Assignment – 9.2

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Batch - 40

Lab 9 – Documentation Generation: Automatic Documentation and Code Comments

Lab Objectives

• To use AI-assisted coding tools for generating Python documentation and code comments.

• To apply zero-shot, few-shot, and context-based prompt engineering for documentation creation.

• To practice generating and refining docstrings, inline comments, and module-level documentation.

• To compare outputs from different prompting styles for quality analysis.

Task Description -1 (Documentation – Function Summary Generation)

Task:

Use AI to generate concise functional summaries for each Python function in a given script.

Instructions:

• Provide a Python script to the AI.

• Ask the AI to write a short summary describing the purpose of each function.

• Ensure summaries are brief and technically accurate.

• Do not include code implementation details.

Expected Output -1:

A Python script where each function contains a clear and concise summary explaining its purpose.

Prompts:

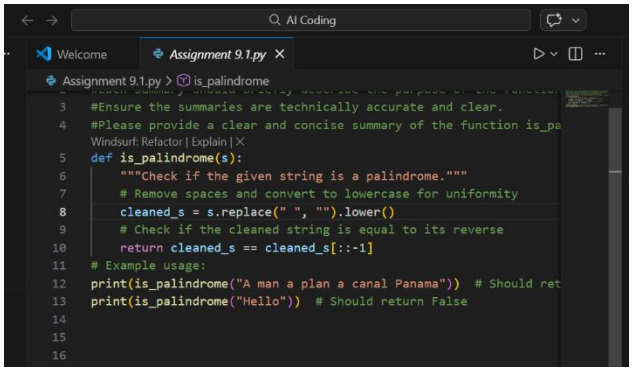
#Please read the following Python script and generate concise docstrings for each function.

#Each summary should briefly describe the purpose of the function, without including implementation details.

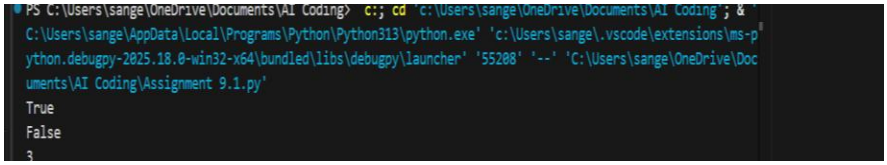
#Ensure the summaries are technically accurate and clear.

#Please provide a clear and concise summary of the function is_palindrome that indicates its purpose and functionality.

Code:



Output:



Analysis:

Step 1 – Input the Script

Provide the Python script containing multiple functions to the AI tool.

Step 2 – Extract Each Function

Identify each function's name, parameters, and purpose by reading or parsing the code.

Step 3 – Generate Summaries

Use AI prompting (zero-shot, few-shot, or context-based) to produce **a one-sentence summary** describing each function's purpose — no implementation details.

Step 4 – Insert Documentation

Add the generated summaries as **docstrings** inside each function or compile them into a documentation file.

Step 5 – Review and Refine

Check summaries for **accuracy, brevity, and consistency**, and edit if needed for clarity and correctness.

Task Description -2 (Documentation – Logical Explanation for Conditions and Loops)

Task:

Use AI to document the logic behind conditional statements and loops in a Python program.

Instructions:

• Provide a Python program without comments.

• Instruct AI to explain only decision-making logic and loop behavior.

• Skip basic syntax explanations.

Expected Output -2:

Python code with clear explanations describing the logic of conditions and loops.

Prompts:

#You are a Python documentation assistant. Explain only logic for conditions and loops, no syntax details.

#Example 1:

#Code:

#if x > 0:

y = x * 2

#Explanation:

#"This checks if x is positive. If true, it doubles x and stores in y."

#Example 2:

#Code:

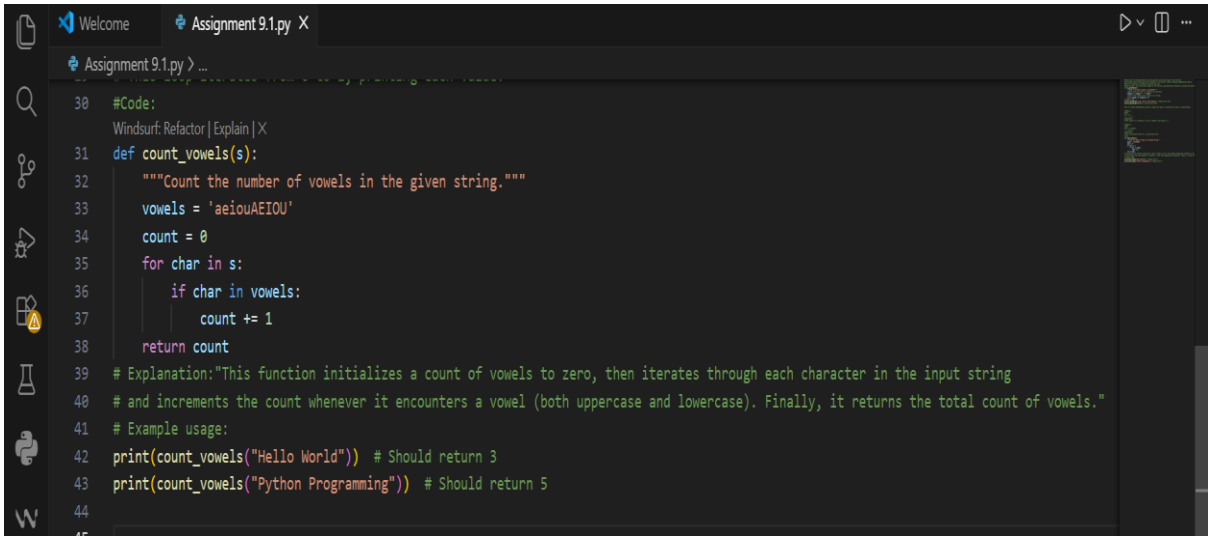
#for i in range(3):

print(i)

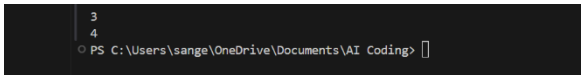
#Explanation:

#"This loop iterates from 0 to 2, printing each value."

Code:



Output:



Analysis:

Step 1 – Provide the Code

Give the AI the Python program **without comments** that you want documented.

Step 2 – Define the Role

Tell the AI:
"You are a Python documentation assistant."
This focuses it on **producing explanations**, not fixing or rewriting code.

Step 3 – Limit the Scope

Instruct the AI to explain **only the logic of if/elif/else statements and loops**, skipping syntax or basic Python keywords.

Step 4 – Give Examples (Optional)

Provide **few-shot examples** showing how a condition or loop should be explained in one concise sentence.
This helps AI **match style and clarity**.

Step 5 – Generate and Review

Ask the AI to analyze your code, produce explanations, and then **review them for accuracy, conciseness, and clarity** before adding as comments or a separate documentation file.

Task Description -3 (Documentation – File-Level Overview)

Task:

Use AI to generate a high-level overview describing the functionality of

an entire Python file.

Instructions:

• Provide the complete Python file to AI.

• Ask AI to write a brief overview summarizing the file's purpose

and functionality.

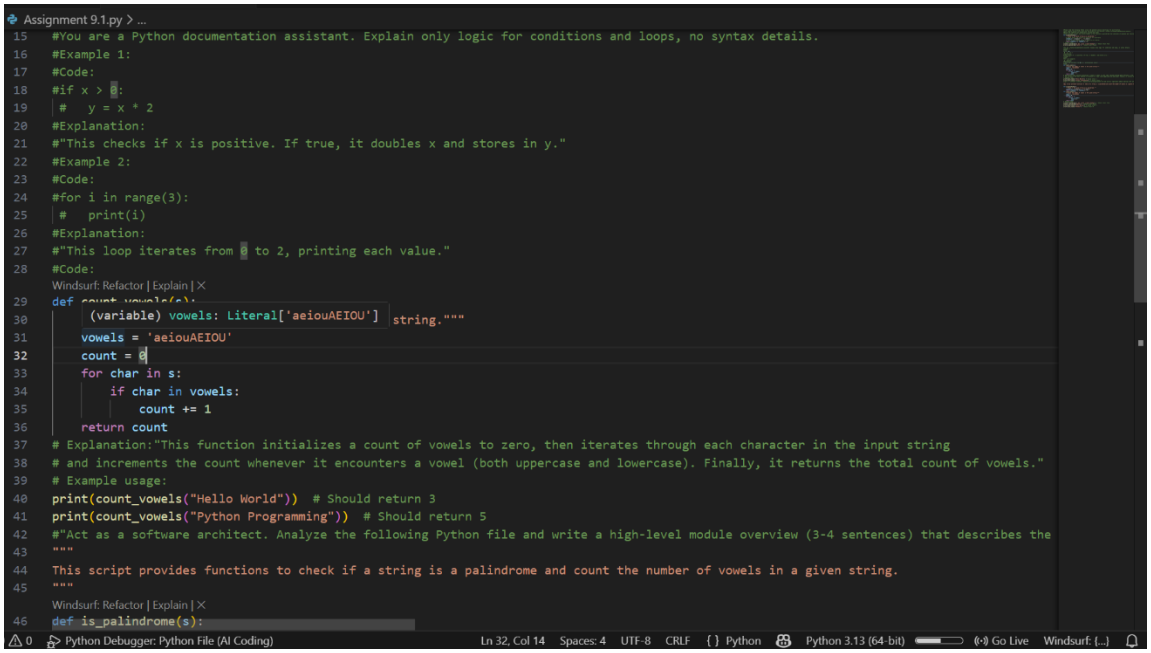
• Place the overview at the top of the file.

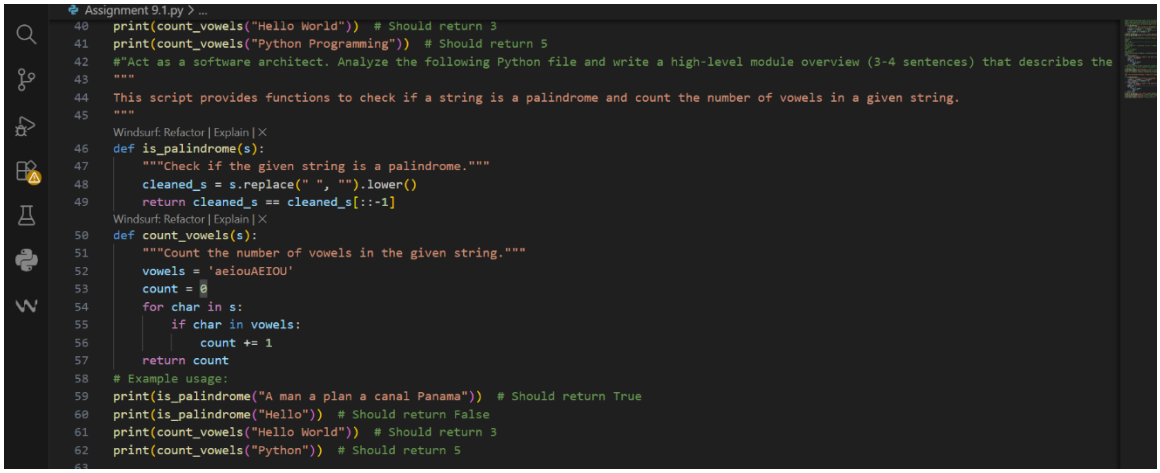
Expected Output -3:

A Python file with a clear and concise file-level overview at the

beginning.

Code:





Output:

Analysis:

Role Constraint: "Software architect" shifts the AI from describing syntax to describing system intent.

Structural Requirement: Placing it "before imports" ensures PEP 257 compliance for module-level documentation.

Synthesis Instruction: "Do not list functions" prevents the AI from being redundant and forces high-level abstraction.

Brevity Control: The "3-sentence" limit ensures the overview remains a summary, not a manual.

Output Format: Requesting the "complete script" makes the result immediately deployable.

Task Description -4 (Documentation – Refine Existing

Documentation)

Task:

Use AI to improve clarity and consistency of existing documentation in

Python code.

Instructions:

• Provide Python code containing basic or unclear comments.

• Ask AI to rewrite the documentation to improve clarity and

consistency.

• Ensure technical meaning remains unchanged.

Expected Output -4:

Python code with refined and improved documentation that is clear and

consistent.

Prompts:

#Give the AI a Python file containing **existing comments or docstrings**, even if they are basic, unclear, or inconsistent.

#Example snippet:

#def compute_average(values):

    # computes avg

    #return sum(values)/len(values)

Analysis:

 Input: Provide Python code with existing comments or docstrings, even if unclear.

 Role: Assign AI as a documentation assistant focused on clarity and consistency.

 Scope: Instruct AI to rewrite comments/docstrings without changing technical meaning.

 Examples (Optional): Show a few before-and-after comment samples to guide style.

 Output: Generate the Python file with refined, clear, and consistent documentation ready for review.

Task Description -5 (Documentation – Prompt Detail Impact Study)

Task:

Study the impact of prompt detail on AI-generated documentation

quality.

Instructions:

Create two prompts: one brief and one detailed.

• Use both prompts to document the same Python function.

• Compare the generated outputs.

Expected Output -5:

A comparison table highlighting differences in completeness, clarity, and

accuracy of documentation.

Prompts:

#"You are a Python documentation assistant. Write a short, concise docstring for the following function explaining its purpose.

#"You are a Python documentation assistant. Write a clear, detailed docstring for the following function. Include: function purpose, input parameters with types, return value with type, and any edge cases. Keep it accurate, concise, and professional.

#"After generating outputs using both prompts, create a table comparing them on completeness, clarity, and accuracy. Highlight differences clearly."

#"Use one brief prompt and one detailed prompt to document the same Python function. Compare the AI outputs and summarize findings in a table format focusing on completeness, clarity, and accuracy."

#"Analyze the two docstrings generated for the same function. Score each on completeness (0–3), clarity (0–3), and accuracy (0–3). Provide a short explanation for each score to highlight differences."

Code:

```
Assignment 9.1.py > ...
91  #"You are a Python documentation assistant. Write a clear, detailed docstring for the following funct
92  #"After generating outputs using both prompts, create a table comparing them on completeness, clarity
93  #"Use one brief prompt and one detailed prompt to document the same Python function. Compare the AI c
94  #"Analyze the two docstrings generated for the same function. Score each on completeness (0-3), clari
    Windsurf: Refactor | Explain | X
95  def factorial(n):
96      """Calculate the factorial of a non-negative integer n."""
97      if n < 0:
98          raise ValueError("Factorial is undefined for negative numbers.")
99      result = 1
100     for i in range(1, n + 1):
101         result *= i
102     return result
103 # Example usage:
104 print(factorial(5))  # Should return 120
105 print(factorial(0))  # Should return 1
106 print(factorial(-1))  # Should raise ValueError
107
108
```

Output:

```
3.0
0
120
1
```

Analysis:

Step 1 – Select a Python Function

Choose a representative Python function to document. Make sure it has clear inputs, outputs, and some logic so differences in prompt detail will show.

Step 2 – Create Two Prompts

- **Brief Prompt:** Ask AI for a short, concise docstring describing only the function's purpose.
- **Detailed Prompt:** Ask AI for a full docstring including purpose, inputs with types, return values, and edge cases.

Step 3 – Generate Documentation

Use both prompts on the same function to get two separate AI-generated docstrings.

Step 4 – Compare Outputs

Evaluate the two outputs on:

1. **Completeness:** Are purpose, inputs, outputs, and edge cases covered?
2. **Clarity:** Is the documentation easy to understand?
3. **Accuracy:** Does it preserve technical meaning?

Step 5 – Summarize Findings

Create a table or short report showing differences between brief vs detailed prompts, highlighting which prompt produces more complete, clear, and accurate documentation.