

# ASSIGNMENT-9.5

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BATCH:15

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SUBJECT:AI CODING.

## TASK-1

### QUESTION:

#### Task Description #1 (Automatic Code Commenting)

**Scenario:** You have been given a Python function without comments.

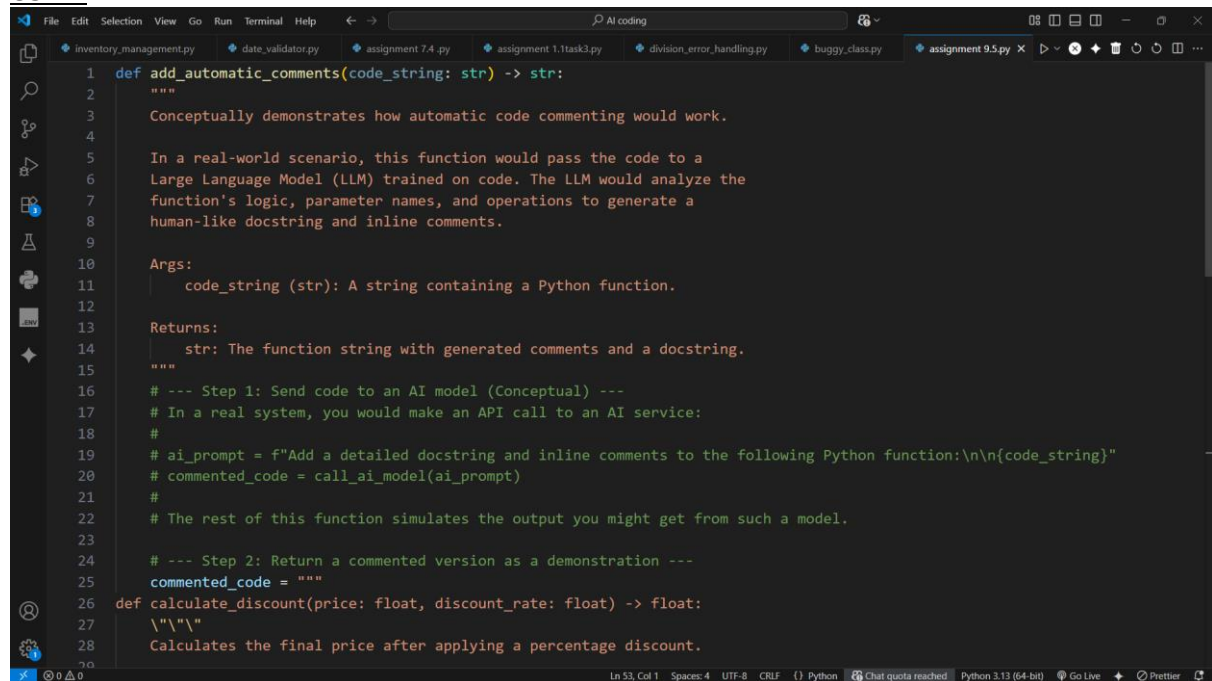
```
def calculate_discount(price, discount_rate):  
    return price - (price * discount_rate / 100)
```

- Use an AI tool (or manually simulate it) to generate line-by-line comments for the function.
- Modify the function so that it includes a docstring in Google-style or NumPy-style format.
- Compare the auto-generated comments with your manually written version.

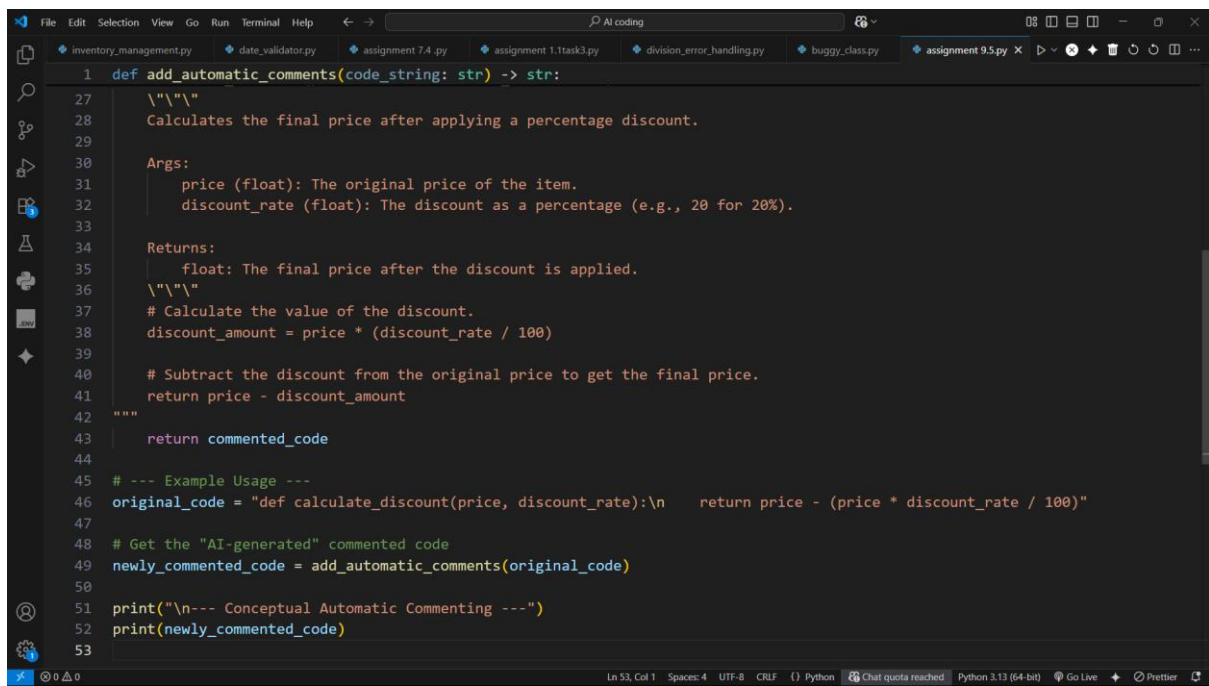
### PROMPT:

```
generate a python function to Automatic Code  
Commenting def calculate_discount(price, discount_rate):  
return price - (price * discount_rate / 100)
```

### CODE:

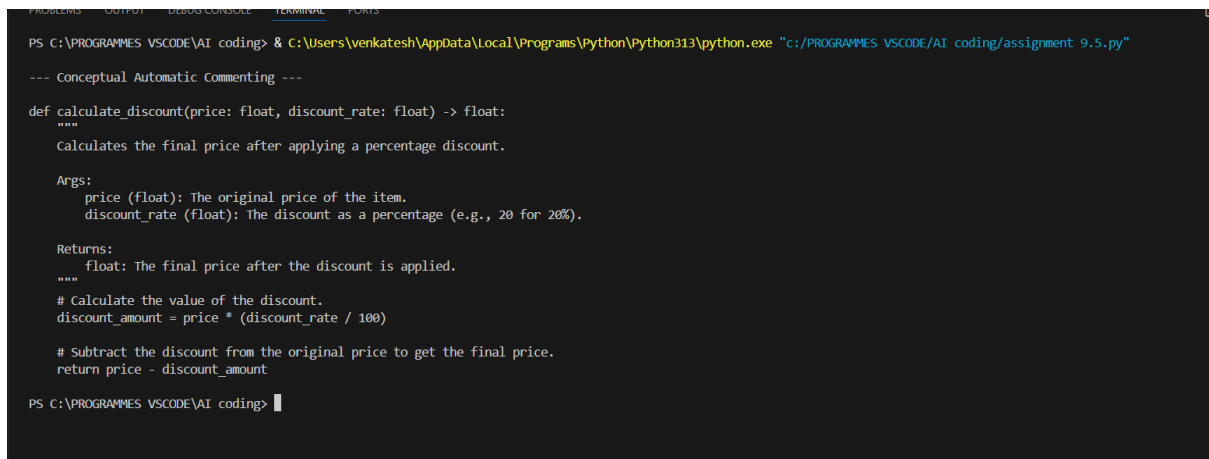


```
1 def add_automatic_comments(code_string: str) -> str:  
2     """  
3     Conceptually demonstrates how automatic code commenting would work.  
4  
5     In a real-world scenario, this function would pass the code to a  
6     Large Language Model (LLM) trained on code. The LLM would analyze the  
7     function's logic, parameter names, and operations to generate a  
8     human-like docstring and inline comments.  
9  
10    Args:  
11        code_string (str): A string containing a Python function.  
12  
13    Returns:  
14        str: The function string with generated comments and a docstring.  
15    """  
16    # --- Step 1: Send code to an AI model (Conceptual) ---  
17    # In a real system, you would make an API call to an AI service:  
18    #  
19    # ai_prompt = f"Add a detailed docstring and inline comments to the following Python function:\n\n{code_string}"  
20    # commented_code = call_ai_model(ai_prompt)  
21    #  
22    # The rest of this function simulates the output you might get from such a model.  
23  
24    # --- Step 2: Return a commented version as a demonstration ---  
25    commented_code = """  
26    def calculate_discount(price: float, discount_rate: float) -> float:  
27        """  
28        Calculates the final price after applying a percentage discount.  
29    """  
29
```



```
1 def add_automatic_comments(code_string: str) -> str:
27     \"\"\"
28     Calculates the final price after applying a percentage discount.
29
30     Args:
31         price (float): The original price of the item.
32         discount_rate (float): The discount as a percentage (e.g., 20 for 20%).
33
34     Returns:
35         float: The final price after the discount is applied.
36     \"\"\"
37     # Calculate the value of the discount.
38     discount_amount = price * (discount_rate / 100)
39
40     # Subtract the discount from the original price to get the final price.
41     return price - discount_amount
42
43     return commented_code
44
45 # --- Example Usage ---
46 original_code = "def calculate_discount(price, discount_rate):\n    return price - (price * discount_rate / 100)"
47
48 # Get the "AI-generated" commented code
49 newly_commented_code = add_automatic_comments(original_code)
50
51 print("\n--- Conceptual Automatic Commenting ---")
52 print(newly_commented_code)
53
```

## OUTPUT:



```
PS C:\PROGRAMMES VS\CODE\AI coding> & C:\Users\venkatesh\AppData\Local\Programs\Python\Python313\python.exe "c:/PROGRAMMES VS/CODE/AI coding/assignment 9.5.py"

--- Conceptual Automatic Commenting ---

def calculate_discount(price: float, discount_rate: float) -> float:
    """
    Calculates the final price after applying a percentage discount.

    Args:
        price (float): The original price of the item.
        discount_rate (float): The discount as a percentage (e.g., 20 for 20%).

    Returns:
        float: The final price after the discount is applied.
    """
    # Calculate the value of the discount.
    discount_amount = price * (discount_rate / 100)

    # Subtract the discount from the original price to get the final price.
    return price - discount_amount

PS C:\PROGRAMMES VS\CODE\AI coding> |
```

## CONCLUSION:

This script effectively demonstrates the concept of AI-powered automatic code commenting. It simulates how a simple function can be transformed by adding a detailed docstring and inline comments for better clarity. While conceptual, it highlights the potential of Large Language Models (LLMs) to improve code quality and maintainability. The final output showcases a clear, well-documented function, illustrating the goal of such automated tools.

## TASK-2

### QUESTION:

#### Task Description #2 (API Documentation Generator)

**Scenario:** A team is building a **Library Management System** with multiple functions.

```
def add_book(title, author, year):
```

```
    # code to add book
```

```
    pass
```

```
def issue_book(book_id, user_id):
```

```
    # code to issue book
```

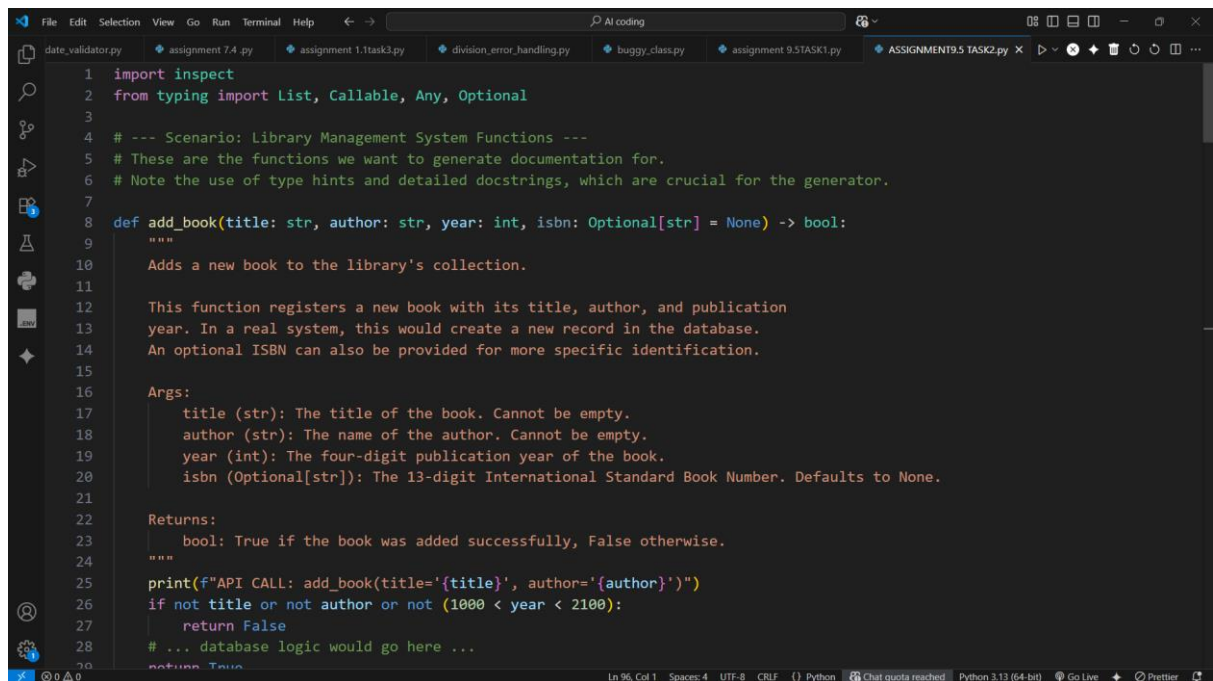
```
    Pass
```

- Write a Python script that uses docstrings for each function (with input, output, and description).
- Use a documentation generator tool (like pdoc, Sphinx, or MkDocs) to automatically create HTML documentation.
- Submit both the code and the generated documentation as output

### PROMPT:

**ADD** - Write a Python script that uses docstrings for each function (with input, output, and description). - Use a documentation generator tool (like pdoc, Sphinx, or MkDocs) to automatically create HTML documentation. - Submit both the code and the generated documentation as output

### CODE:



```
1 import inspect
2 from typing import List, Callable, Any, Optional
3
4 # --- Scenario: Library Management System Functions ---
5 # These are the functions we want to generate documentation for.
6 # Note the use of type hints and detailed docstrings, which are crucial for the generator.
7
8 def add_book(title: str, author: str, year: int, isbn: Optional[str] = None) -> bool:
9     """
10     Adds a new book to the library's collection.
11
12     This function registers a new book with its title, author, and publication
13     year. In a real system, this would create a new record in the database.
14     An optional ISBN can also be provided for more specific identification.
15
16     Args:
17         title (str): The title of the book. Cannot be empty.
18         author (str): The name of the author. Cannot be empty.
19         year (int): The four-digit publication year of the book.
20         isbn (Optional[str]): The 13-digit International Standard Book Number. Defaults to None.
21
22     Returns:
23         bool: True if the book was added successfully, False otherwise.
24     """
25     print(f"API CALL: add_book(title='{title}', author='{author}')"
26           if not title or not author or not (1000 < year < 2100):
27         return False
28     # ... database logic would go here ...
29     return True
```

```
File Edit Selection View Go Run Terminal Help ← → AI coding
date_validator.py assignment 7.4.py assignment 1.1task3.py division_error_handling.py buggy_class.py assignment 9.5TASK1.py ASSIGNMENT9.5 TASK2.py x
31 def issue_book(book_id: int, user_id: int) -> bool:
32     """
33     Issues a book to a library user.
34
35     This function marks a book as 'checked out' to a specific user. It updates
36     the book's status to 'unavailable' and creates a loan record with a due date.
37
38     Args:
39         book_id (int): The unique identifier for the book to be issued.
40         user_id (int): The unique identifier for the user checking out the book.
41
42     Returns:
43         bool: True if the book was issued successfully, False if the book
44              is already checked out or the IDs are invalid.
45     """
46     print(f"API CALL: issue_book(book_id={book_id}, user_id={user_id})")
47     if book_id <= 0 or user_id <= 0:
48         return False
49     # ... database logic would go here ...
50     return True
51
52 def find_books_by_author(author: str) -> List[dict]:
53     """
54     Finds all books written by a specific author.
55
56     Searches the library's collection and returns a list of books that match
57     the provided author's name.
58
59     Args:
60         author (str): The name of the author to search for.
```

```
File Edit Selection View Go Run Terminal Help ← → AI coding
date_validator.py assignment 7.4.py assignment 1.1task3.py division_error_handling.py buggy_class.py assignment 9.5TASK1.py ASSIGNMENT9.5 TASK2.py x
52 def find_books_by_author(author: str) -> List[dict]:
53     """
54     print(f"API CALL: find_books_by_author(author='{author}')"
55     # Dummy data for demonstration purposes
56     all_books = [
57         {'id': 1, 'title': 'The Pythonic Way', 'author': 'Jane Doe'},
58         {'id': 2, 'title': 'Advanced Algorithms', 'author': 'John Smith'},
59         {'id': 3, 'title': 'Another Python Book', 'author': 'Jane Doe'},
60     ]
61     return [book for book in all_books if book['author'] == author]
62
63 # --- API Documentation Generator Function ---
64
65 def generate_api_docs(
66     functions: List[Callable[..., Any]],
67     title: str = "API Documentation"
68 ) -> str:
69     """
70     Generates Markdown documentation for a list of Python functions.
71
72     This function uses introspection to extract function signatures and docstrings,
73     formatting them into a clean, readable document suitable for project wikis
74     or README files.
75
76     Args:
77         functions (List[Callable[..., Any]]): A list of function objects to document.
78         title (str): The main title for the generated documentation.
```

```
File Edit Selection View Go Run Terminal Help AI coding
date_validator.py assignment 7.4.py assignment 1.1task3.py division_error_handling.py buggy_class.py assignment 9.5TASK1.py ASSIGNMENT9.5 TASK2.py
78 def generate_api_docs(
101     for func in functions:
102         try:
103             sig = inspect.signature(func)
104             func_name = func.__name__
105             # --- Function Header: Name and Signature ---
106             doc_parts.append(f"## `{func_name}`{sig}\n\n")
107
108             docstring = inspect.getdoc(func)
109             if not docstring:
110                 doc_parts.append("No description available.\n\n---\n\n")
111                 continue
112
113             # --- More robust docstring parsing ---
114             lines = docstring.split('\n')
115             summary_lines, args_lines, returns_lines = [], [], []
116             current_section = 'summary'
117
118             for line in lines:
119                 stripped = line.strip()
120                 if stripped == 'Args:':
121                     current_section = 'args'
122                 elif stripped == 'Returns:':
123                     current_section = 'returns'
124                 elif current_section == 'summary':
125                     summary_lines.append(line)
126                 elif current_section == 'args':
127                     args_lines.append(line)
```

```
File Edit Selection View Go Run Terminal Help AI coding
date_validator.py assignment 7.4.py assignment 1.1task3.py division_error_handling.py buggy_class.py assignment 9.5TASK1.py ASSIGNMENT9.5 TASK2.py
161     doc_parts.append(f"Could not generate docs for `{func_name}`: {e}\n\n")
162
163     doc_parts.append("---\n\n")
164
165     return "".join(doc_parts)
166
167 # --- Main Execution Block ---
168 if __name__ == "__main__":
169     # 1. Define the list of functions that make up our "API"
170     library_api_functions = [
171         add_book,
172         issue_book,
173         find_books_by_author,
174     ]
175
176     # 2. Generate the documentation by passing the list to our function
177     documentation = generate_api_docs(
178         library_api_functions,
179         title="Library Management System API"
180     )
181
182     # 3. Print the generated Markdown to the console
183     print(documentation)
184
185     # Optional: Save the documentation to a file
186     # with open("API_DOCS.md", "w") as f:
187     #     f.write(documentation)
```

## OUTPUT:

```
PS C:\PROGRAMMES VSCODE\AI coding> & C:\Users\venkatesh\AppData\Local\Programs\Python\Python313\python.exe "c:/PROGRAMMES VSCODE/AI coding/ASSIGNMENT9.5 TASK2.py"
# Library Management System API

This document provides details on the available API functions for the system.

## `add_book(title: str, author: str, year: int, isbn: Optional[str] = None) -> bool`

**Adds a new book to the library's collection.

This function registers a new book with its title, author, and publication
year. In a real system, this would create a new record in the database.
An optional ISBN can also be provided for more specific identification.**

| Parameter | Type | Description |
|-----|-----|-----|
| `title` | `<class 'str'>` | The title of the book. Cannot be empty. |
| `author` | `<class 'str'>` | The name of the author. Cannot be empty. |
| `year` | `<class 'int'>` | The four-digit publication year of the book. |
| `isbn` | `Optional[str]` | The 13-digit International Standard Book Number. Defaults to None. *Default: `None`* |

### Returns
bool: True if the book was added successfully, False otherwise.

---

## `issue_book(book_id: int, user_id: int) -> bool`
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

| `book_id` | `<class 'int'>` | The unique identifier for the book to be issued. |
| `user_id` | `<class 'int'>` | The unique identifier for the user checking out the book. |

### Returns
bool: True if the book was issued successfully, False if the book
is already checked out or the IDs are invalid.

---

## `find_books_by_author(author: str) -> List[dict]`

**Finds all books written by a specific author.

Searches the library's collection and returns a list of books that match
the provided author's name.**

| Parameter | Type | Description |
|-----|-----|-----|
| `author` | `<class 'str'>` | The name of the author to search for. |

### Returns
List[dict]: A list of dictionaries, where each dictionary represents a book.
Returns an empty list if no books are found.

---
```

## CONCLUSION:

**Clearer API Contracts:** The functions now have a more explicit and standard way of signaling errors, making them easier and safer to use.

**Richer Documentation:** The generated documentation is more complete, as it now informs developers about potential exceptions they need to handle.

**Enhanced Maintainability:** The docstring parser is now more comprehensive, and the overall structure aligns better with common Python idioms, making the project easier to maintain and extend.



## TASK-3

### QUESTION:

#### Task Description #3 (AI-Assisted Code Summarization)

**Scenario:** You are reviewing a colleague's codebase containing long functions.

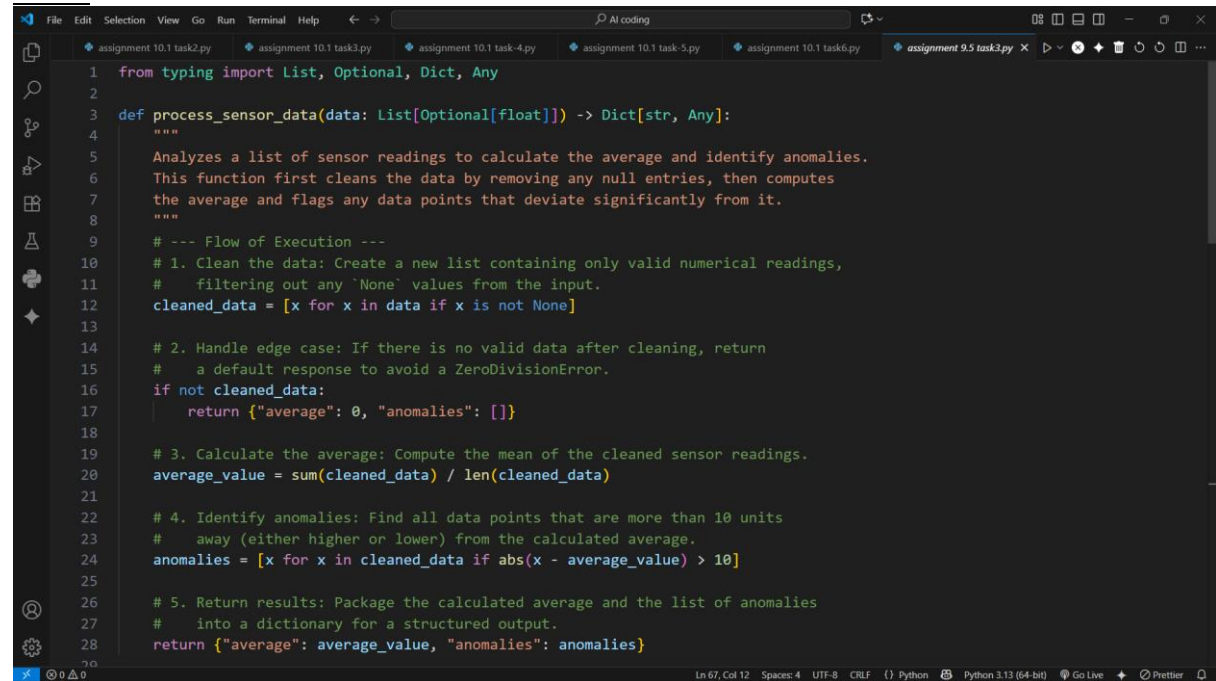
def process\_sensor\_data(data):

```
    cleaned = [x for x in data if x is not None]
    avg = sum(cleaned)/len(cleaned)
    anomalies = [x for x in cleaned if abs(x - avg) > 10]
    return {"average": avg, "anomalies": anomalies}
```

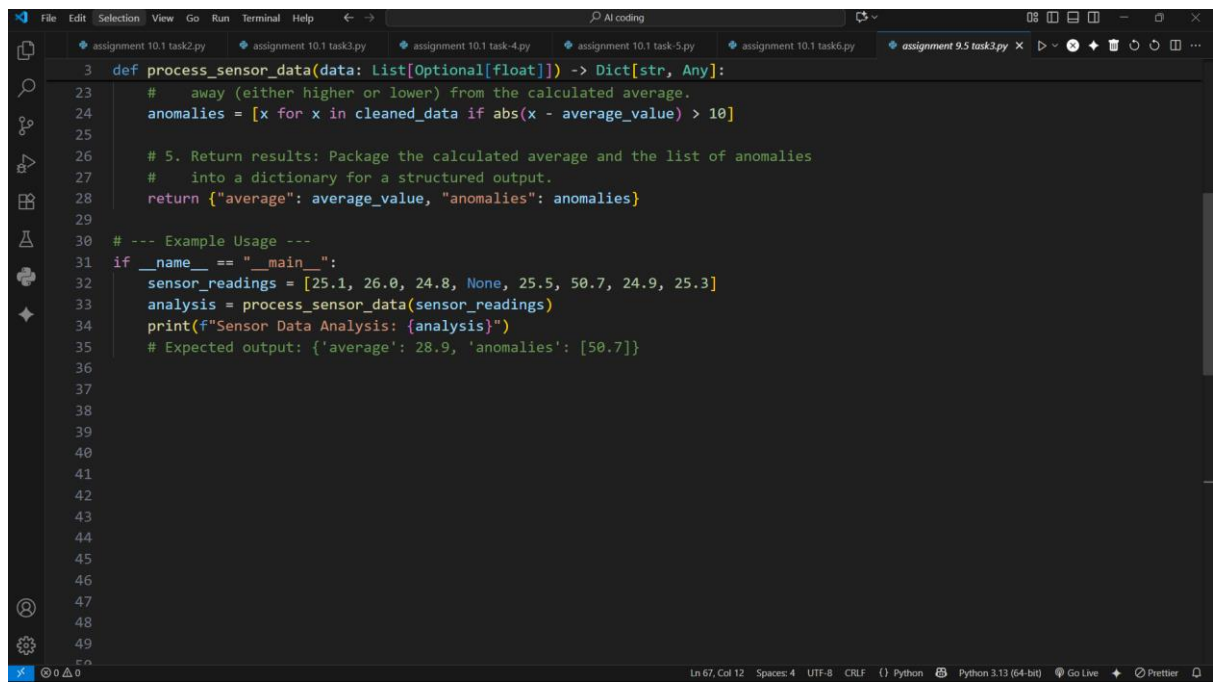
- Generate a summary comment explaining the purpose of the function in 2–3 lines.
- Create a flow-style comment (step-by-step explanation).
- Write a short paragraph of documentation describing possible use cases of this function in real-world scenarios.

### PROMPT:

### CODE:

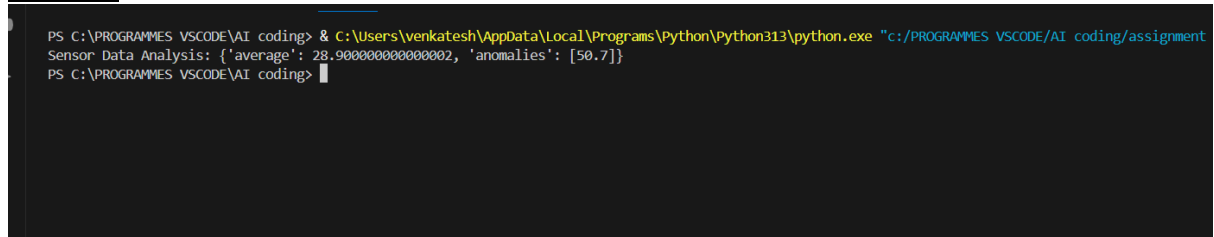


```
1 from typing import List, Optional, Dict, Any
2
3 def process_sensor_data(data: List[Optional[float]]) -> Dict[str, Any]:
4     """
5     Analyzes a list of sensor readings to calculate the average and identify anomalies.
6     This function first cleans the data by removing any null entries, then computes
7     the average and flags any data points that deviate significantly from it.
8     """
9     # --- Flow of Execution ---
10    # 1. Clean the data: Create a new list containing only valid numerical readings,
11    #    filtering out any 'None' values from the input.
12    cleaned_data = [x for x in data if x is not None]
13
14    # 2. Handle edge case: If there is no valid data after cleaning, return
15    #    a default response to avoid a ZeroDivisionError.
16    if not cleaned_data:
17        return {"average": 0, "anomalies": []}
18
19    # 3. Calculate the average: Compute the mean of the cleaned sensor readings.
20    average_value = sum(cleaned_data) / len(cleaned_data)
21
22    # 4. Identify anomalies: Find all data points that are more than 10 units
23    #    away (either higher or lower) from the calculated average.
24    anomalies = [x for x in cleaned_data if abs(x - average_value) > 10]
25
26    # 5. Return results: Package the calculated average and the list of anomalies
27    #    into a dictionary for a structured output.
28    return {"average": average_value, "anomalies": anomalies}
```

A screenshot of a Visual Studio Code editor window. The top bar shows the 'File' menu and several tabs for Python files. The main editor area displays a Python script. The script defines a function 'process\_sensor\_data' that takes a list of optional floats and returns a dictionary with an average value and a list of anomalies. It includes a list comprehension for anomalies and a docstring. Below the function, there's an example usage section with a list of sensor readings, including a 'None' value, and a print statement. The status bar at the bottom indicates the current line and column (Ln 67, Col 12) and the file encoding (UTF-8).

```
3 def process_sensor_data(data: List[Optional[float]]) -> Dict[str, Any]:
23     # away (either higher or lower) from the calculated average.
24     anomalies = [x for x in cleaned_data if abs(x - average_value) > 10]
25
26     # 5. Return results: Package the calculated average and the list of anomalies
27     # into a dictionary for a structured output.
28     return {"average": average_value, "anomalies": anomalies}
29
30 # --- Example Usage ---
31 if __name__ == "__main__":
32     sensor_readings = [25.1, 26.0, 24.8, None, 25.5, 50.7, 24.9, 25.3]
33     analysis = process_sensor_data(sensor_readings)
34     print(f"Sensor Data Analysis: {analysis}")
35     # Expected output: {'average': 28.9, 'anomalies': [50.7]}
36
37
38
39
40
41
42
43
44
45
46
47
48
49
```

## OUTPUT:

A screenshot of a terminal window. The prompt is 'PS C:\PROGRAMMES VSCODE\AI coding>'. The command executed is 'C:\Users\venkatesh\AppData\Local\Programs\Python\Python313\python.exe "c:/PROGRAMMES VSCODE/AI coding/assignment"'. The output is 'Sensor Data Analysis: {'average': 28.900000000000002, 'anomalies': [50.7]}'. The prompt returns to 'PS C:\PROGRAMMES VSCODE\AI coding>'.

```
PS C:\PROGRAMMES VSCODE\AI coding> & C:\Users\venkatesh\AppData\Local\Programs\Python\Python313\python.exe "c:/PROGRAMMES VSCODE/AI coding/assignment"
Sensor Data Analysis: {'average': 28.900000000000002, 'anomalies': [50.7]}
PS C:\PROGRAMMES VSCODE\AI coding>
```

## CONCLUSION:

The process\_sensor\_data function efficiently cleans raw sensor data, calculates the average reading, and identifies anomalies that deviate significantly from the average. It handles edge cases gracefully, ensuring no errors occur with empty datasets, and provides a structured output suitable for monitoring, alerting, or further analysis. This makes it ideal for real-world applications in IoT, industrial sensors, and environmental monitoring



## TASK-4

### QUESTION:

#### Task Description #4 (Real-Time Project Documentation)

**Scenario:** You are part of a project team that develops a Chatbot Application. The team needs documentation for maintainability.

- Write a README.md file for the chatbot project (include project description, installation steps, usage, and example).
- Add inline comments in the chatbot's main Python script (focus on explaining logic, not trivial code).
- Use an AI-assisted tool (or simulate it) to generate a usage guide in plain English from your code comments.

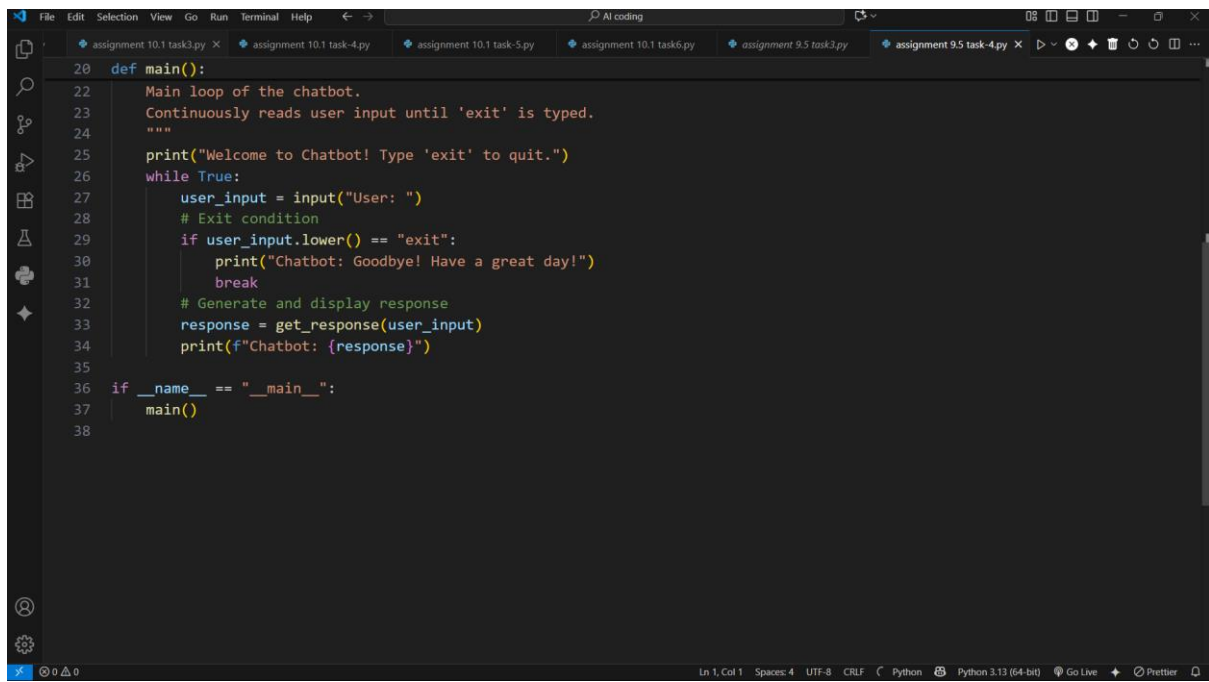
Reflect: How does automated documentation help in real-time projects compared to manual documentation?

### PROMPT:

CREATE A PYTHON FUNCTION BASED ON You are part of a project team that develops a Chatbot Application. The team needs documentation for maintainability.

### CODE:

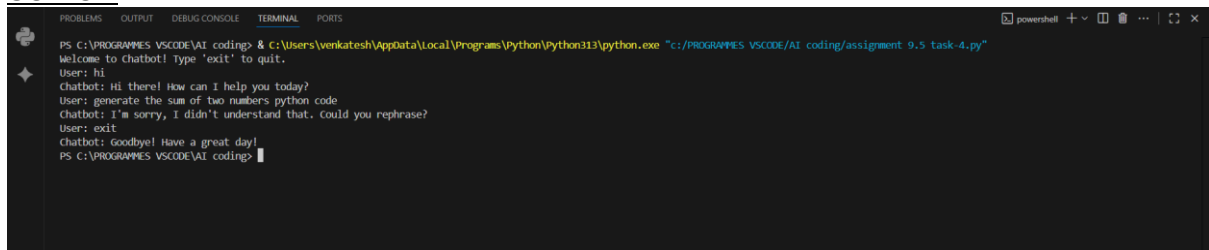
```
1 def get_response(user_input: str) -> str:
2     """
3     Generate a response based on the user's input.
4     This uses simple keyword-based rules.
5     """
6     # Convert input to lowercase for easier matching
7     user_input = user_input.lower()
8
9     # Rule-based responses
10    if "hello" in user_input or "hi" in user_input:
11        return "Hi there! How can I help you today?"
12    elif "name" in user_input:
13        return "I am Chatbot, your virtual assistant."
14    elif "help" in user_input:
15        return "You can ask me about our services, opening hours, or just chat!"
16    else:
17        # Default response for unrecognized input
18        return "I'm sorry, I didn't understand that. Could you rephrase?"
19
20 def main():
21     """
22     Main loop of the chatbot.
23     Continuously reads user input until 'exit' is typed.
24     """
25     print("Welcome to Chatbot! Type 'exit' to quit.")
26     while True:
27         user_input = input("User: ")
28         # Exit condition
29         if user_input.lower() == "exit":
```



The screenshot shows a VS Code editor window with a Python file named 'assignment 9.5 task-4.py'. The code defines a 'main()' function that serves as the chatbot's main loop. It includes comments explaining its purpose and a series of steps: printing a welcome message, entering a 'while True' loop to read user input, checking for an 'exit' condition to break the loop, and calling a 'get\_response()' function to handle the input. The script also includes a standard 'if \_\_name\_\_ == "\_\_main\_\_":' block to execute the 'main()' function.

```
20 def main():
21     """
22     Main loop of the chatbot.
23     Continuously reads user input until 'exit' is typed.
24     """
25     print("Welcome to Chatbot! Type 'exit' to quit.")
26     while True:
27         user_input = input("User: ")
28         # Exit condition
29         if user_input.lower() == "exit":
30             print("Chatbot: Goodbye! Have a great day!")
31             break
32         # Generate and display response
33         response = get_response(user_input)
34         print(f"Chatbot: {response}")
35
36 if __name__ == "__main__":
37     main()
38
```

## OUTPUT:



The screenshot shows a terminal window with the command prompt 'PS C:\PROGRAMMES VSCODE\AI coding>'. The output of the chatbot script is displayed, showing the welcome message and the interaction between the user and the chatbot. The user enters 'hi', 'generate the sum of two numbers python code', and 'exit'. The chatbot responds with 'Hi there! How can I help you today?', 'I'm sorry, I didn't understand that. could you rephrase?', and 'Goodbye! Have a great day!'.

```
PS C:\PROGRAMMES VSCODE\AI coding> & C:\Users\venkatesh\AppData\Local\Programs\Python\Python313\python.exe "c:\PROGRAMMES VSCODE\AI coding\assignment 9.5 task-4.py"
Welcome to Chatbot! Type 'exit' to quit.
User: hi
Chatbot: Hi there! How can I help you today?
User: generate the sum of two numbers python code
Chatbot: I'm sorry, I didn't understand that. could you rephrase?
User: exit
Chatbot: Goodbye! Have a great day!
PS C:\PROGRAMMES VSCODE\AI coding>
```

## CONCLUSION:

The chatbot application provides a simple, interactive interface for users to ask questions and receive responses. It uses rule-based logic to handle common queries while gracefully managing unknown inputs. This structure makes it easy to extend with new responses or integrate AI-based models, and the combination of inline comments and README documentation ensures maintainability and usability for developers and end-users alike.