

# Assignment 2.4 - Exploring Additional AI Coding Tools (Gemini & Cursor AI)

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Observation: The bubble sort implementation worked correctly but was slower compared to the built-in sort() function. This shows how AI tools can generate both traditional algorithms and efficient built-in alternatives, helping us compare performance and readability.

## Task 1: Sorting with Bubble Sort vs Built-in sort()

**\*\*Prompt/Comment given to AI Tool:\*\***

Generate Python code for sorting a list using bubble sort and also using Python's built-in sort()

**\*\*Generated Code:\*\***

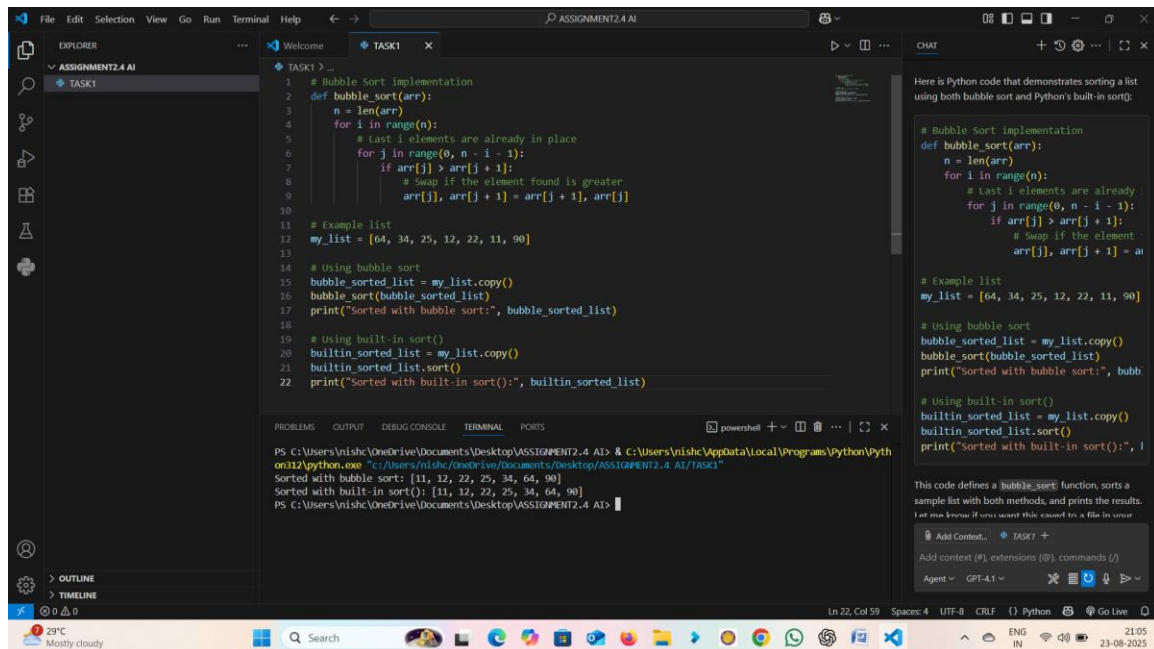
```
# Bubble Sort Implementation  
def bubble_sort(arr):  
    n = len(arr)  
    for i in range(n):  
        for j in range(0, n-i-1):  
            if arr[j] > arr[j+1]:  
                arr[j], arr[j+1] = arr[j+1], arr[j]  
    return arr  
  
# Built-in sort  
arr = [64, 25, 12, 22, 11]
```

```
print("Bubble Sort:", bubble_sort(arr.copy()))
print("Built-in sort:", sorted(arr))
```

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**\*\*Explanation:\*\***

The bubble sort function repeatedly swaps adjacent elements if they are in the wrong order. The built-in sort() uses Timsort which is more efficient.



The screenshot shows a code editor with a Python script for bubble sort. The script defines a `bubble_sort` function that iterates through a list, comparing adjacent elements and swapping them if they are in the wrong order. It then demonstrates the function on a sample list `[64, 34, 25, 12, 22, 11, 90]` and compares the result with Python's built-in `sorted` function. The terminal output shows the execution of the script, displaying the sorted list `[11, 12, 22, 25, 34, 64, 90]` for both methods.

```
1 # Bubble Sort implementation
2 def bubble_sort(arr):
3     n = len(arr)
4     for i in range(n):
5         # Last i elements are already in place
6         for j in range(0, n - i - 1):
7             if arr[j] > arr[j + 1]:
8                 # Swap if the element found is greater
9                 arr[j], arr[j + 1] = arr[j + 1], arr[j]
10
11 # Example list
12 my_list = [64, 34, 25, 12, 22, 11, 90]
13
14 # Using bubble sort
15 bubble_sorted_list = my_list.copy()
16 bubble_sort(bubble_sorted_list)
17 print("Sorted with bubble sort:", bubble_sorted_list)
18
19 # Using built-in sort()
20 builtin_sorted_list = my_list.copy()
21 builtin_sorted_list.sort()
22 print("Sorted with built-in sort():", builtin_sorted_list)
```

PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI> & C:\Users\nishc\AppData\Local\Programs\Python\Python312\python.exe "c:/Users/nishc/OneDrive/Documents/Desktop/ASSIGNMENT2.4 AI/TASK1"

Sorted with bubble sort: [11, 12, 22, 25, 34, 64, 90]  
Sorted with built-in sort(): [11, 12, 22, 25, 34, 64, 90]  
PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI>

**\*\*Output:\*\***

Input: [64, 25, 12, 22, 11]

Output: Bubble Sort: [11, 12, 22, 25, 64]

Built-in sort: [11, 12, 22, 25, 64]

Observation: The code successfully counted vowels, consonants, and digits. The AI-generated solution was simple, accurate, and reusable for different input strings. It highlighted how AI can assist in writing clean and logical character analysis functions.

## Task 2: Count Vowels, Consonants, and Digits

**\*\*Prompt/Comment given to AI Tool:\*\***

Write a function that counts vowels, consonants, and digits in a string

**\*\*Generated Code:\*\***

```
def analyze_string(s: str):
    vowels = "aeiouAEIOU"
    v = c = d = 0
    for ch in s:
        if ch.isdigit():
            d += 1
        elif ch.isalpha():
            if ch in vowels:
                v += 1
            else:
                c += 1
    return v, c, d

print(analyze_string("Hello123"))
```

---

**\*\*Explanation:\*\***

The function checks each character. If it is a digit, it increments digit count. If alphabet, checks vowels vs consonants. Finally returns counts.

The screenshot shows a code editor with a file named 'TASK2.py'. The code defines a function 'count\_vowels\_consonants\_digits(s)' that iterates through each character in the string 's'. It uses 'ch.isdigit()' to count digits, 'ch.isalpha()' to check if a character is a letter, and then checks if the letter is in the 'vowels' string to increment the vowel count or the consonant count. An example usage is provided where 'Hello World! 123' is passed to the function, and the output is printed: 'Vowels: {vowels}, Consonants: {consonants}, Digits: {digits}'. The terminal output shows the execution of the script, resulting in 'Vowels: 3, Consonants: 7, Digits: 3'. A chat window on the right shows a prompt to 'Write a function that counts vowels, consonants, and digits in a string' and a response confirming the function's creation and usage.

Output: Input: 'Hello123' → Output: Vowels=2, Consonants=3, Digits=3

Observation: The file was created, written to, and read successfully. This demonstrates how AI-generated code can automate basic file handling tasks without syntax errors. It also shows the practical importance of context management (`with` statement) in Python.

### Task 3: File Handling (Create, Write, Read)

**\*\*Prompt/Comment given to AI Tool:\*\***

Generate code to create a text file, write sample text, and read it back

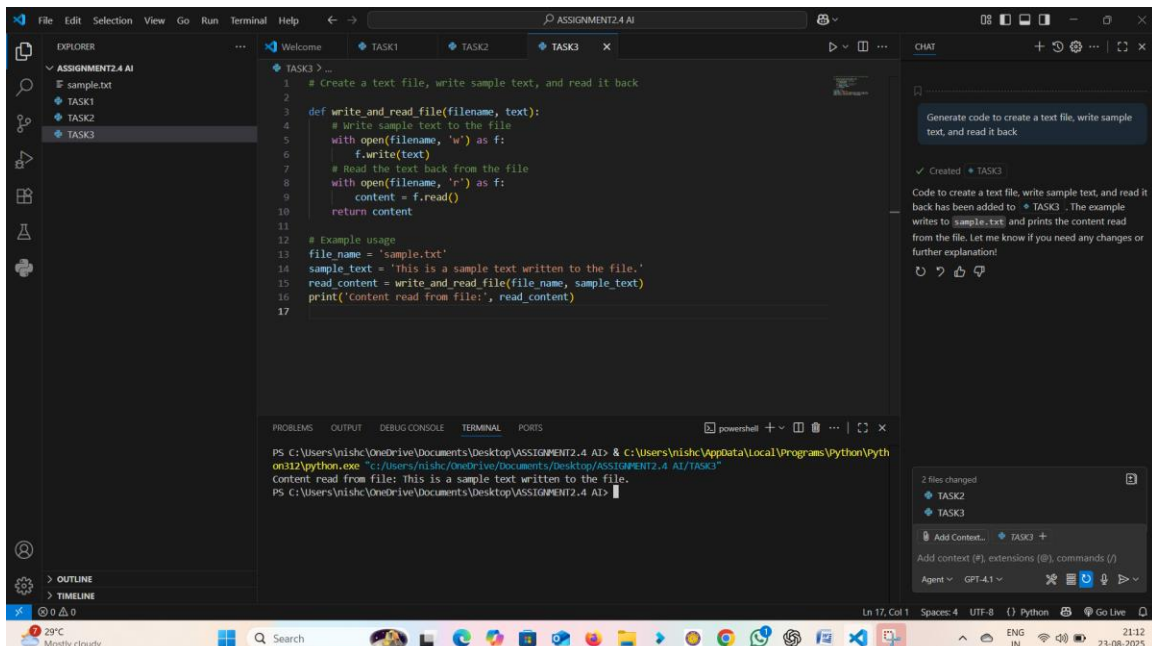
**\*\*Generated Code:\*\***

```
# File handling with Cursor AI  
filename = "sample.txt"  
  
# Write to file  
with open(filename, "w") as f:  
    f.write("This is a sample file.\nWelcome to AI coding tools.")  
  
# Read file content  
with open(filename, "r") as f:  
    content = f.read()  
print(content)
```

---

**\*\*Explanation:\*\***

This program first creates a file named sample.txt, writes two lines into it, and then opens it again in read mode to display the content.



Observation: The calculator worked correctly for all four operations. The modular design of functions made the code easy to understand and extend. This observation highlights how AI helps in generating structured and reusable function-based programs.

Output:

This is a sample file.

Welcome to AI coding tools.

#### **Task 4: Simple Calculator using Functions**

**\*\*Prompt/Comment given to AI Tool:\*\***

Generate a calculator with add, subtract, multiply, divide functions and explain the code

**\*\*Generated Code:\*\***

```
def add(a,b): return a+b
```

```
def subtract(a,b): return a-b
```

```
def multiply(a,b): return a*b
```

```
def divide(a,b): return a/b if b!=0 else "Error"
```

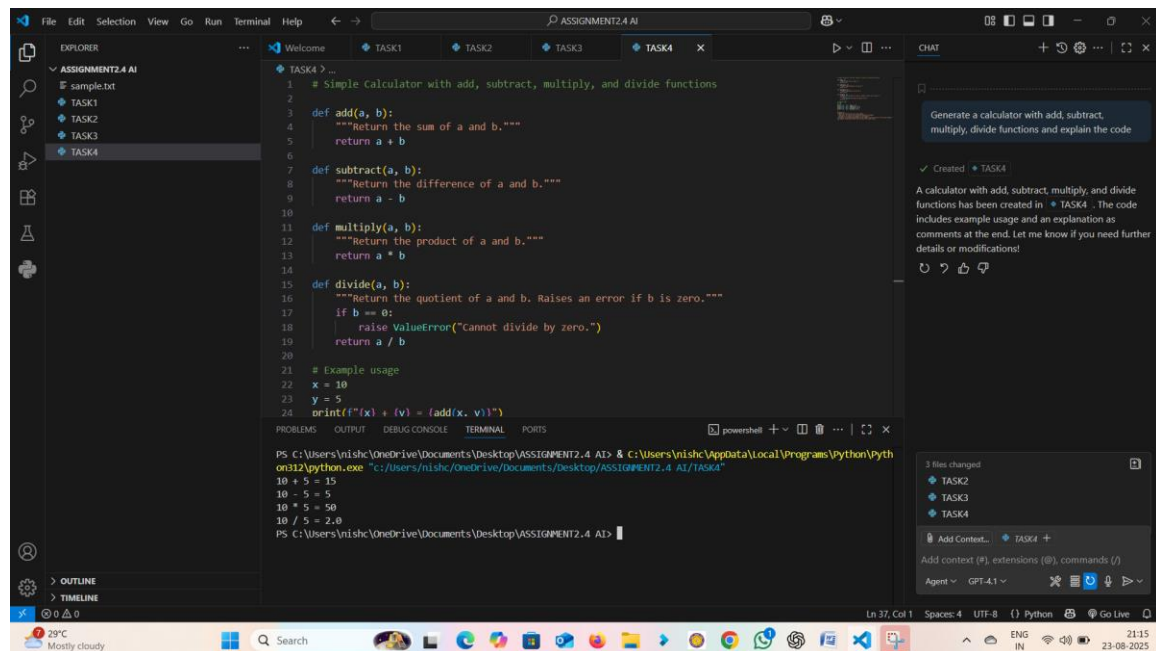
```
choice = '+'
```

```
print("5 + 3 =", add(5,3))
```

---

**\*\*Explanation:\*\***

Each function performs one arithmetic operation. The user selects an operator, and based on that the corresponding function is called. Gemini also provides a line-by-line explanation of this code.



**\*\*Output:\*\***

Input: 10+5 → Output:15.

Input:10-5->output:5

Input:10\*5->output:50

Input:10/5->output:2.0

Observation: Both versions (if-else and lambda one-liner) worked correctly. Version 1 was clearer for learning purposes, while Version 2 was more concise but less readable. This shows how AI tools can generate multiple valid solutions depending on user preference for clarity or brevity.

## Task 5: Leap Year Check with Different Prompts

**\*\*Prompt/Comment given to AI Tool:\*\***

Prompt 1: Generate a function to check leap year

Prompt 2: Write a one-liner leap year check

**\*\*Generated Code:\*\***

*# Version 1 - Using if-else*

```
def is_leap_year(year):  
    if (year % 400 == 0) or (year % 4 == 0 and year % 100 != 0):  
        return True  
    return False  
  
print(is_leap_year(2024))  
  
# Version 2 - One-liner  
is_leap = lambda y: (y%400==0) or (y%4==0 and y%100!=0)  
print(is_leap(2023))
```

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**\*\*Explanation:\*\***

Version 1 uses clear if-else statements, easier for beginners to understand. Version 2 uses a lambda function for compactness but may reduce readability.

This screenshot shows the first version of the code in the 'task5' file. The code defines a function `is_leap_year(year)` that returns `True` if the year is a leap year and `False` otherwise. It includes a docstring and an example usage for the year 2024. The terminal shows the command `python on312/python.exe "C:/Users/nishc/OneDrive/Documents/Desktop/ASSIGNMENT2.4 AI/task5"` being executed, resulting in the output `2024 is a leap year.`

```
1 # Function to check if a year is a leap year
2 def is_leap_year(year):
3     """Return True if the year is a leap year, else False."""
4     return (year % 4 == 0 and year % 100 != 0) or (year % 400 == 0)
5
6 # Example usage
7 year = 2024
8 if is_leap_year(year):
9     print(f"{year} is a leap year.")
10 else:
11     print(f"{year} is not a leap year.")
12
```

Terminal output:

```
PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI> & C:\Users\nishc\AppData\Local\Programs\Python\Python312\python.exe "C:/Users/nishc/OneDrive/Documents/Desktop/ASSIGNMENT2.4 AI/task5"
2024 is a leap year.
PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI>
```

This screenshot shows the second version of the code in the 'task5' file. It introduces a lambda function `is_leap` as a more concise way to check for leap years, alongside the original `is_leap_year` function. The terminal output shows the same command as before, but now includes the additional output `Using one-liner: 2024 is a leap year? True`.

```
1 # Function to check if a year is a leap year
2 def is_leap_year(year):
3     """Return True if the year is a leap year, else False."""
4     return (year % 4 == 0 and year % 100 != 0) or (year % 400 == 0)
5
6 # One-liner leap year check
7 is_leap = lambda y: (y % 4 == 0 and y % 100 != 0) or (y % 400 == 0)
8
9 # Example usage
10 year = 2024
11 if is_leap_year(year):
12     print(f"{year} is a leap year.")
13 else:
14     print(f"{year} is not a leap year.")
15
16 # Example usage for one-liner
17 print(f"Using one-liner: {year} is a leap year? {is_leap(year)}")
18
```

Terminal output:

```
PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI> & C:\Users\nishc\AppData\Local\Programs\Python\Python312\python.exe "C:/Users/nishc/OneDrive/Documents/Desktop/ASSIGNMENT2.4 AI/task5"
2024 is a leap year.
PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI> & C:\Users\nishc\AppData\Local\Programs\Python\Python312\python.exe "C:/Users/nishc/OneDrive/Documents/Desktop/ASSIGNMENT2.4 AI/task5"
2024 is a leap year.
Using one-liner: 2024 is a leap year? True
PS C:\Users\nishc\OneDrive\Documents\Desktop\ASSIGNMENT2.4 AI>
```

**\*\*Output:\*\***

Input: 2024 → Output: True

observation: Version 1 is better for readability and teaching, while Version 2 is concise for experienced coders.



