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

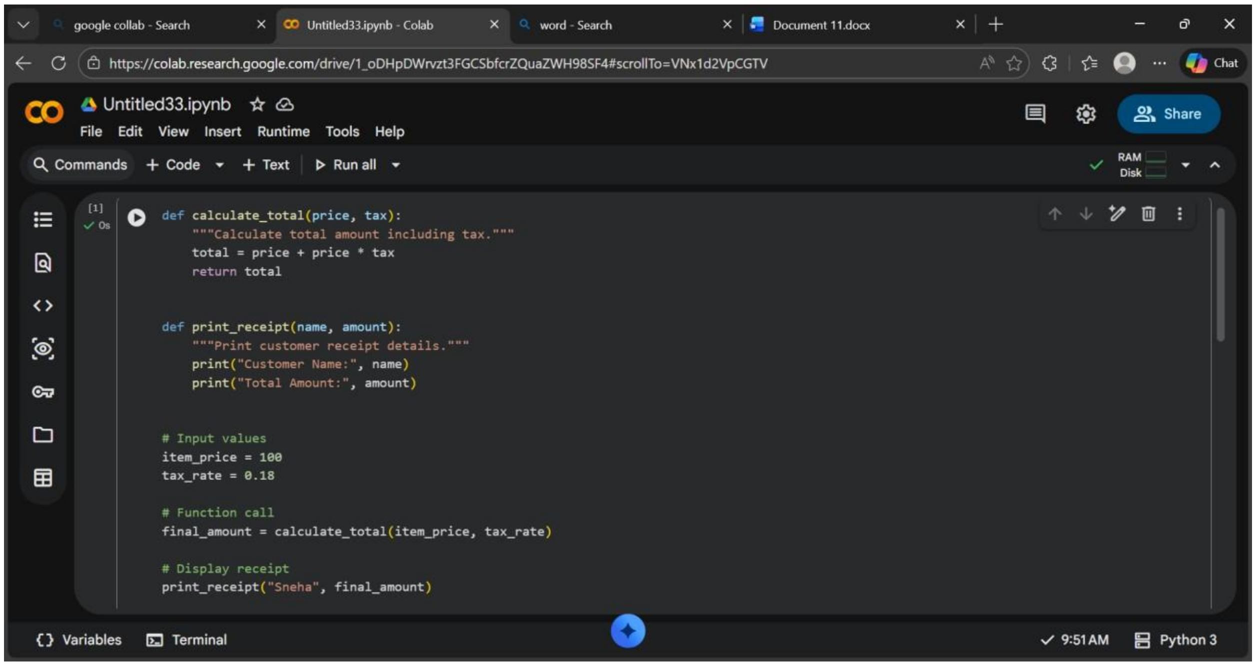
Expected Outcome

• Fully corrected and executable Python code

• AI-generated explanation describing: o Syntax fixes o Naming corrections o Structural improvements • Clean,

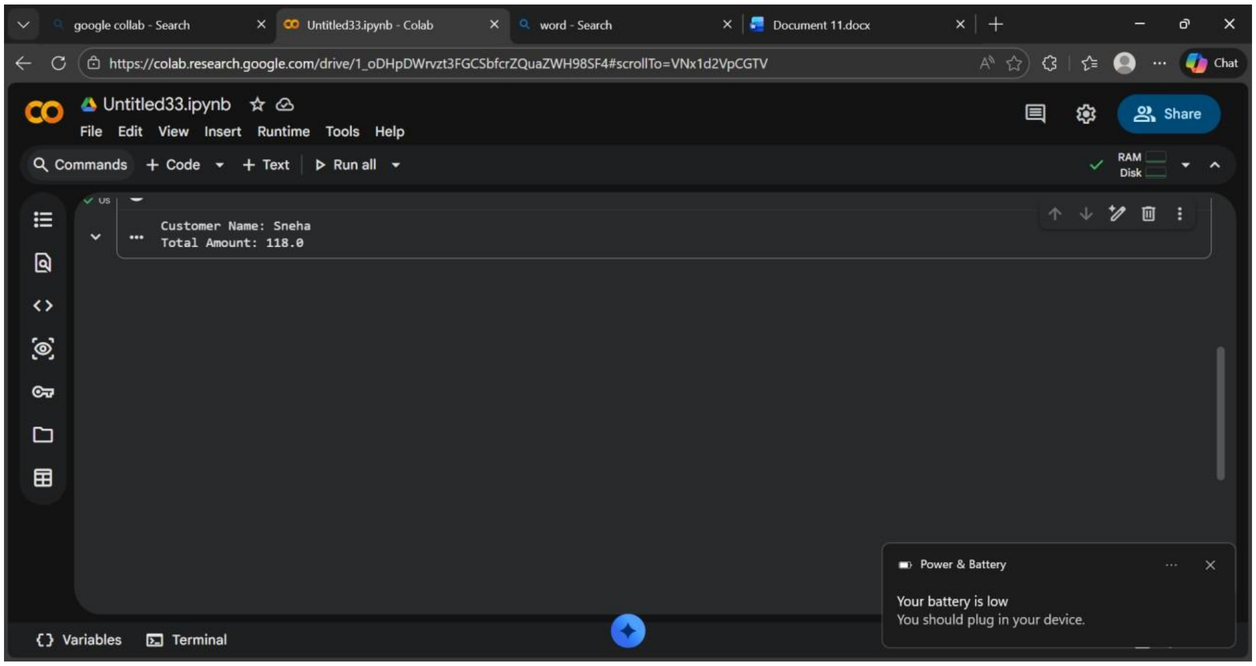
readable version of the script

Code:



```
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

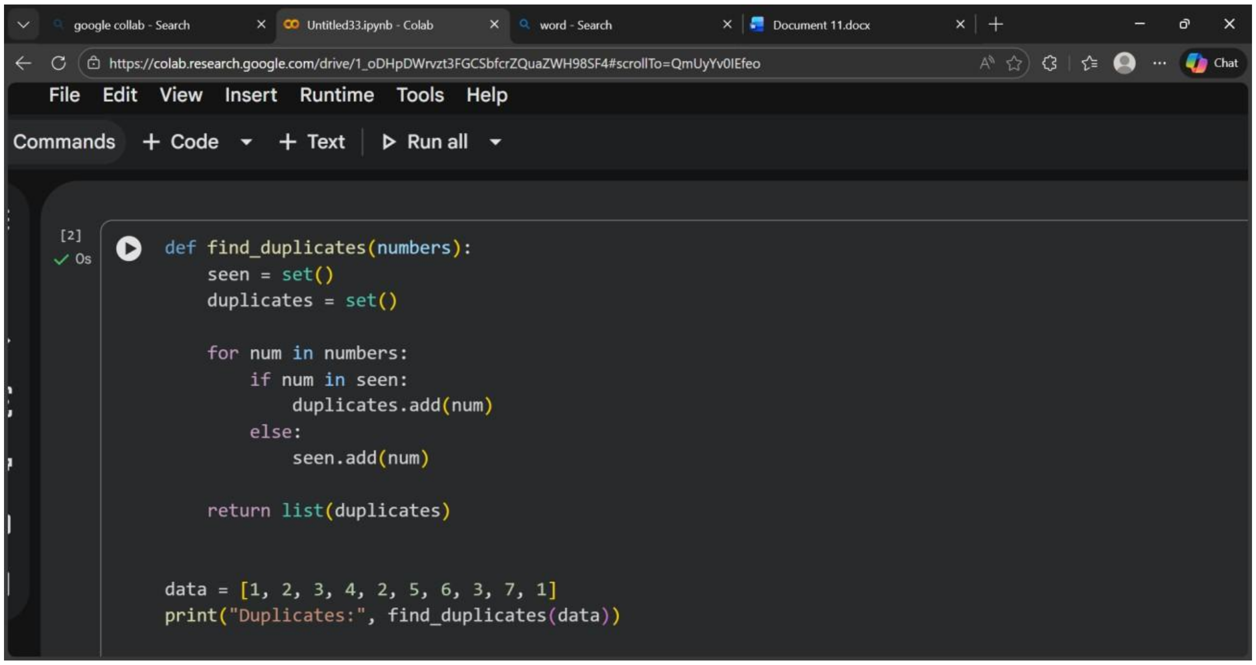
Expected Outcome

• Optimized duplicate-detection logic (e.g., using sets or hash- based structures)

• Improved time complexity

• AI explanation of performance improvement

• Clean, readable implementation Code: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[2]
0s

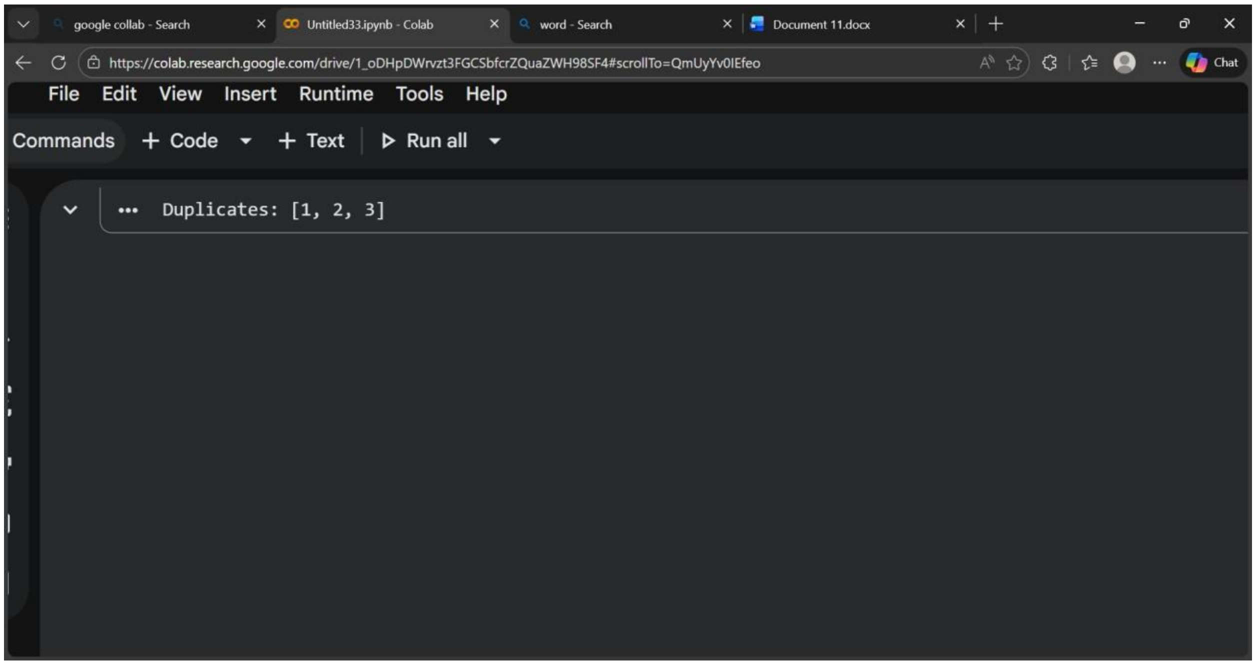
```
def find_duplicates(numbers):
    seen = set()
    duplicates = set()

    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: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```
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

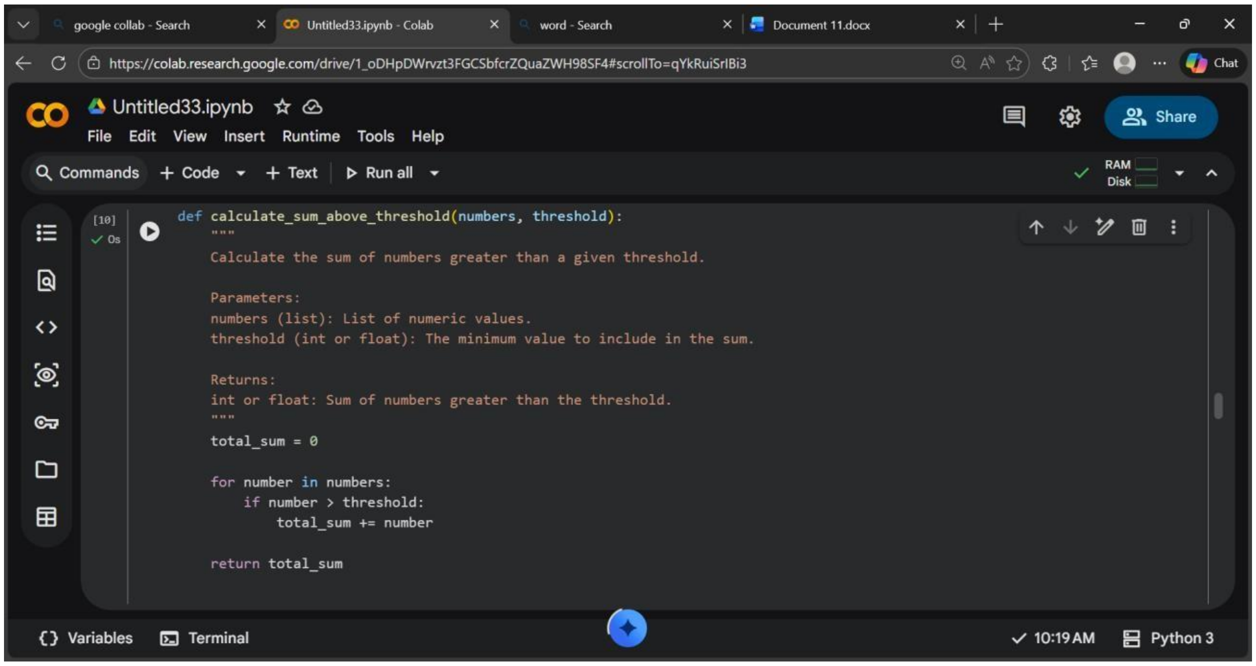
• Clean, well-structured code

• Descriptive function and variable names

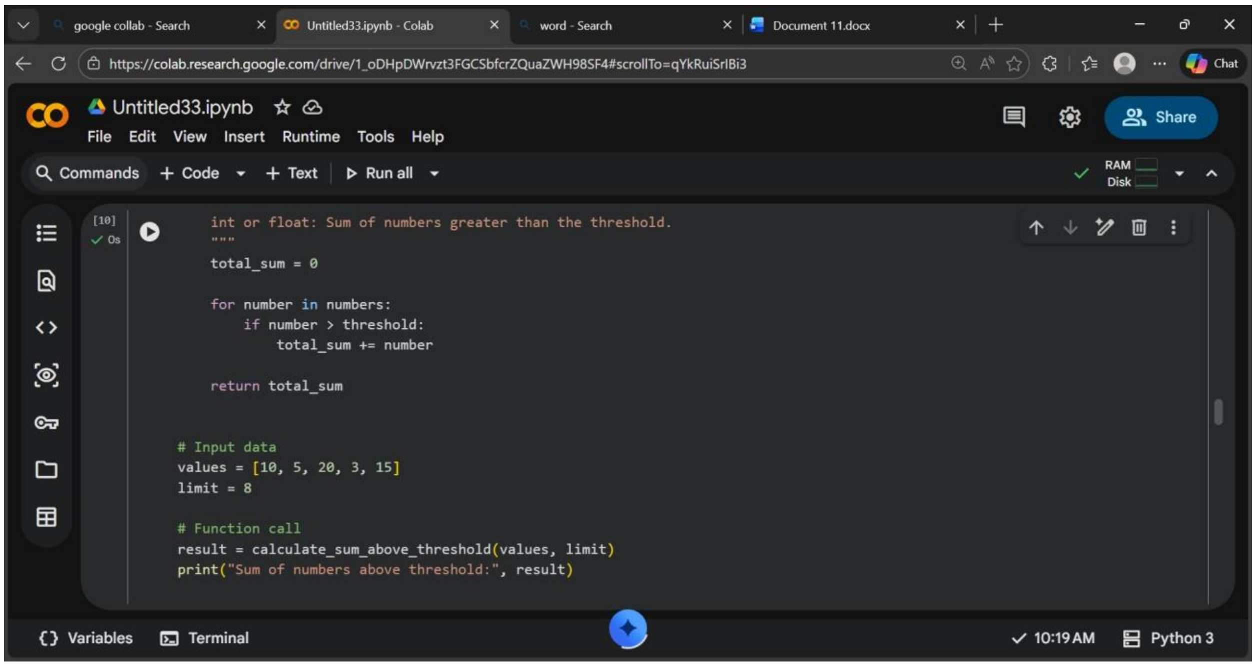
• Proper indentation and formatting

• Docstrings explaining the function purpose

• AI explanation of readability improvements Code:

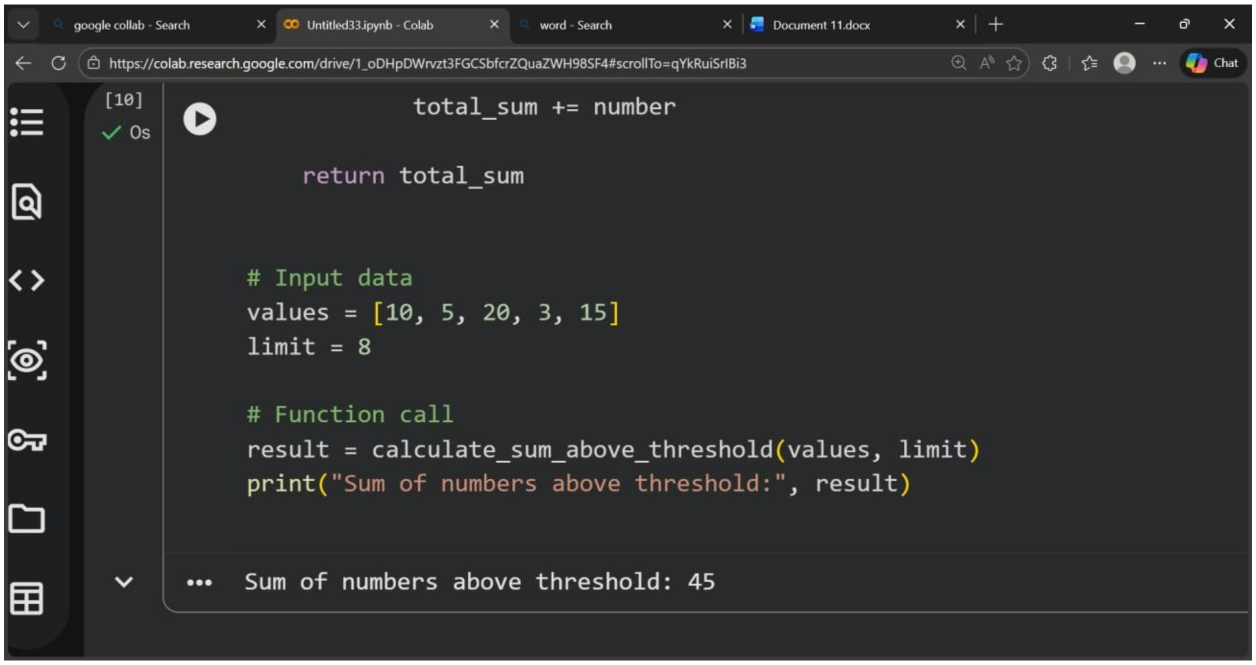


```
def calculate_sum_above_threshold(numbers, threshold):
    """
    Calculate the sum of numbers greater than a given threshold.

    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
```



```
    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:



```
            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

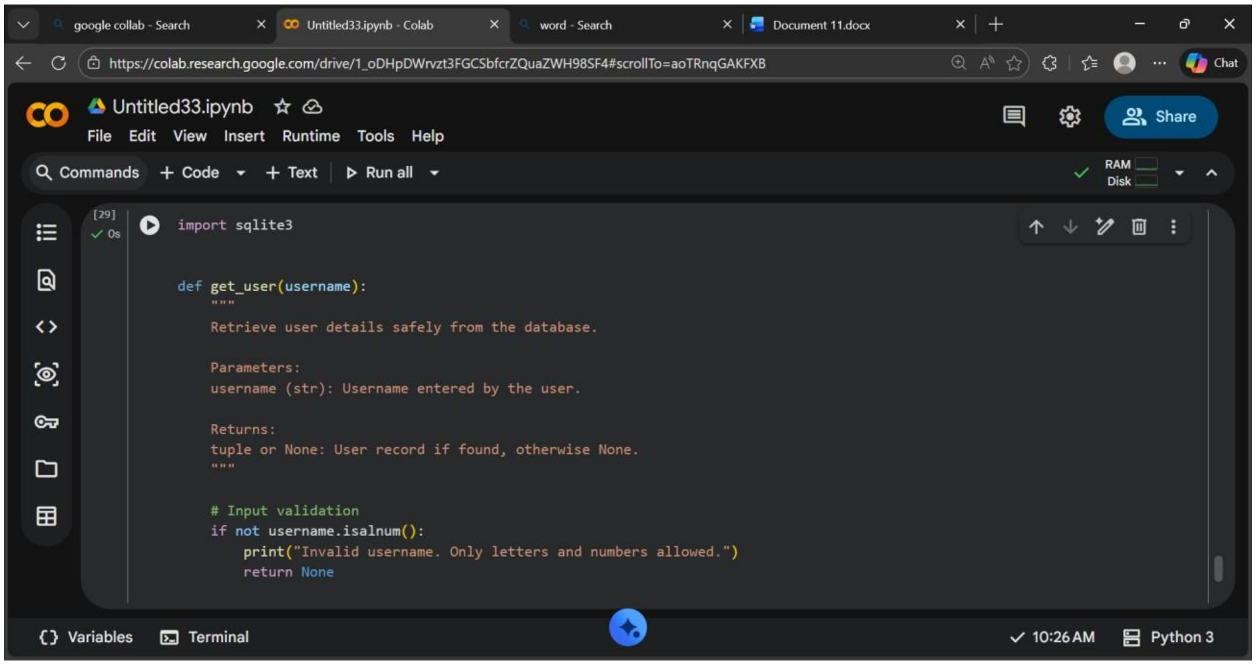
• Secure SQL queries using parameterized statements

• Input validation logic

• Try-except blocks for runtime safety

• AI-generated explanation of security improvements

• Production-ready code structure Code:



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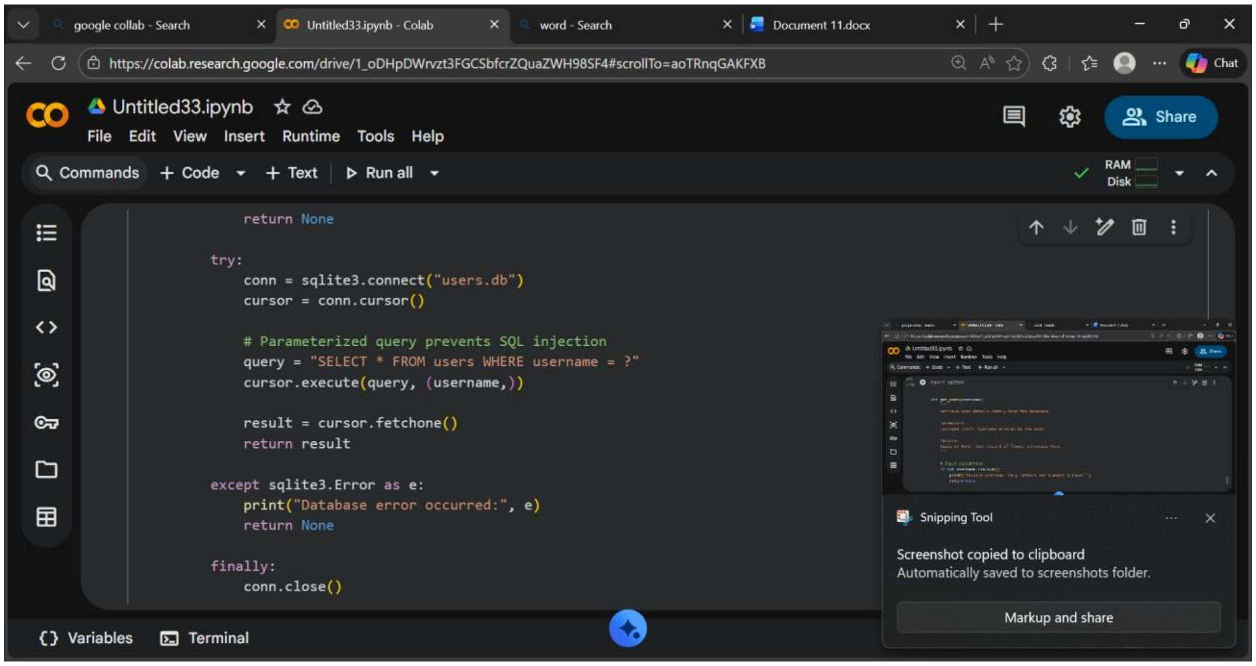
```python
import sqlite3


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
```



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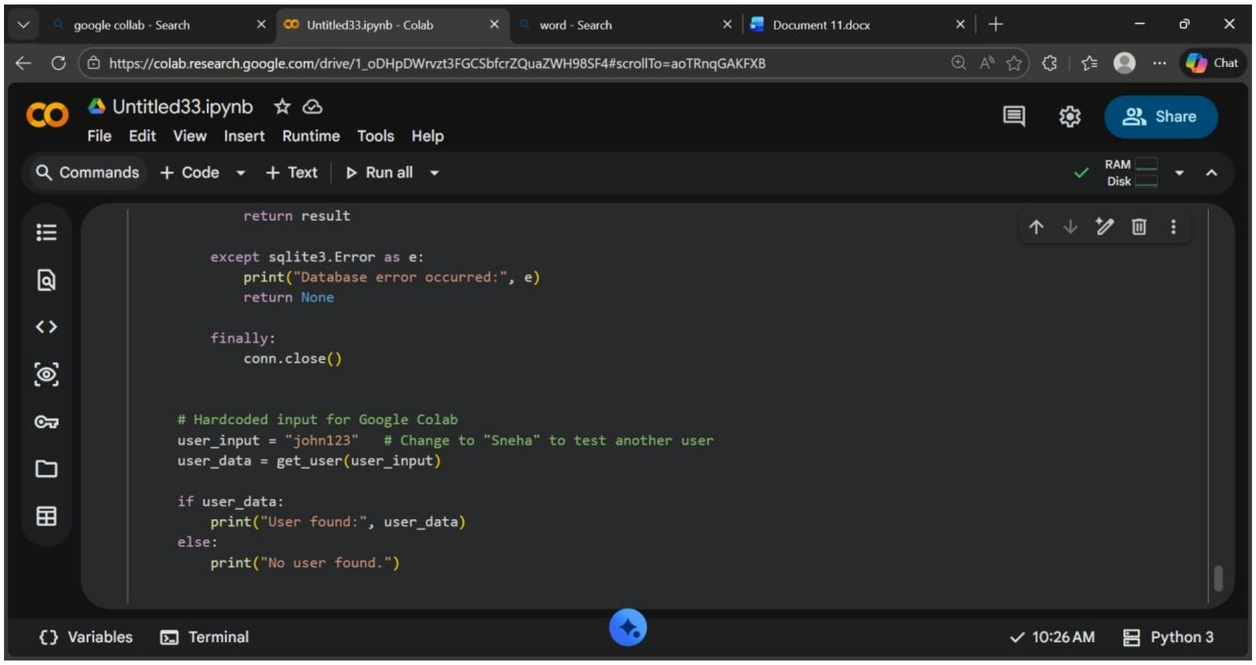
```python
        return None

    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()
```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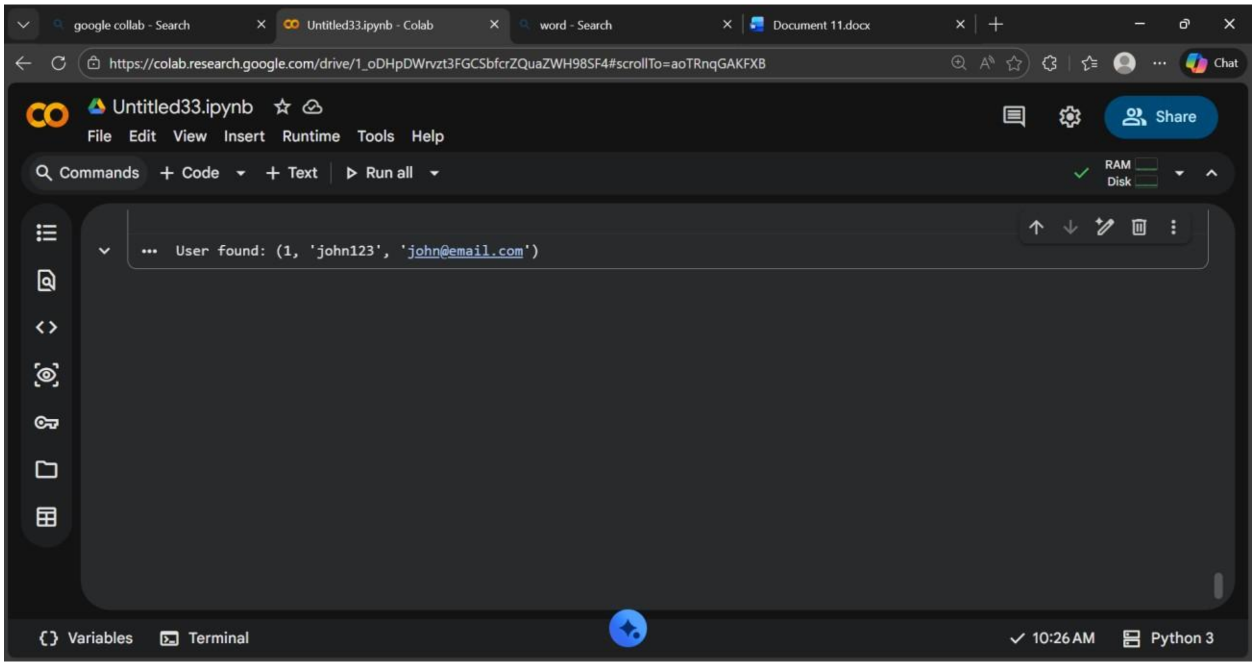
```
            return result

        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: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```
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:

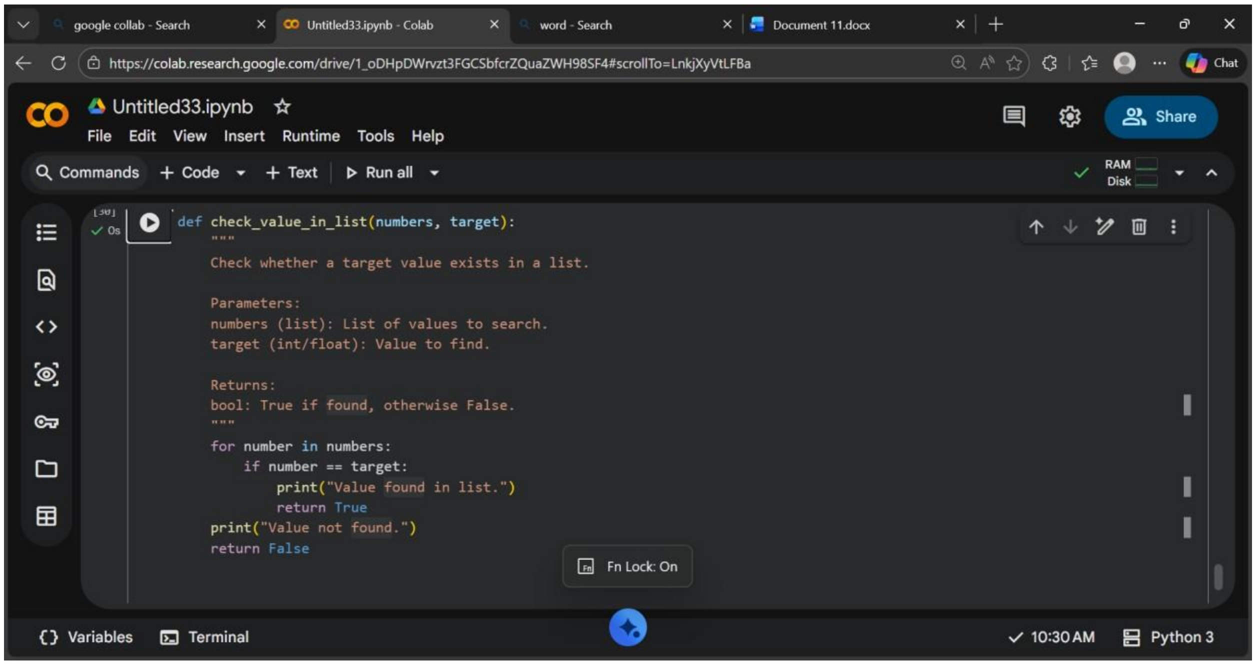
o Identified quality issues o Risk areas o

Code smell detection o Improvement

suggestions • Optional improved version

of the code

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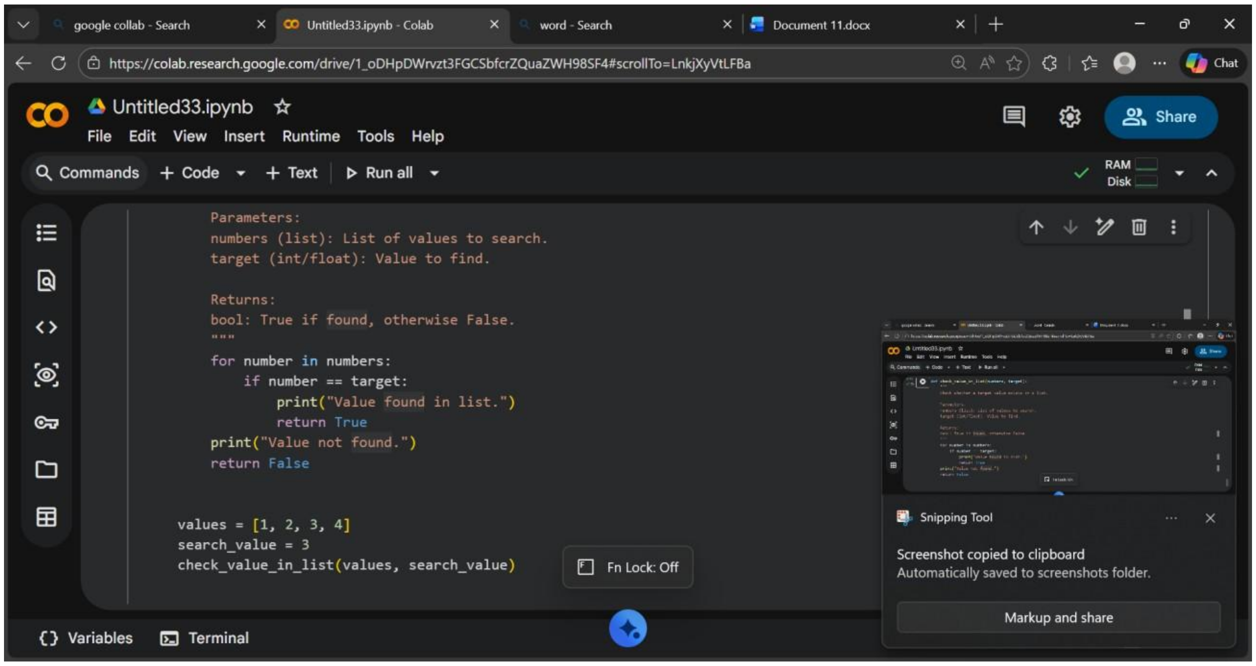
```python
def check_value_in_list(numbers, target):
    """
    Check whether a target value exists in a list.

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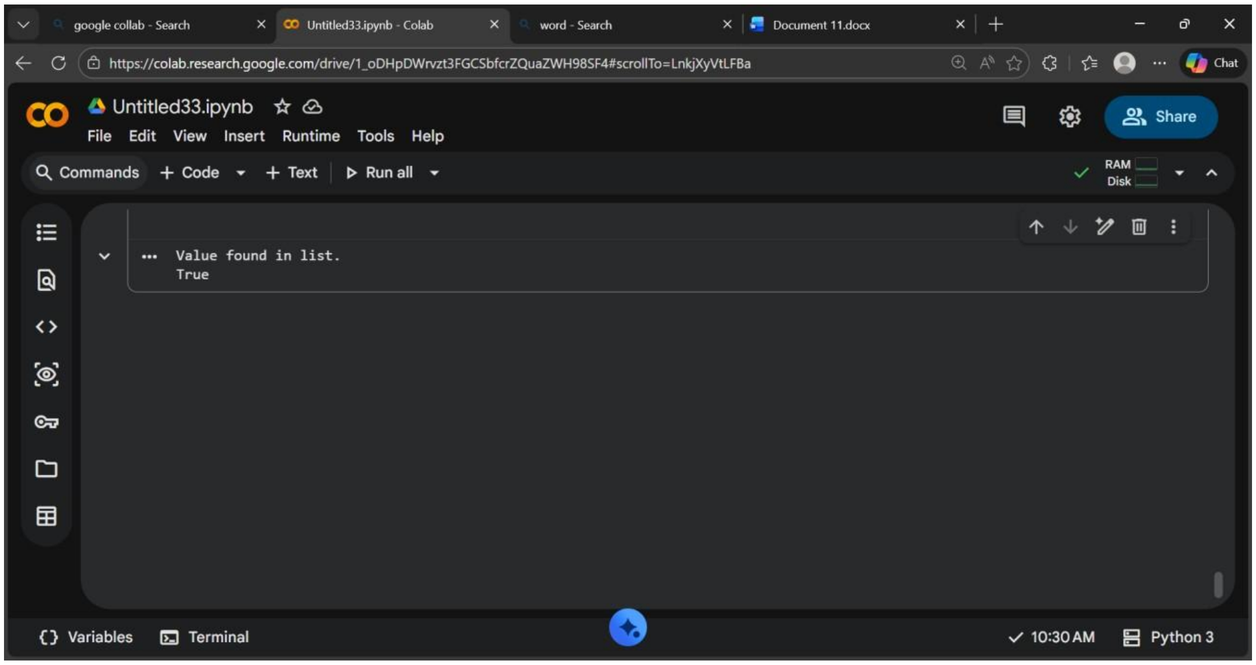
```python
    Parameters:
    numbers (list): List of values to search.
    target (int/float): Value to find.

    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: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```
Value found in list.
True
```

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.