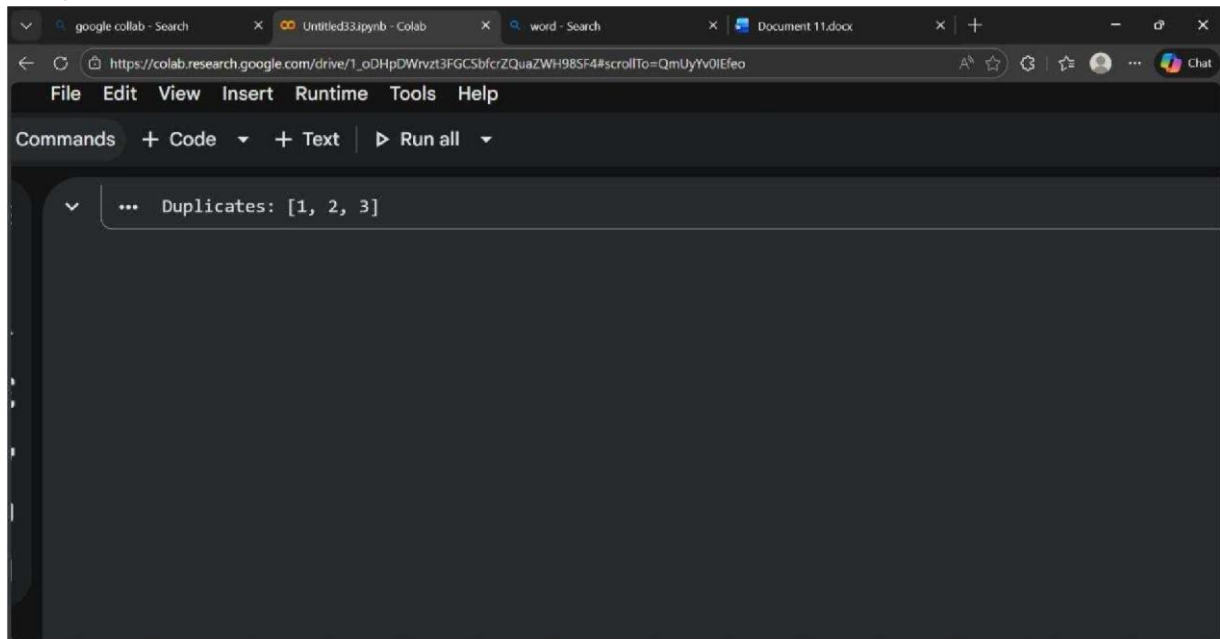
- Optimized duplicate-detection logic (e.g., using sets or hash-based structures)
- Improved time complexity
- AI explanation of performance improvement
- Clean, readable implementation Code:



The screenshot shows a Google Colab notebook interface. The top bar includes tabs for 'google collab - Search', 'Untitled33.ipynb - Colab', 'word - Search', and 'Document 11.docx'. The address bar shows the URL 'https://colab.research.google.com/drive/1_oDHpDWrvzt3FGCSbfcZQuaZWH98SF4#scrollTo=QmUyYv0IEfeo'. The menu bar includes 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. Below the menu bar, there are tabs for 'Commands', '+ Code', '+ Text', and 'Run all'. The main code cell is labeled '[2]' and shows a Python function 'find_duplicates' that uses a set to find duplicates in a list. The function iterates through the list, adding elements to a 'seen' set and a 'duplicates' set. The output of the function is a list of duplicates. The code is as follows:

```
[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 one, but now the output of the code cell is visible. The output is a text box containing the string 'Duplicates: [1, 2, 3]'. The interface elements are the same as in the previous screenshot.

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

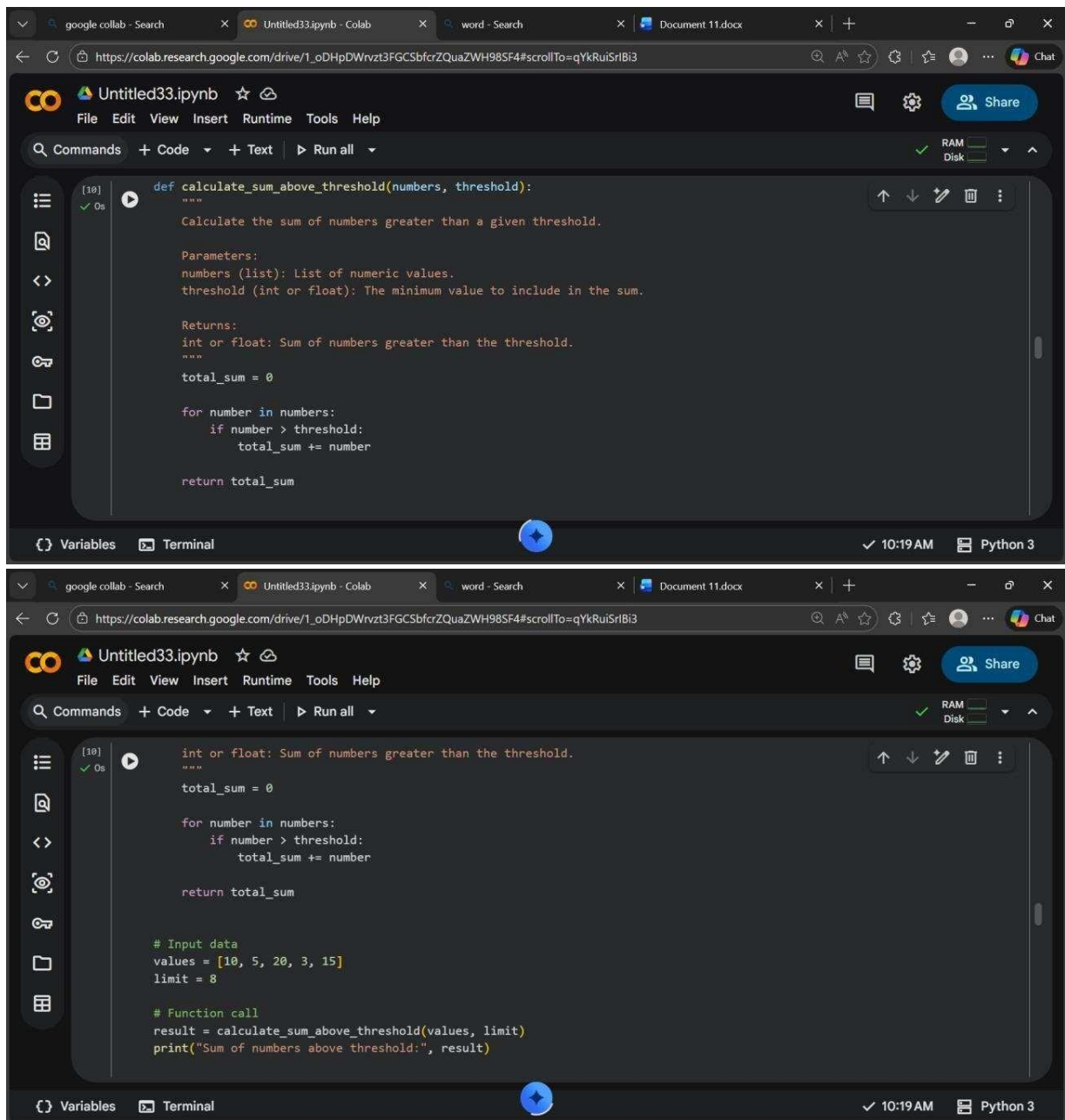
Use AI-assisted review to:

- 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 specific input data, and the output is printed to the console.

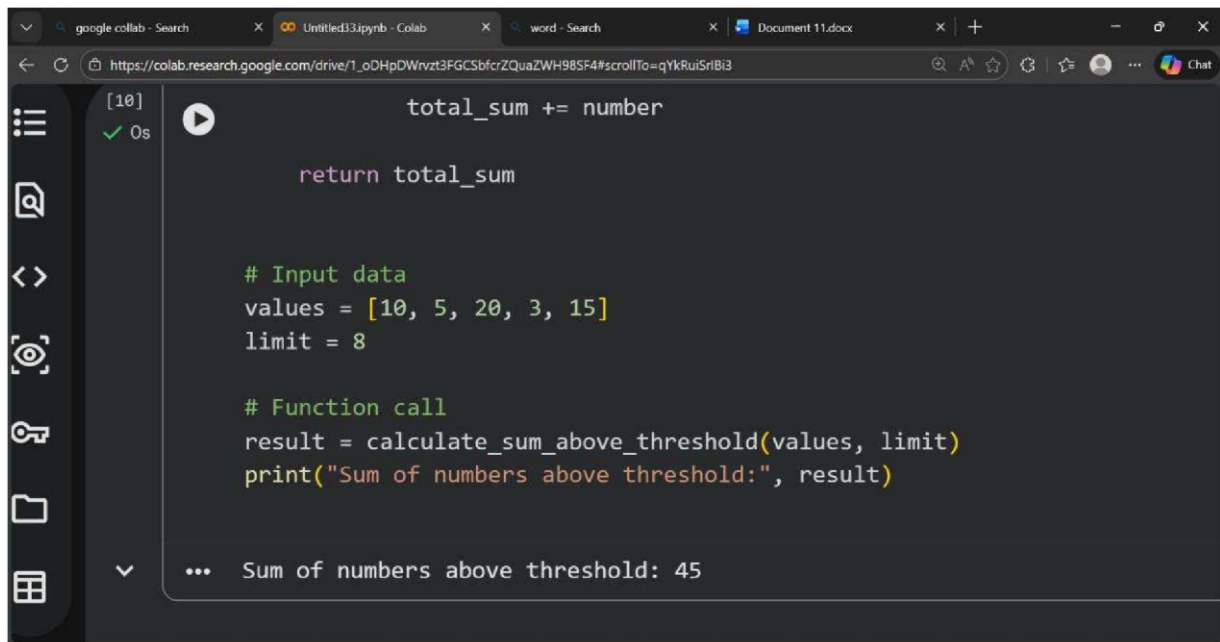
Top Screenshot: Function Definition

```
[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
```

Bottom Screenshot: Function Call and Output

```
[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:

A screenshot of a Google Colab notebook interface. The browser tabs at the top include 'google colab - Search', 'Untitled33.ipynb - Colab', 'word - Search', and 'Document 11.docx'. The address bar shows a URL from colab.research.google.com. The notebook editor has a dark theme. On the left sidebar, there are icons for file explorer, search, and other tools. The main code area shows a function definition for 'calculate_sum_above_threshold' with a docstring, input data, and a function call. The output cell at the bottom shows the result of the function call.

```
[10] ✓ 0s  
  
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 the Google Colab interface for a notebook titled "Untitled33.ipynb". The code editor contains the following Python code:

```
[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
```

The interface includes a menu bar (File, Edit, View, Insert, Runtime, Tools, Help), a toolbar with "Commands", "+ Code", "+ Text", and "Run all", and a status bar at the bottom showing "Variables", "Terminal", "10:26 AM", and "Python 3".

The screenshot shows the Google Colab interface for the same notebook, displaying the continuation of the Python code:

```
        return None

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

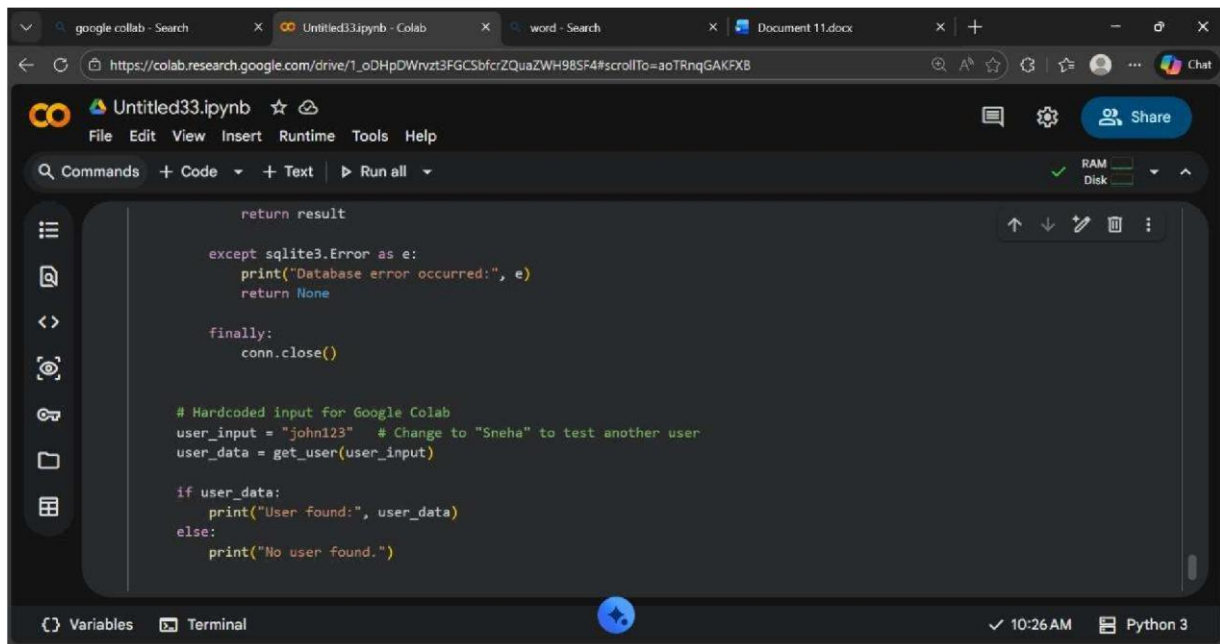
        # Parameterized query prevents SQL injection
        query = "SELECT * FROM users WHERE username = ?"
        cursor.execute(query, (username,))

        result = cursor.fetchone()
        return result

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

    finally:
        conn.close()
```

A "Snipping Tool" window is overlaid on the right side of the code editor, displaying the message: "Screenshot copied to clipboard. Automatically saved to screenshots folder." Below this message is a button labeled "Markup and share".



```
return result

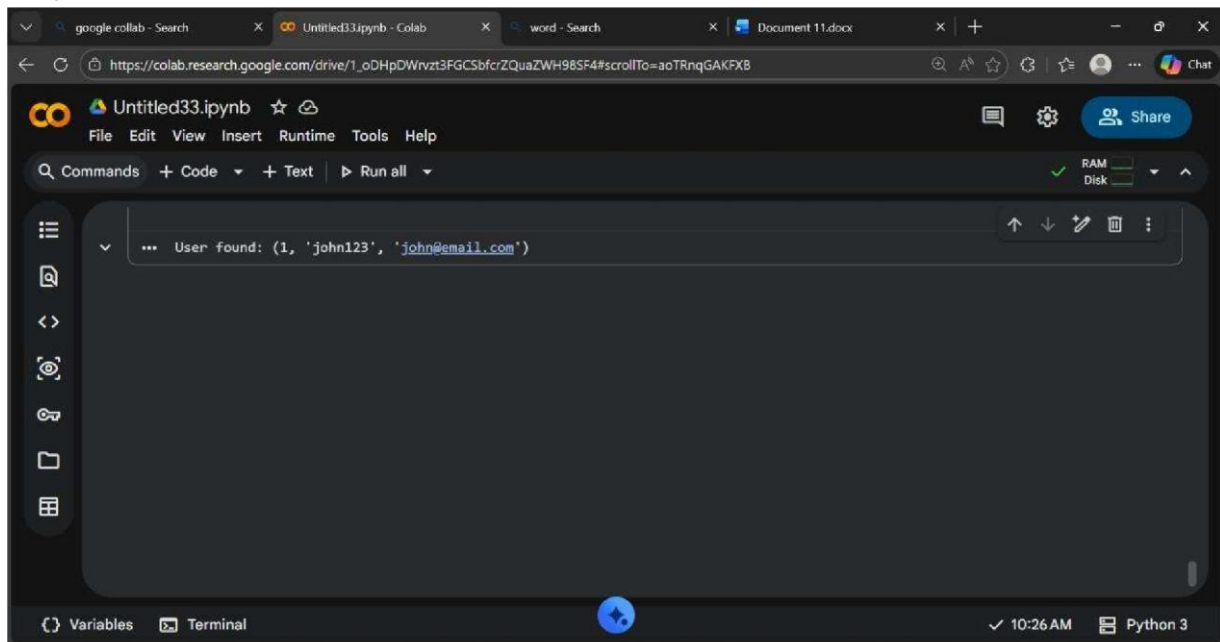
except sqlite3.Error as e:
    print("Database error occurred:", e)
    return None

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.")
```

Output:



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

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:

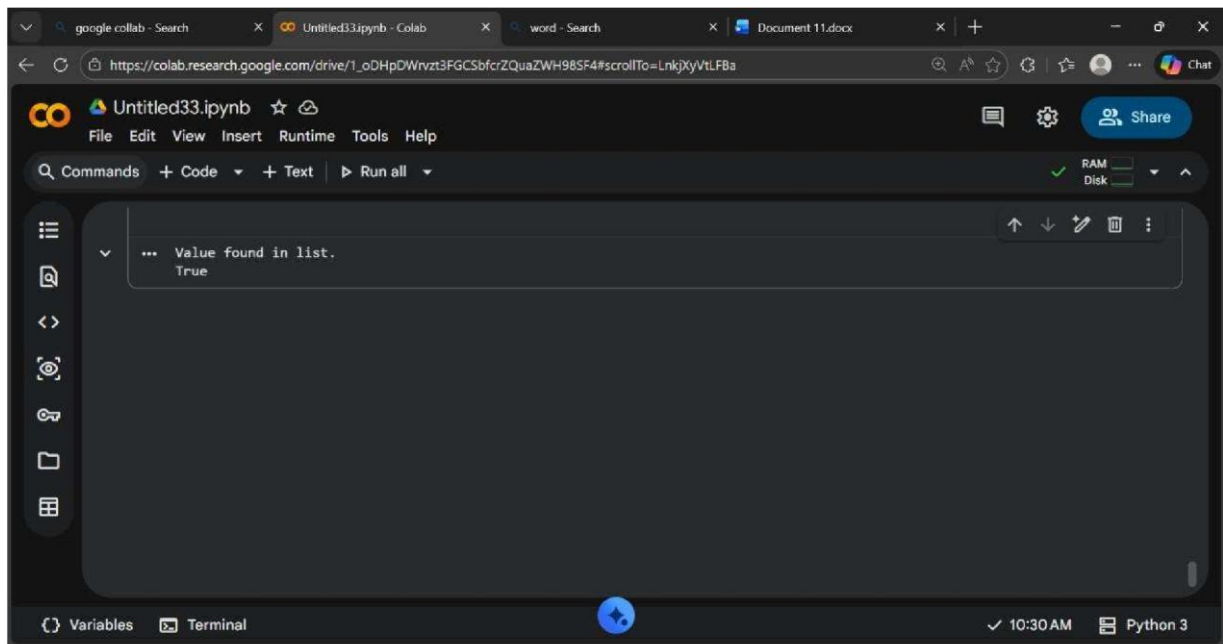
The screenshot shows the Google Colab interface for a notebook titled 'Untitled33.ipynb'. The code cell contains a function definition for `check_value_in_list`. The function takes a list of numbers and a target value, and returns a boolean indicating whether the target is in the list. The function is currently not executed.

```
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 screenshot shows the same Google Colab interface, but now the function is being called with test data. The code cell contains the function definition followed by a list of values and a search value, and a call to the function. The function is currently not executed.

```
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  
  
values = [1, 2, 3, 4]  
search_value = 3  
check_value_in_list(values, search_value)
```

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.