Assignment – 2.2

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Task 1: Cleaning Sensor Data

PROMPT :

Generate a function that filters out all negative numbers from a list.

CODE and OUTPUT :

```python
import pandas as pd
import numpy as np

def clean_sensor_data(sensor_data):
  """
  Cleans IoT sensor data by replacing negative values with NaN.

  Args:
    sensor_data: A list or pandas Series of numerical sensor readings.

  Returns:
    A pandas Series with negative values replaced by NaN.
  """
  cleaned_data = pd.Series(sensor_data).apply(lambda x: x if x >= 0 else np.nan)
  return cleaned_data

# Example Usage:
raw_data = [25.3, 26.1, -5.0, 24.9, 27.2, -1.2, 28.5]
print("Raw Sensor Data:", raw_data)

cleaned_data = clean_sensor_data(raw_data)
print("Cleaned Sensor Data:", cleaned_data.tolist())

# You can also filter out the invalid values completely:
filtered_data = cleaned_data.dropna().tolist()
print("Filtered (valid only) Sensor Data:", filtered_data)
```

```
Raw Sensor Data: [25.3, 26.1, -5.0, 24.9, 27.2, -1.2, 28.5]
Cleaned Sensor Data: [25.3, 26.1, nan, 24.9, 27.2, nan, 28.5]
Filtered (valid only) Sensor Data: [25.3, 26.1, 24.9, 27.2, 28.5]
```

Justification :

The first task involved removing negative values from IoT sensor data. Since real-world sensor data often contains invalid or noisy values, data cleaning is an essential preprocessing step. Gemini generated an efficient function using list comprehension to filter negative numbers. This shows that AI tools can quickly produce optimized and readable code for data preprocessing, reducing manual effort and minimizing errors.

Task 2: String Character Analysis

PROMPT :

Generate a Python function that counts vowels, consonants, and digits in a string.

CODE and OUTPUT :

```
def count_chars(input_string):
  """
  Counts the number of vowels, consonants, and digits in a given string.

  Args:
    input_string: The string to analyze.

  Returns:
    A tuple containing (vowel_count, consonant_count, digit_count).
  """
  vowels = "aeiou"
  vowel_count = 0
  consonant_count = 0
  digit_count = 0

  for char in input_string:
    char_lower = char.lower()
    if char_lower.isalpha():
      if char_lower in vowels:
        vowel_count += 1
      else:
        consonant_count += 1
    elif char_lower.isdigit():
      digit_count += 1

  return vowel_count, consonant_count, digit_count

# Example Usage:
sample_string = "Hello World 123!"
v, c, d = count_chars(sample_string)
print(f"Original String: '{sample_string}'")
print(f"Number of Vowels: {v}")
print(f"Number of Consonants: {c}")
print(f"Number of Digits: {d}")
```

```
Original String: 'Hello World 123!'
Number of Vowels: 3
Number of Consonants: 7
Number of Digits: 3
```

Justification :

This task focused on counting vowels, consonants, and digits in a string, which is important in text analysis and input validation. Gemini generated a structured function using built-in string methods. This demonstrates the ability of AI tools to handle conditional logic correctly and generate reusable functions. The solution highlights how AI can support both learning and practical text-processing tasks.

Task 3: Palindrome Check – Tool Comparison

PROMPT :

Generate a palindrome-checking function.

CODE and OUTPUT :

Gemini :

```python
import re

def is_palindrome(text):
  """
  Checks if a given string is a palindrome.

  A string is a palindrome if it reads the same forwards and backwards,
  ignoring case and non-alphanumeric characters.

  Args:
    text: The string to check.

  Returns:
    True if the string is a palindrome, False otherwise.
  """
  # Remove non-alphanumeric characters and convert to lowercase
  cleaned_text = re.sub(r'[^a-zA-Z0-9]', '', text).lower()

  # Compare the cleaned string with its reverse
  return cleaned_text == cleaned_text[::-1]

# Example Usage:
print(f"'Madam' is a palindrome: {is_palindrome('Madam')}")
print(f"'A man, a plan, a canal: Panama' is a palindrome: {is_palindrome('A man, a plan, a canal: Panama')}")
print(f"'Hello World' is a palindrome: {is_palindrome('Hello World')}")
print(f"'racecar' is a palindrome: {is_palindrome('racecar')}")
print(f"'No lemon, no melon' is a palindrome: {is_palindrome('No lemon, no melon')}")
```

```
'Madam' is a palindrome: True
'A man, a plan, a canal: Panama' is a palindrome: True
'Hello World' is a palindrome: False
'racecar' is a palindrome: True
'No lemon, no melon' is a palindrome: True
```

Co-pilot :

```python
#Generate a palindrome-checking function
def is_palindrome(s):
    """
    Check if the given string is a palindrome.

    Parameters:
    s (str): The string to check.

    Returns:
    bool: True if the string is a palindrome, False otherwise.
    """
    cleaned_string = ''.join(c.lower() for c in s if c.isalnum())
    return cleaned_string == cleaned_string[::-1]
# Example usage:
test_string = "A man, a plan, a canal: Panama"
result = is_palindrome(test_string)
print(f'Is the string "{test_string}" a palindrome? {result}')
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

PS D:\AI>  & 'c:\Users\aatiq\AppData\Local\Programs\Python\Python314\python.exe' 'c:\Users\aatiq\.vscode\
.0-win32-x64\bundled\libs\debugpy\launcher' '61560' '--' 'D:\AI\AI-02.py'
Is the string "A man, a plan, a canal: Panama" a palindrome? True
PS D:\AI>
```

Justification :

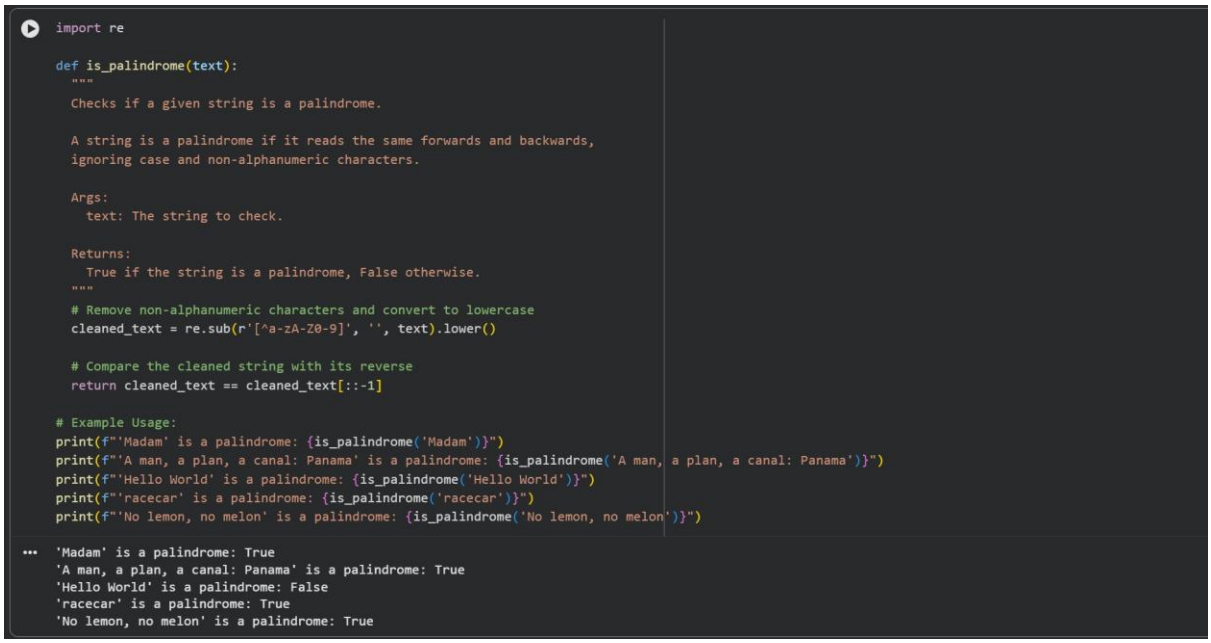
In this task, palindrome-checking functions were generated using Gemini and Copilot. Gemini provided a short and optimized solution, while Copilot produced a more detailed, step-by-step approach. This comparison justified that different AI tools offer different strengths: Gemini is effective for concise professional code, whereas Copilot is helpful for understanding logic clearly. This task emphasized the importance of comparing AI tools to choose the most suitable one.

Task 4: Code Explanation Using AI

PROMPT :

Explain a Python function (prime check OR palindrome check) line by line.

CODE and OUTPUT :



```
import re

def is_palindrome(text):
  """
  Checks if a given string is a palindrome.

  A string is a palindrome if it reads the same forwards and backwards,
  ignoring case and non-alphanumeric characters.

  Args:
    text: The string to check.

  Returns:
    True if the string is a palindrome, False otherwise.
  """
  # Remove non-alphanumeric characters and convert to lowercase
  cleaned_text = re.sub(r'[^a-zA-Z0-9]', '', text).lower()

  # Compare the cleaned string with its reverse
  return cleaned_text == cleaned_text[::-1]

# Example Usage:
print(f"'Madam' is a palindrome: {is_palindrome('Madam')}")
print(f"'A man, a plan, a canal: Panama' is a palindrome: {is_palindrome('A man, a plan, a canal: Panama')}")
print(f"'Hello World' is a palindrome: {is_palindrome('Hello World')}")
print(f"'racecar' is a palindrome: {is_palindrome('racecar')}")
print(f"'No lemon, no melon' is a palindrome: {is_palindrome('No lemon, no melon')}")
```

```
'Madam' is a palindrome: True
'A man, a plan, a canal: Panama' is a palindrome: True
'Hello World' is a palindrome: False
'racecar' is a palindrome: True
'No lemon, no melon' is a palindrome: True
```

Explanation:

1. **`is_palindrome(text)` Function:** This function takes a string `text` as input.
2. **Import `re`:** The `re` module (regular expressions) is imported to help clean the string.
3. **Clean the String:**
   - `re.sub(r'[^a-zA-Z0-9]', '', text)`: This line uses a regular expression to find all characters that are *not* (indicated by `^`) alphanumeric (`a-zA-Z0-9`) and replaces them with an empty string (`''`). This effectively removes spaces, punctuation, and other symbols.
   - `.lower()`: The resulting string is then converted to lowercase to ensure case-insensitive comparison (e.g., 'Madam' and 'madam' are treated the same).
4. **Check for Palindrome:**
   - `cleaned_text[::-1]`: This is a Python slice that creates a reversed version of the `cleaned_text`.
   - `return cleaned_text == cleaned_text[::-1]`: The cleaned string is compared to its reversed version. If they are identical, the function returns `True` (it's a palindrome); otherwise, it returns `False`.

Justification:

This task demonstrated Gemini's ability to explain unfamiliar code line by line. The explanation of the Palindrome checking function helped in understanding both logic and optimization. This justifies the role of AI not only as a coding assistant but also as a learning support tool.