ASSIGNMENT 9.5

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Lab 9 – Documentation Generation: Automatic Documentation and Code Comments

Lab Objectives

- Inline comments
- Docstrings
- Auto-documentation tools
- AI-assisted summarization

Task Description #1 (Automatic Code Commenting)

PROMPT : generate at least 3 assert test cases for is_strong_password(password) and implement the validator function.

- Requirements:
  - Password must have at least 8 characters.
  - Must include uppercase, lowercase, digit, and special character.
  - Must not contain spaces.

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.

```
# --- Manually written line-by-line comments ---
def calculate_discount(price, discount_rate):
    # Calculate the amount to discount from the price
    # Subtract the discount from the original price to get the final price
    return price - (price * discount_rate / 100)
```

```
# --- AI-generated line-by-line comments ---
def calculate_discount(price, discount_rate):
    # Subtracts the discount amount from the original price
    # Calculates the discount by multiplying price and discount_rate, then dividing by 100
    return price - (price * discount_rate / 100)
```

- Modify the function so that it includes a docstring in Google-style or NumPy-style format.

```python
# --- Function with Google-style docstring ---
def calculate_discount(price, discount_rate):
    """
    Calculate the final price after applying a percentage discount.

    Args:
        price (float): The original price of the item.
        discount_rate (float): The discount rate as a percentage.

    Returns:
        float: The price after the discount is applied.
    """
    return price - (price * discount_rate / 100)
```

- Compare the auto-generated comments with your manually written version.

--- Comparison ---

1. AI-generated comments focus on the calculation steps.

2.Manual comments clarify the purpose and the logic.

3.The docstring provides structured documentation for users and tools.

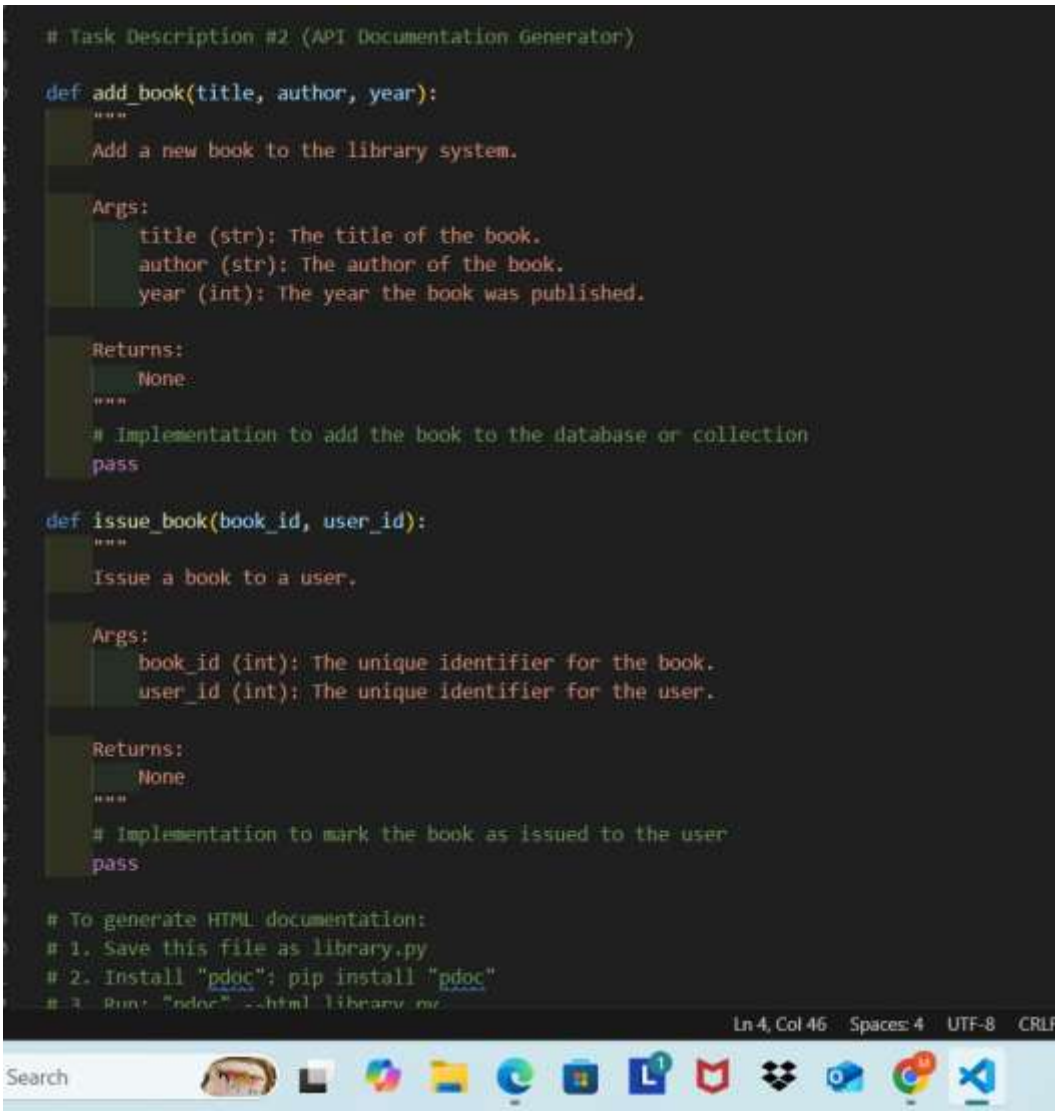
Conclusion: AI is helpful for quick annotation, but **manual comments provide better clarity** and domain-specific insight when needed.

Task Description #2 (API Documentation Generator)

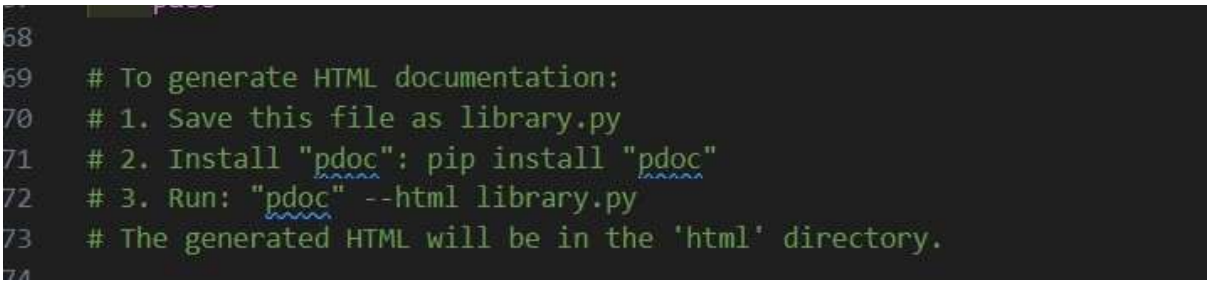
PROMPT: Write detailed docstrings for each function, explaining what they do, their inputs, and outputs. Then use tools like Sphinx or MkDocs to automatically generate clean, well-structured API documentation from these docstrings. Focus on making the docs clear and easy for others to use.

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.



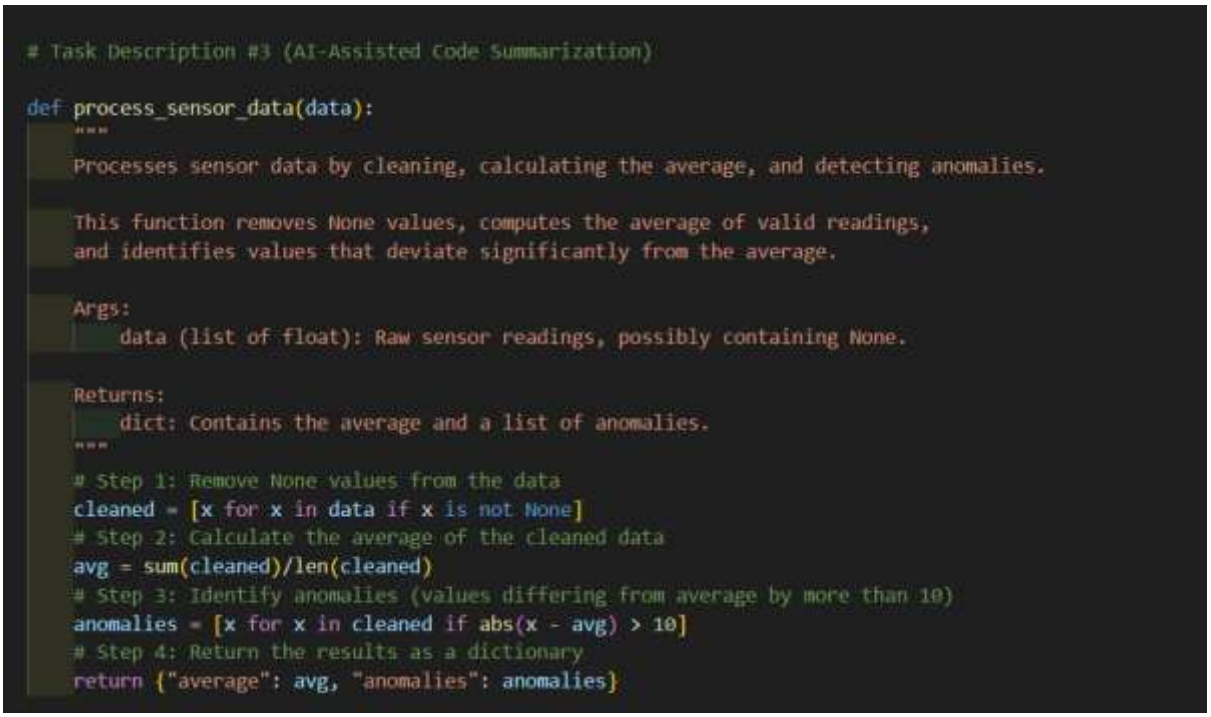
- Submit both the code and the generated documentation as output.

Task Description #3 (AI-Assisted Code Summarization)

PROMPT: Write brief comments summarizing each function's goal. Clearly explain each step, like reading data, cleaning it, or outputting results. Include real-world use cases—for example, how the function processes user data or generates reports. Keep it practical and easy for developers to follow

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}



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

def process_sensor_data(data):
    """
    Processes sensor data by cleaning, calculating the average, and detecting anomalies.

    This function removes None values, computes the average of valid readings,
    and identifies values that deviate significantly from the average.

    Args:
        data (list of float): Raw sensor readings, possibly containing None.

    Returns:
        dict: Contains the average and a list of anomalies.
    """
    # Step 1: Remove None values from the data
    cleaned = [x for x in data if x is not None]
    # Step 2: Calculate the average of the cleaned data
    avg = sum(cleaned)/len(cleaned)
    # Step 3: Identify anomalies (values differing from average by more than 10)
    anomalies = [x for x in cleaned if abs(x - avg) > 10]
    # Step 4: Return the results as a dictionary
    return {"average": avg, "anomalies": anomalies}
```

- Generate a summary comment explaining the purpose of the function in 2–3 lines.

1.Processes sensor data by removing invalid entries, computing average,

2.and identifying anomalies that deviate significantly from the average.

• Create a flow-style comment (step-by-step explanation).

```
56
57
58      # Flow-Style Step-by-Step Comment
59  def process_sensor_data(data):
60      # Step 1: Remove None values from the data
61      cleaned = [x for x in data if x is not None]
62
63      # Step 2: Compute the average of the cleaned data
64      avg = sum(cleaned) / len(cleaned)
65
66      # Step 3: Identify values that differ from the average by more than 10 un
67      anomalies = [x for x in cleaned if abs(x - avg) > 10]
68
69      # Step 4: Return the average and list of anomalies
70      return {"average": avg, "anomalies": anomalies}
71
```

Flow-style comment:

1. Remove None values from input data.

2. Calculate the average of the cleaned data.

3. Find values that differ from the average by more than 10.

4. Return the average and anomalies as a dictionary.

• Write a short paragraph of documentation describing possible use cases of this function in real-world scenarios

=>This function is useful in IoT and industrial systems where sensors may occasionally report invalid or extreme values. It helps in filtering out noise and identifying abnormal behavior such as temperature spikes or equipment malfunctions.

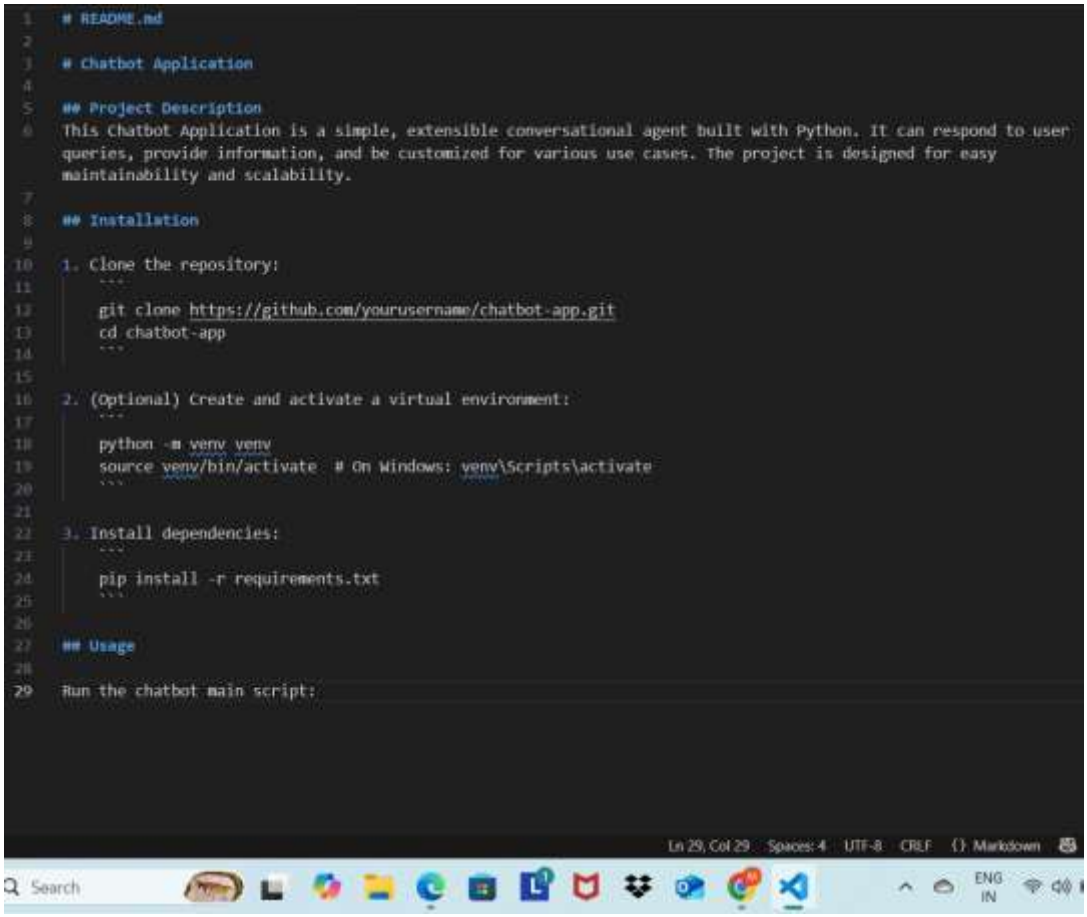
Task Description #4 (Real-Time Project Documentation)

PROMPT: Produce real-time project documentation by creating a detailed README covering setup and usage, writing precise inline comments explaining complex code sections, and generating AI-assisted user guides. Evaluate

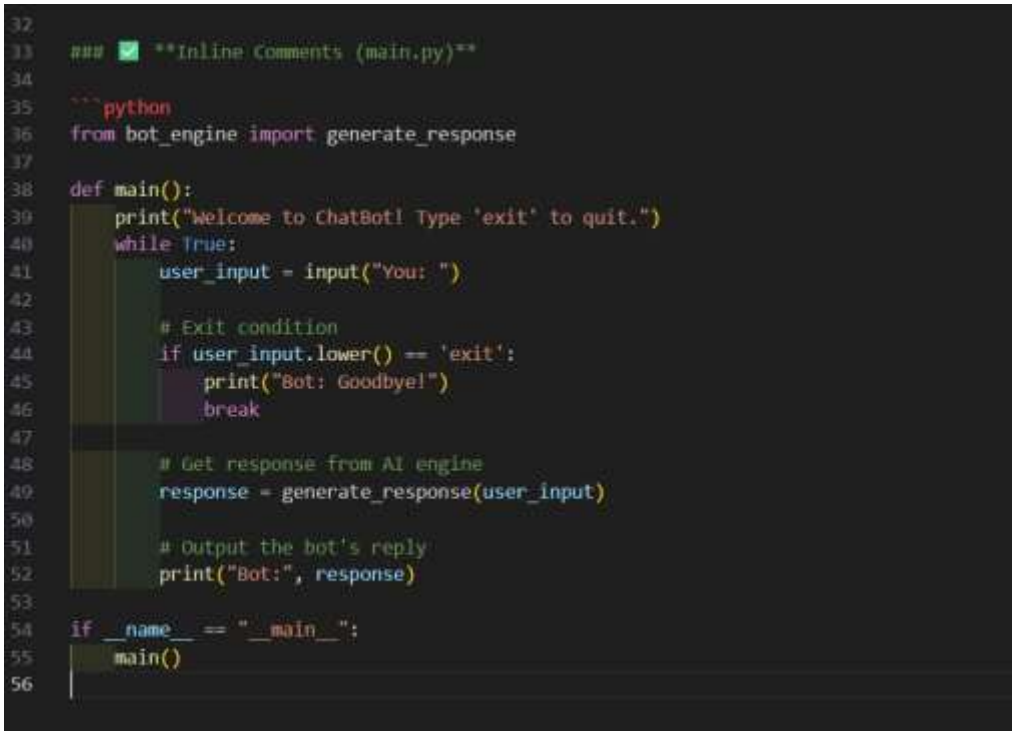
the accuracy and completeness of automated documentation tools compared to manual documentation, emphasizing maintainability and developer onboarding

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).



```
### ✅ **Inline Comments (main.py)**

```python
from bot_engine import generate_response

def main():
    print("Welcome to ChatBot! Type 'exit' to quit.")
    while True:
        user_input = input("You: ")

        # Exit condition
        if user_input.lower() == 'exit':
            print("Bot: Goodbye!")
            break

        # Get response from AI engine
        response = generate_response(user_input)

        # Output the bot's reply
        print("Bot:", response)

if __name__ == "__main__":
    main()
```

- Use an AI-assisted tool (or simulate it) to generate a usage guide in plain English from your code comments.

=>This chatbot starts a conversation with the user. When the user types something, the chatbot generates an AI-based reply. Typing "exit" ends the conversation. All processing happens in the generate_response() function which contains the core logic for response generation.

Conclusion: Automated tools accelerate documentation but **must be supplemented by manual context-driven comments**, especially in real-time team projects.
```