ASSIGNMENT-02

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Batch:05

Q) Task 1: Word Frequency from Text File

❖ Scenario:

You are analyzing log files for keyword frequency.

❖ Task:

Use Gemini to generate Python code that reads a text file and counts word frequency, then explains the code.

❖ Expected Output:

➢ Working code

➢ Explanation

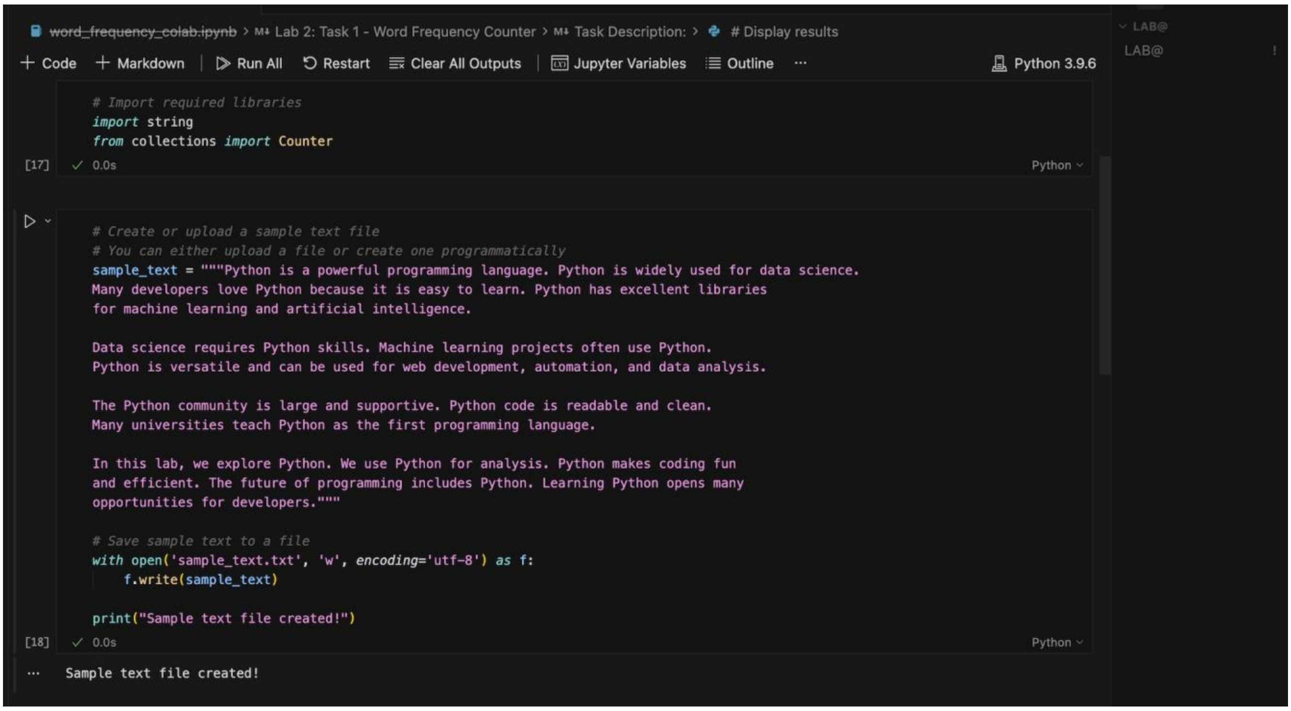
➢ Screenshot

Solution:

PROMPT

Generate a Python program in Google Colab that reads a text file and counts the frequency of each word.

CODE:



word_frequency_colab.ipynb > Lab 2: Task 1 - Word Frequency Counter > Task Description: > # Display results
+ Code
+ Markdown
Run All
Restart
Clear All Outputs
Jupyter Variables
Outline
Python 3.9.6
LAB@
LAB@
Python

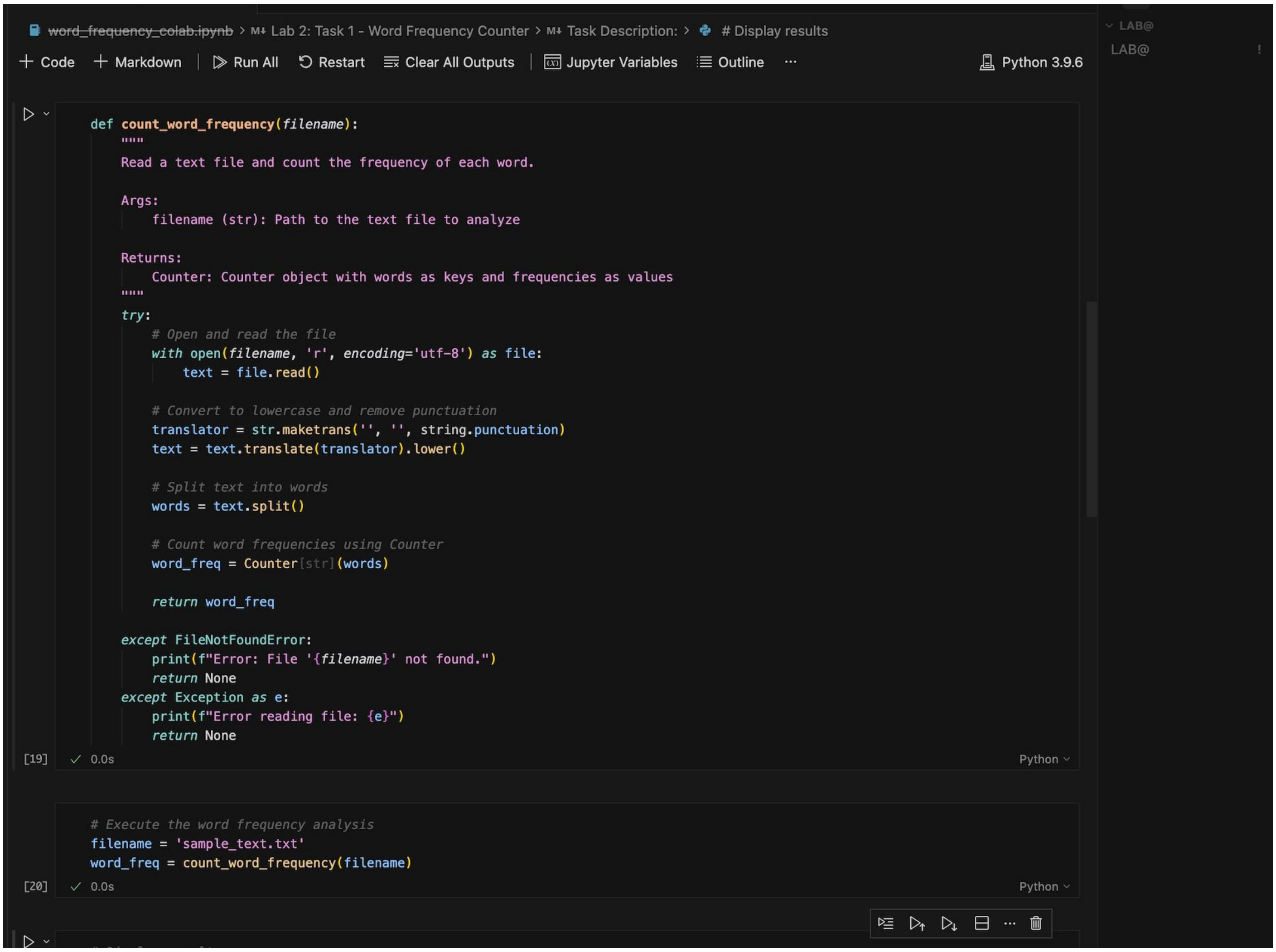
```
# Import required libraries
import string
from collections import Counter
```

[17] ✓ 0.0s

```
# Create or upload a sample text file
# You can either upload a file or create one programmatically
sample_text = """Python is a powerful programming language. Python is widely used for data science.
Many developers love Python because it is easy to learn. Python has excellent libraries
for machine learning and artificial intelligence.

Data science requires Python skills. Machine learning projects often use Python.
Python is versatile and can be used for web development, automation, and data analysis.

The Python community is large and supportive. Python code is readable and clean.
Many universities teach Python as the first programming language.

In this lab, we explore Python. We use Python for analysis. Python makes coding fun
and efficient. The future of programming includes Python. Learning Python opens many
opportunities for developers."""

# Save sample text to a file
with open('sample_text.txt', 'w', encoding='utf-8') as f:
    f.write(sample_text)

print("Sample text file created!")
```

[18] ✓ 0.0s

```
Sample text file created!
```

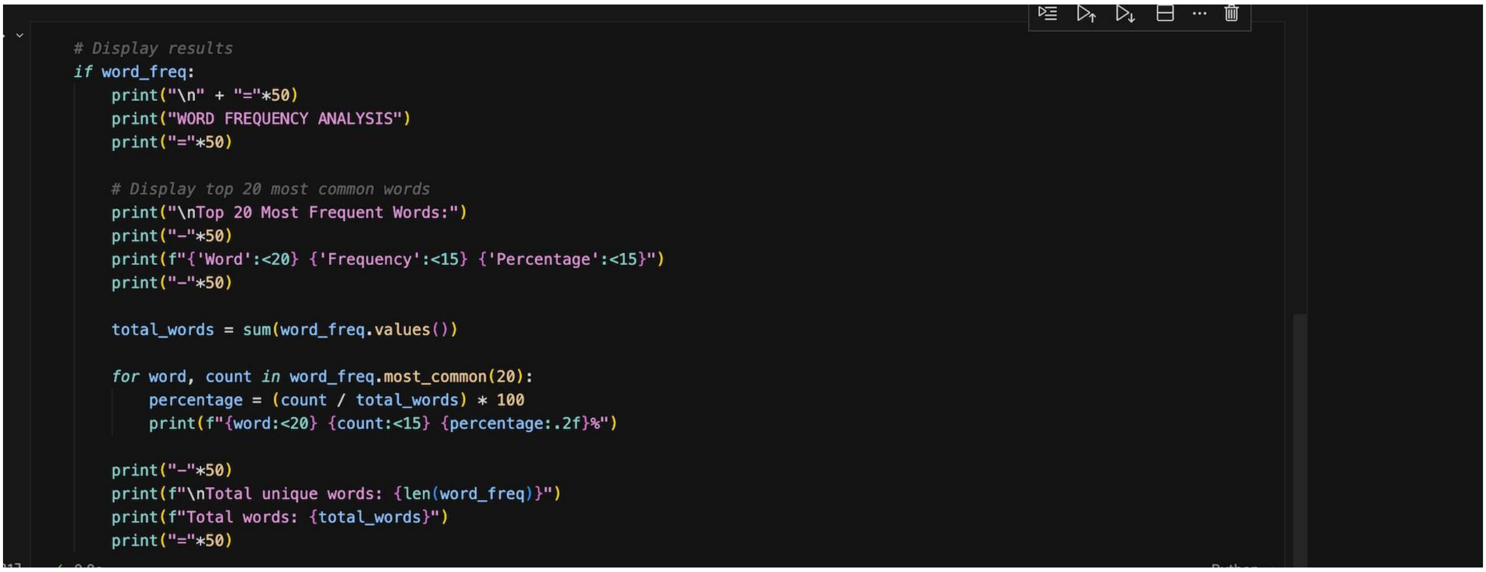

~~word_frequency_colab.ipynb~~ > M↓ Lab 2: Task 1 - Word Frequency Counter > M↓ Task Description: > # Display results
LAB@
LAB@
+ Code
+ Markdown
Run All
Restart
Clear All Outputs
Jupyter Variables
Outline
···
Python 3.9.6
Python
Python

```python
def count_word_frequency(filename):
    """
    Read a text file and count the frequency of each word.

    Args:
        filename (str): Path to the text file to analyze

    Returns:
        Counter: Counter object with words as keys and frequencies as values
    """
    try:
        # Open and read the file
        with open(filename, 'r', encoding='utf-8') as file:
            text = file.read()

        # Convert to lowercase and remove punctuation
        translator = str.maketrans('', '', string.punctuation)
        text = text.translate(translator).lower()

        # Split text into words
        words = text.split()

        # Count word frequencies using Counter
        word_freq = Counter[str](words)

        return word_freq

    except FileNotFoundError:
        print(f"Error: File '{filename}' not found.")
        return None
    except Exception as e:
        print(f"Error reading file: {e}")
        return None
```

[19] ✓ 0.0s

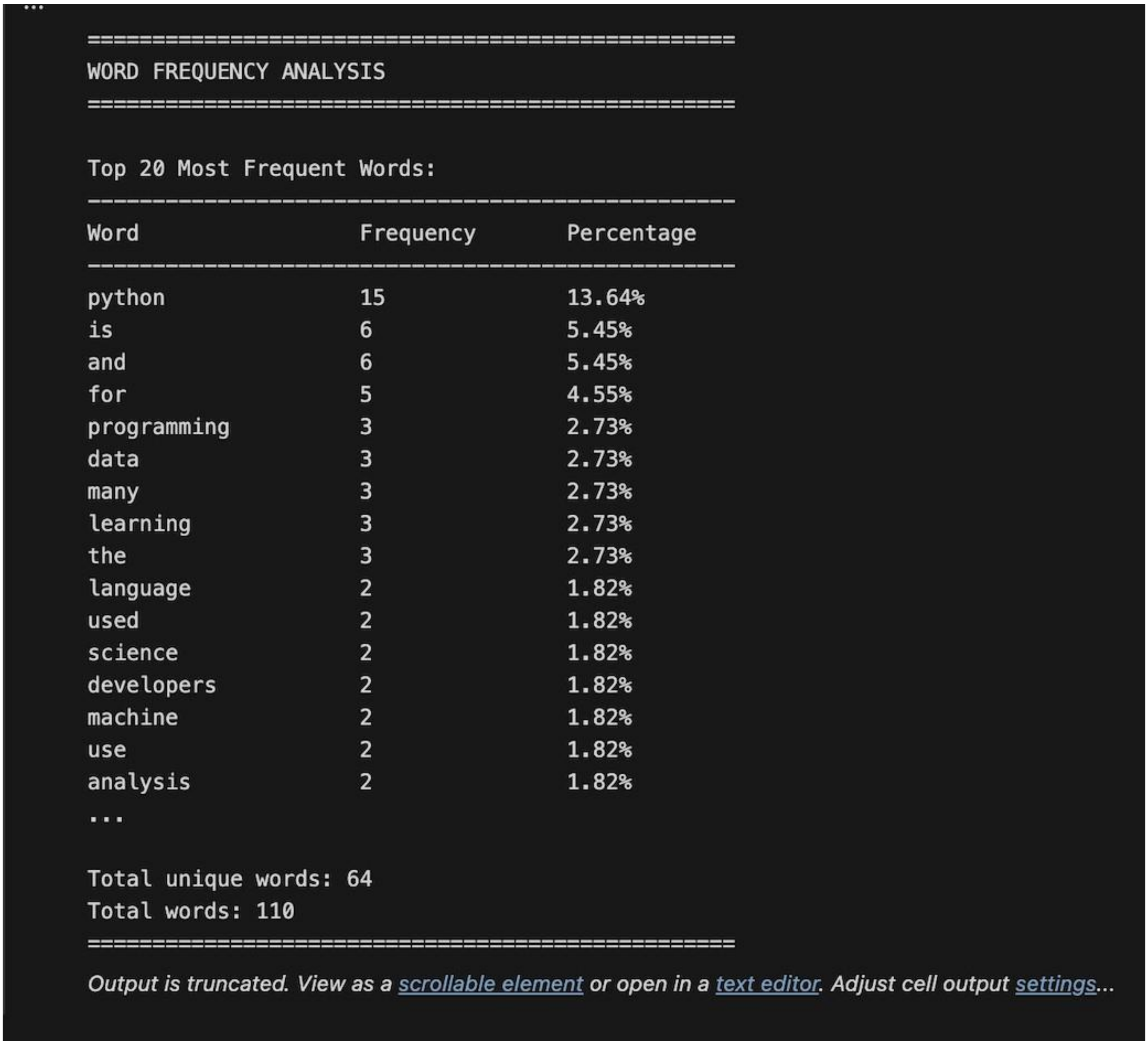
```python
# Execute the word frequency analysis
filename = 'sample_text.txt'
word_freq = count_word_frequency(filename)
```

[20] ✓ 0.0s



```python
# Display results
if word_freq:
    print("\n" + "="*50)
    print("WORD FREQUENCY ANALYSIS")
    print("="*50)

    # Display top 20 most common words
    print("\nTop 20 Most Frequent Words:")
    print("-"*50)
    print(f"{'Word':<20} {'Frequency':<15} {'Percentage':<15}")
    print("-"*50)

    total_words = sum(word_freq.values())

    for word, count in word_freq.most_common(20):
        percentage = (count / total_words) * 100
        print(f"{word:<20} {count:<15} {percentage:.2f}%")

    print("-"*50)
    print(f"\nTotal unique words: {len(word_freq)}")
    print(f"Total words: {total_words}")
    print("="*50)
```

OUTPUT:



```
==================================================
WORD FREQUENCY ANALYSIS
==================================================

Top 20 Most Frequent Words:
--------------------------------------------------
Word                 Frequency       Percentage
--------------------------------------------------
python               15              13.64%
is                   6               5.45%
and                  6               5.45%
for                  5               4.55%
programming          3               2.73%
data                 3               2.73%
many                 3               2.73%
learning             3               2.73%
the                  3               2.73%
language             2               1.82%
used                 2               1.82%
science              2               1.82%
developers           2               1.82%
machine              2               1.82%
use                  2               1.82%
analysis             2               1.82%
...

Total unique words: 64
Total words: 110
==================================================
```

Output is truncated. View as a scrollable element or open in a text editor. Adjust cell output settings...

CODE Explanation:

This Python program works by first importing the required modules to handle punctuation removal and word counting. The text file is opened in read mode and its content is read completely. Then, all punctuation marks are removed and the text is converted to lowercase so that words are counted correctly without case differences. After that, the text is split into individual words. The Counter function is used to count the number of times each word appears in the file. The program also includes error handling to display a message if the file is not found or if any other error occurs. Finally, the word frequencies are displayed in an organized format, making the output easy to understand

Q) Task 2: File Operations Using Cursor AI

❖ Scenario:

You are automating basic file operations.

❖ Task:

Use Cursor AI to generate a program that:

- ➢ Creates a text file
- ➢ Writes sample text
- ➢ Reads and displays the content

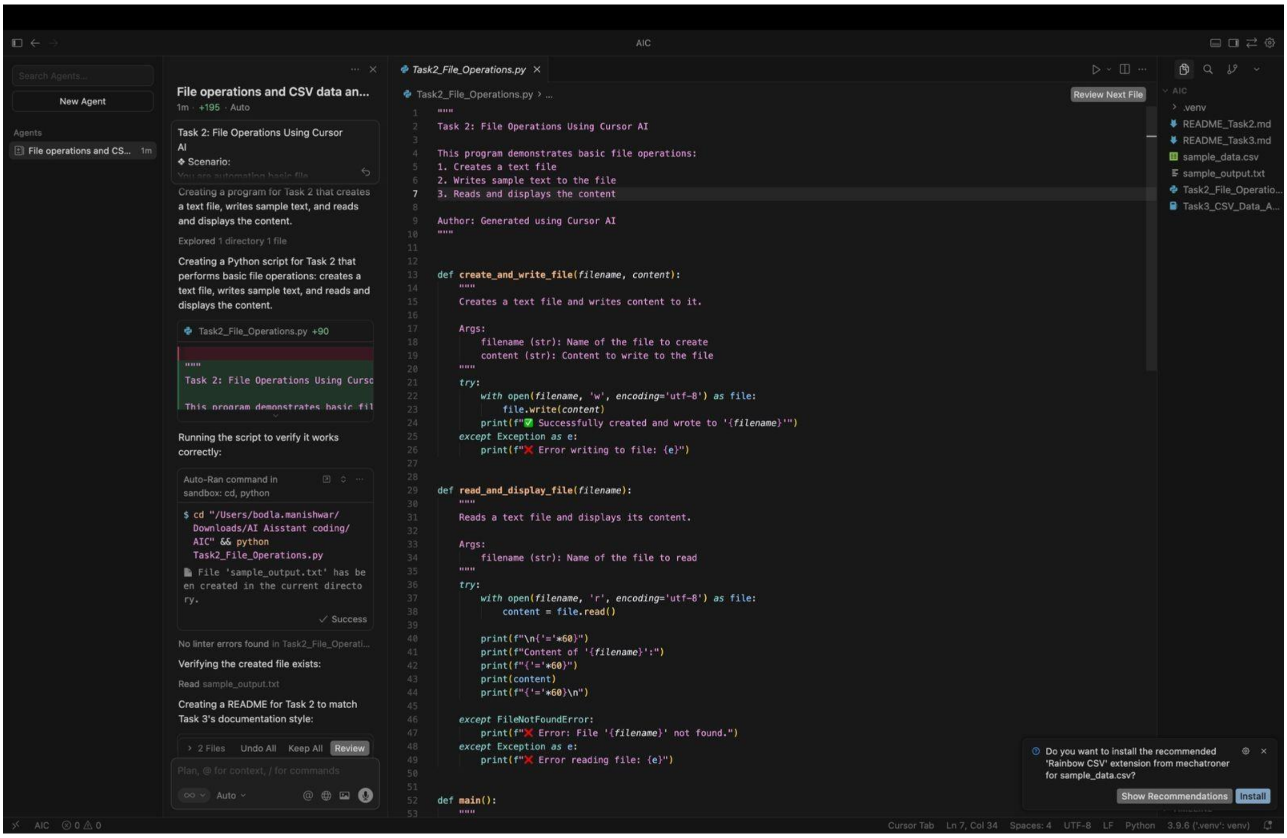
❖ Expected Output:

- ➢ Functional code
- ➢ Cursor AI screenshots

PROMPT:

Generate a simple Python program that demonstrates basic file operations. The program should create a text file, write some sample text into it, then read the content from the file and display it on the screen.

CODE:



File operations and CSV data an...

1m · +195 · Auto

Task 2: File Operations Using Cursor AI

❖ Scenario:

You are automating basic file

Creating a program for Task 2 that creates a text file, writes sample text, and reads and displays the content.

Explored 1 directory 1 file

Creating a Python script for Task 2 that performs basic file operations: creates a text file, writes sample text, and reads and displays the content.

Task2_File_Operations.py +90

```
"""
Task 2: File Operations Using Cursc

This program demonstrates basic fil
```

Running the script to verify it works correctly:

Auto-Ran command in sandbox: cd, python

```
$ cd "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC" && python Task2_File_Operations.py
File 'sample_output.txt' has been created in the current directory.
```

✓ Success

No linter errors found in Task2_File_Operati...

Verifying the created file exists:

Read sample_output.txt

Creating a README for Task 2 to match Task 3's documentation style:

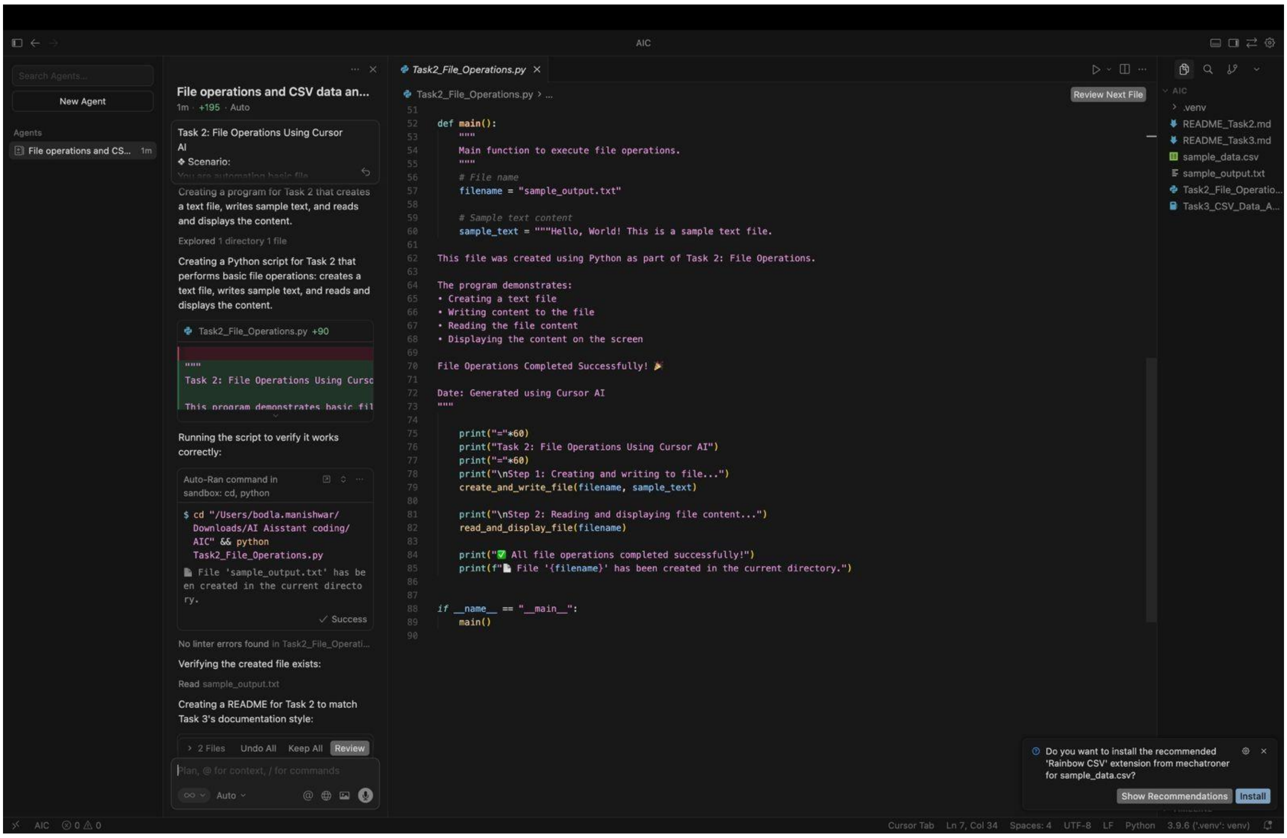
› 2 Files Undo All Keep All Review

Plan, @ for context, / for commands

Auto

```python
"""
Task 2: File Operations Using Cursor AI

This program demonstrates basic file operations:
1. Creates a text file
2. Writes sample text to the file
3. Reads and displays the content

Author: Generated using Cursor AI
"""


def create_and_write_file(filename, content):
    """
    Creates a text file and writes content to it.

    Args:
        filename (str): Name of the file to create
        content (str): Content to write to the file
    """
    try:
        with open(filename, 'w', encoding='utf-8') as file:
            file.write(content)
        print(f"✅ Successfully created and wrote to '{filename}'")
    except Exception as e:
        print(f"❌ Error writing to file: {e}")


def read_and_display_file(filename):
    """
    Reads a text file and displays its content.

    Args:
        filename (str): Name of the file to read
    """
    try:
        with open(filename, 'r', encoding='utf-8') as file:
            content = file.read()

        print(f"\n{'='*60}")
        print(f"Content of '{filename}':")
        print(f"{'='*60}")
        print(content)
        print(f"{'='*60}\n")

    except FileNotFoundError:
        print(f"❌ Error: File '{filename}' not found.")
    except Exception as e:
        print(f"❌ Error reading file: {e}")


def main():
    """
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?



File operations and CSV data an...
1m · +195 · Auto

Task 2: File Operations Using Cursor AI
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Task2_File_Operations.py +90

```
"""
Task 2: File Operations Using Curso
This program demonstrates basic fil
```

Running the script to verify it works correctly:

Auto-Ran command in sandbox: cd, python

```
$ cd "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC" && python Task2_File_Operations.py
📄 File 'sample_output.txt' has been created in the current directory.
```

✓ Success

No linter errors found in Task2_File_Operati...

Verifying the created file exists:

Read sample_output.txt

Creating a README for Task 2 to match Task 3's documentation style:

› 2 Files Undo All Keep All Review

Plan, @ for context, / for commands

Auto

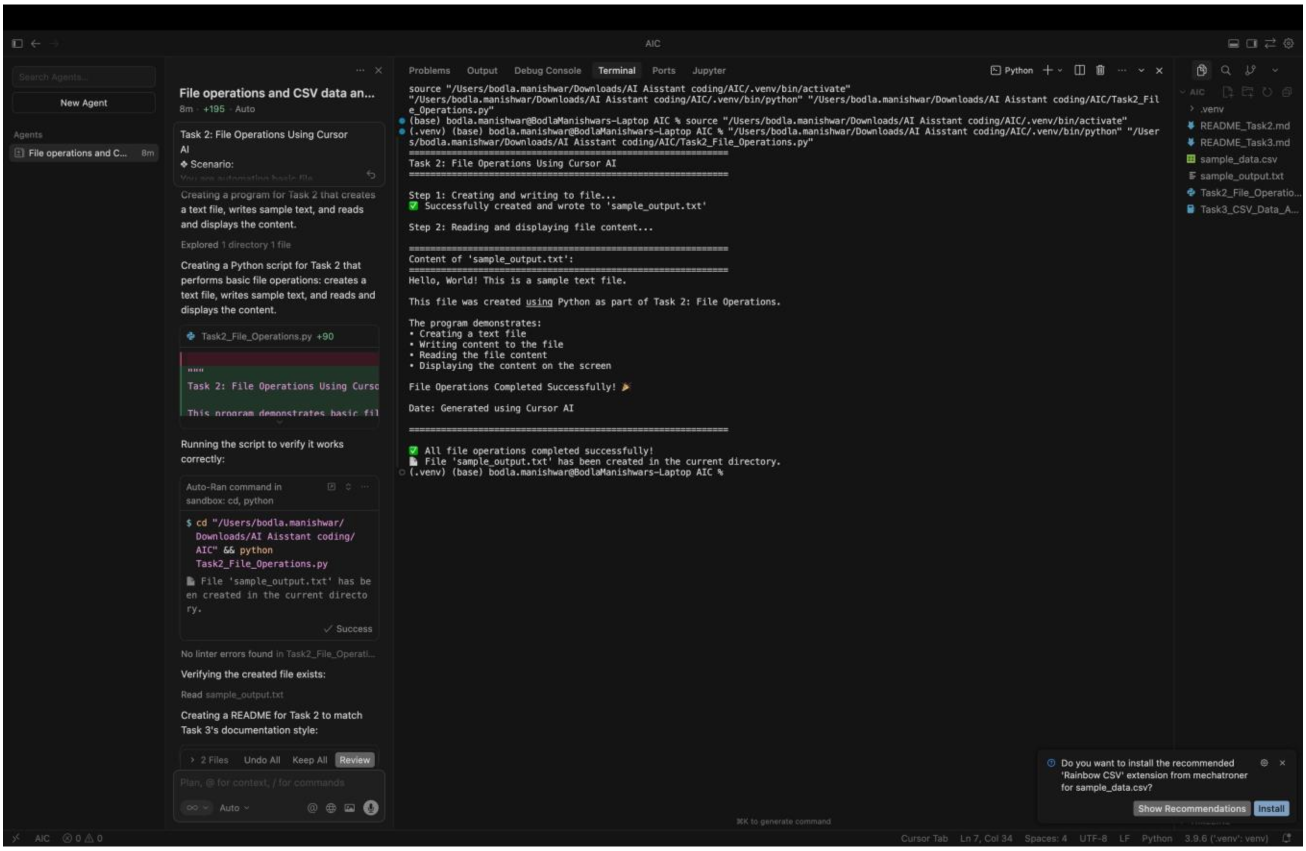
Task2_File_Operations.py › ...

```python

def main():
    """
    Main function to execute file operations.
    """
    # File name
    filename = "sample_output.txt"

    # Sample text content
    sample_text = """Hello, World! This is a sample text file.

This file was created using Python as part of Task 2: File Operations.

The program demonstrates:
• Creating a text file
• Writing content to the file
• Reading the file content
• Displaying the content on the screen

File Operations Completed Successfully! 🎉

Date: Generated using Cursor AI
"""

    print("="*60)
    print("Task 2: File Operations Using Cursor AI")
    print("="*60)
    print("\nStep 1: Creating and writing to file...")
    create_and_write_file(filename, sample_text)

    print("\nStep 2: Reading and displaying file content...")
    read_and_display_file(filename)

    print("✅ All file operations completed successfully!")
    print(f"📄 File '{filename}' has been created in the current directory.")


if __name__ == "__main__":
    main()

```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?

Show Recommendations Install

OUTPUT:



File operations and CSV data an...
8m · +195 · Auto

Task 2: File Operations Using Cursor AI
❖ Scenario:
You are automating basic file

Creating a program for Task 2 that creates a text file, writes sample text, and reads and displays the content.

Explored 1 directory 1 file

Creating a Python script for Task 2 that performs basic file operations: creates a text file, writes sample text, and reads and displays the content.

Task2_File_Operations.py +90

Running the script to verify it works correctly:

Auto-Ran command in sandbox: cd, python

No linter errors found in Task2_File_Operati...

Verifying the created file exists:

Read sample_output.txt

Creating a README for Task 2 to match Task 3's documentation style:

```
source "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/bin/activate"
"/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/bin/python" "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/Task2_Fil
e_Operations.py"
(base) bodla.manishwar@BodlaManishwars-Laptop AIC % source "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/bin/activate"
(.venv) (base) bodla.manishwar@BodlaManishwars-Laptop AIC % "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/bin/python" "/User
s/bodla.manishwar/Downloads/AI Aisstant coding/AIC/Task2_File_Operations.py"
============================================================
Task 2: File Operations Using Cursor AI
============================================================

Step 1: Creating and writing to file...
✅ Successfully created and wrote to 'sample_output.txt'

Step 2: Reading and displaying file content...

============================================================
Content of 'sample_output.txt':
============================================================
Hello, World! This is a sample text file.

This file was created using Python as part of Task 2: File Operations.

The program demonstrates:
• Creating a text file
• Writing content to the file
• Reading the file content
• Displaying the content on the screen

File Operations Completed Successfully! 🎉

Date: Generated using Cursor AI

============================================================

✅ All file operations completed successfully!
📄 File 'sample_output.txt' has been created in the current directory.
(.venv) (base) bodla.manishwar@BodlaManishwars-Laptop AIC %
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?

Show Recommendations Install

CODE EXPLANATION:

This Python program demonstrates basic file operations by creating a text file, writing sample content to it, and then reading and displaying that content on the screen. It uses separate functions for writing and reading files to keep the code organized and clear. The program also includes exception handling to manage errors such as file access issues, ensuring smooth execution. The main() function controls the overall flow, and the program runs only when executed directly, making it a simple and effective example of file handling in Python.

Q)Task 3: CSV Data Analysis

❖ Scenario:

You are processing structured data from a CSV file.

❖ Task:

Use Gemini in Colab to read a CSV file and calculate mean, min, and max.

❖ Expected Output:

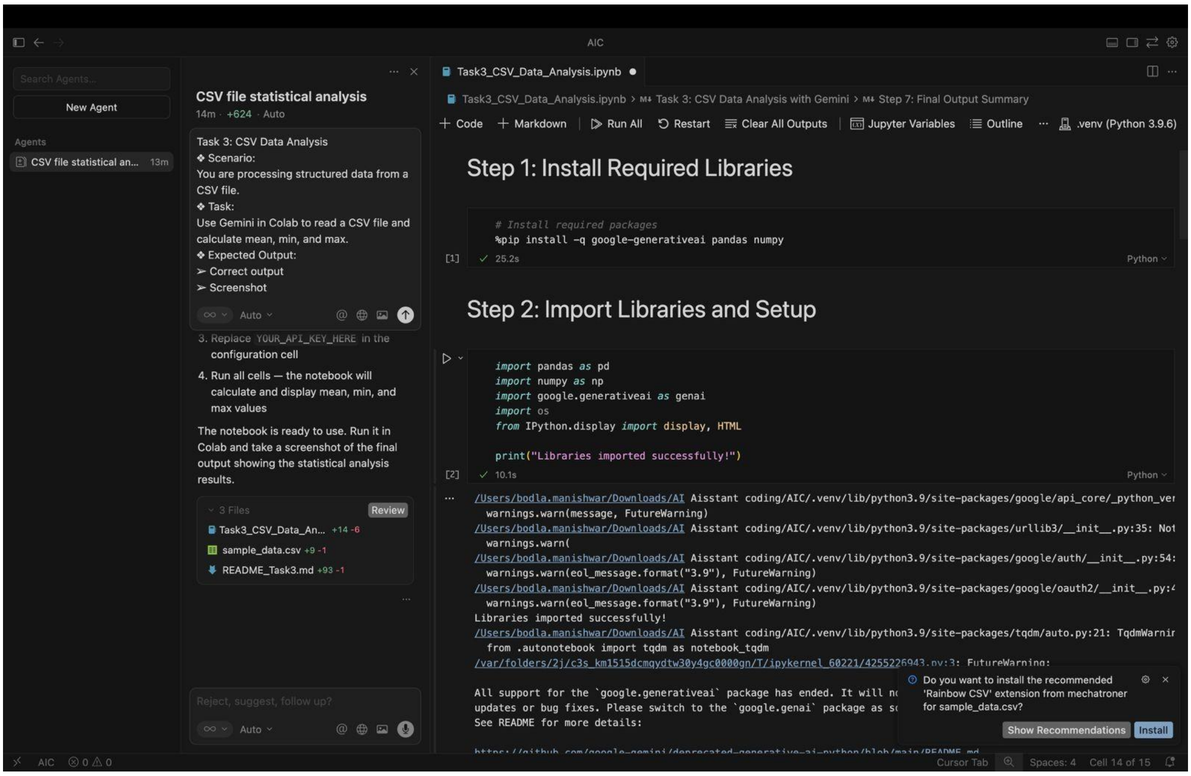
➢ Correct output

➢ Screenshot

PROMPT:

Write Python code in Google Colab to read a CSV file and calculate mean, minimum, and maximum values using pandas.

CODE:



CSV file statistical analysis

14m · +624 · Auto

Task 3: CSV Data Analysis
❖ Scenario:
You are processing structured data from a CSV file.
❖ Task:
Use Gemini in Colab to read a CSV file and calculate mean, min, and max.
❖ Expected Output:
➢ Correct output
➢ Screenshot

3. Replace `YOUR_API_KEY_HERE` in the configuration cell
4. Run all cells — the notebook will calculate and display mean, min, and max values

The notebook is ready to use. Run it in Colab and take a screenshot of the final output showing the statistical analysis results.

3 Files
- Task3_CSV_Data_An... +14 -6
- sample_data.csv +9 -1
- README_Task3.md +93 -1

Reject, suggest, follow up?

Step 1: Install Required Libraries

```
# Install required packages
%pip install -q google-generativeai pandas numpy
```

[1] ✓ 25.2s Python

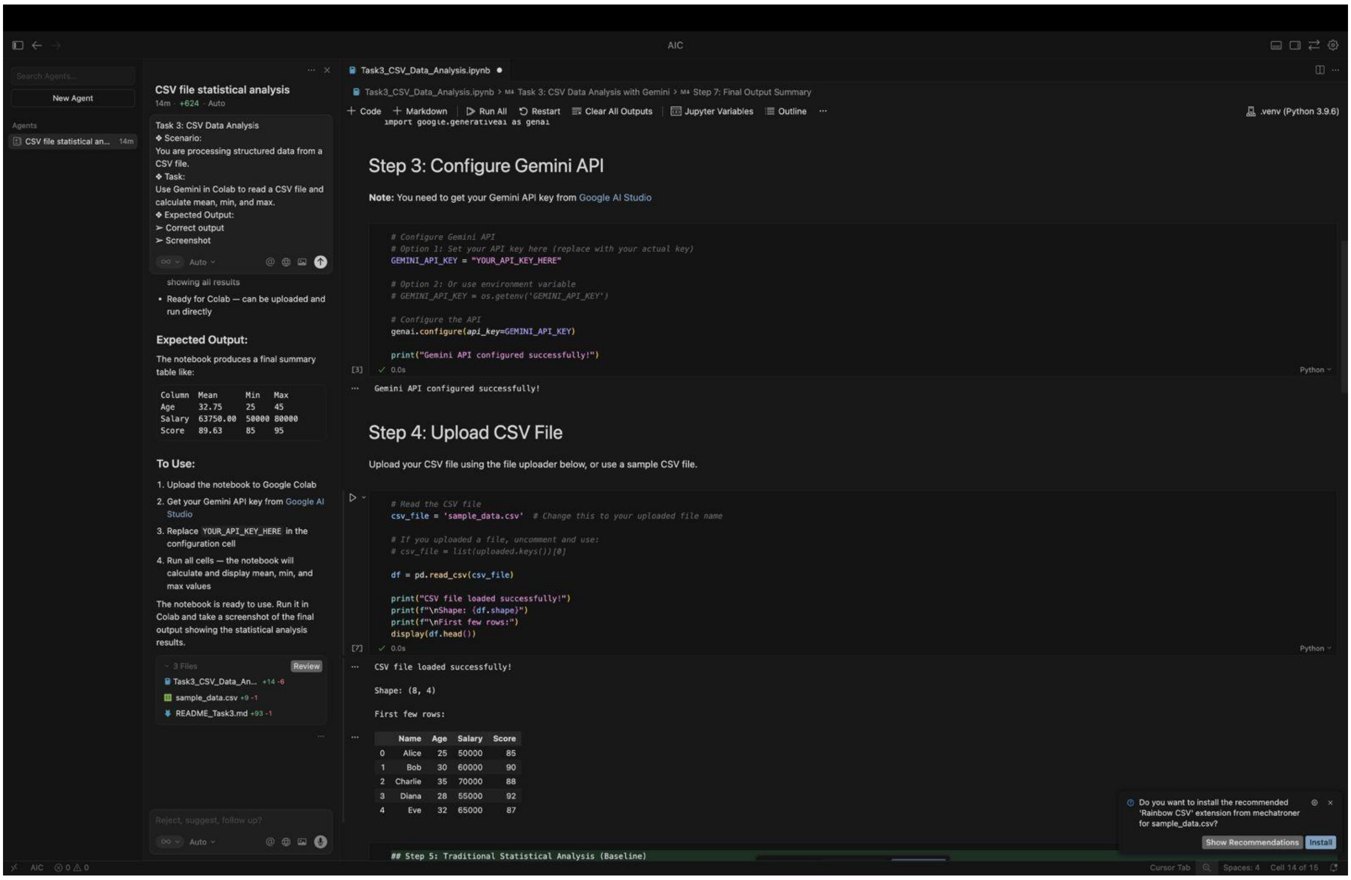
Step 2: Import Libraries and Setup

```
import pandas as pd
import numpy as np
import google.generativeai as genai
import os
from IPython.display import display, HTML

print("Libraries imported successfully!")
```

[2] ✓ 10.1s Python

```
/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/lib/python3.9/site-packages/google/api_core/_python_ver
  warnings.warn(message, FutureWarning)
/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/lib/python3.9/site-packages/urllib3/__init__.py:35: Not
  warnings.warn(
/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/lib/python3.9/site-packages/google/auth/__init__.py:54:
  warnings.warn(eol_message.format("3.9"), FutureWarning)
/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/lib/python3.9/site-packages/google/oauth2/__init__.py:
  warnings.warn(eol_message.format("3.9"), FutureWarning)
Libraries imported successfully!
/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC/.venv/lib/python3.9/site-packages/tqdm/auto.py:21: TqdmWarnir
  from .autonotebook import tqdm as notebook_tqdm
/var/folders/2j/c3s_km1515dcmqydtw30y4gc0000gn/T/ipykernel_60221/4255226943.py:3: FutureWarning:

All support for the `google.generativeai` package has ended. It will nc
updates or bug fixes. Please switch to the `google.genai` package as sc
See README for more details:

https://github.com/google-gemini/deprecated-generative-ai-python/blob/main/README.md
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?


AIC
Search Agents...
New Agent
Agents
CSV file statistical an... 14m
Task3_CSV_Data_Analysis.ipynb
Task3_CSV_Data_Analysis.ipynb > Task 3: CSV Data Analysis with Gemini > Step 7: Final Output Summary
+ Code + Markdown Run All Restart Clear All Outputs Jupyter Variables Outline
.venv (Python 3.9.6)
Auto
Review
Python
Reject, suggest, follow up?
Show Recommendations
Install
Cursor Tab Spaces: 4 Cell 14 of 15

CSV file statistical analysis
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Task 3: CSV Data Analysis
❖ Scenario:
You are processing structured data from a CSV file.
❖ Task:
Use Gemini in Colab to read a CSV file and calculate mean, min, and max.
❖ Expected Output:
➢ Correct output
➢ Screenshot

showing all results

- Ready for Colab — can be uploaded and run directly

Expected Output:

The notebook produces a final summary table like:

```
Column  Mean      Min   Max
Age     32.75     25    45
Salary  63750.00  50000 80000
Score   89.63     85    95
```

To Use:

1. Upload the notebook to Google Colab
2. Get your Gemini API key from Google AI Studio
3. Replace `YOUR_API_KEY_HERE` in the configuration cell
4. Run all cells — the notebook will calculate and display mean, min, and max values

The notebook is ready to use. Run it in Colab and take a screenshot of the final output showing the statistical analysis results.

3 Files
Task3_CSV_Data_An... +14 -6
sample_data.csv +9 -1
README_Task3.md +93 -1

```
import google.generativeai as genai
```

Step 3: Configure Gemini API

Note: You need to get your Gemini API key from Google AI Studio

```python
# Configure Gemini API
# Option 1: Set your API key here (replace with your actual key)
GEMINI_API_KEY = "YOUR_API_KEY_HERE"

# Option 2: Or use environment variable
# GEMINI_API_KEY = os.getenv('GEMINI_API_KEY')

# Configure the API
genai.configure(api_key=GEMINI_API_KEY)

print("Gemini API configured successfully!")
```

[3] ✓ 0.0s

```
Gemini API configured successfully!
```

Step 4: Upload CSV File

Upload your CSV file using the file uploader below, or use a sample CSV file.

```python
# Read the CSV file
csv_file = 'sample_data.csv'  # Change this to your uploaded file name

# If you uploaded a file, uncomment and use:
# csv_file = list(uploaded.keys())[0]

df = pd.read_csv(csv_file)

print("CSV file loaded successfully!")
print(f"\nShape: {df.shape}")
print(f"\nFirst few rows:")
display(df.head())
```

[7] ✓ 0.0s

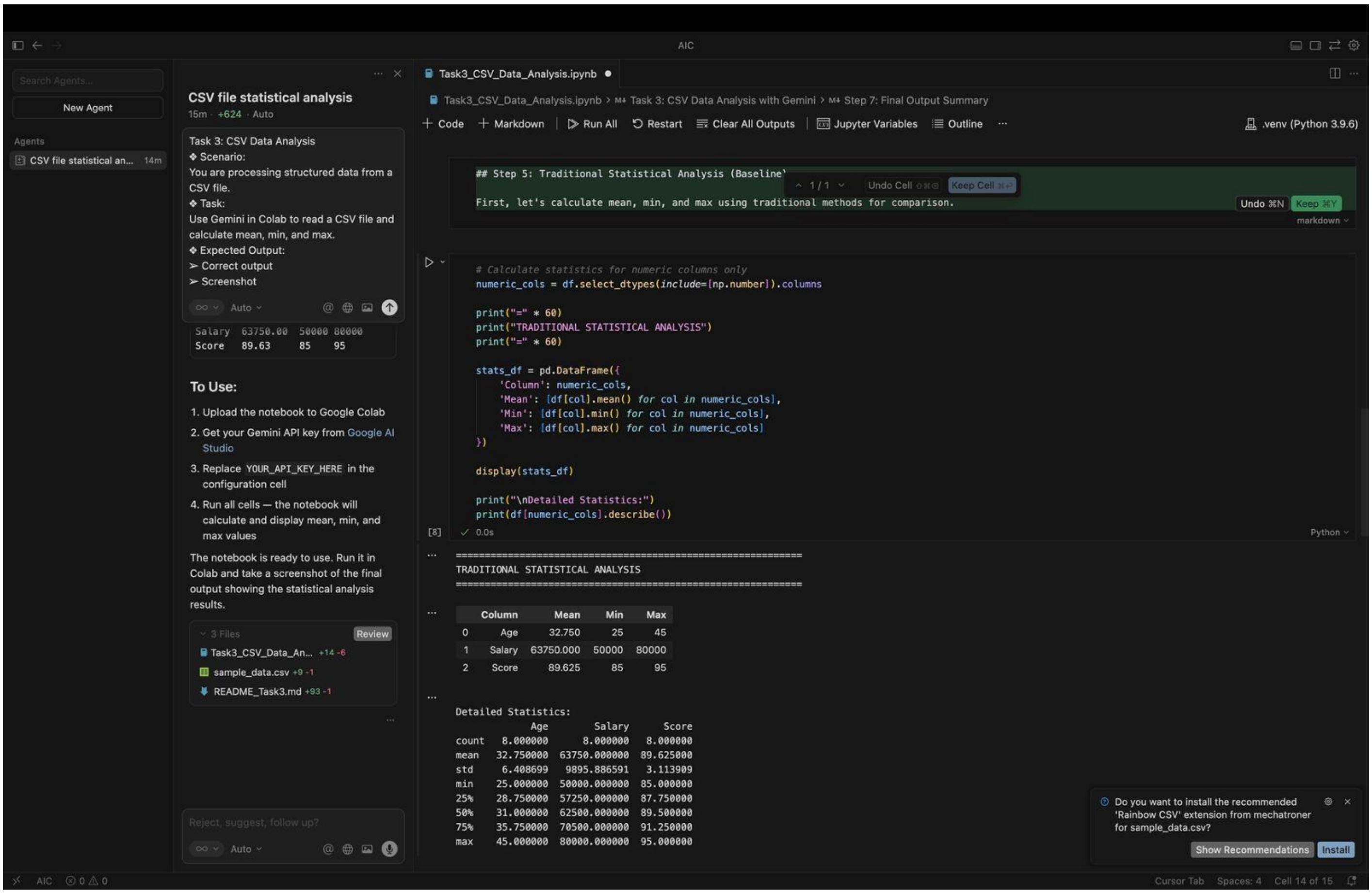
```
CSV file loaded successfully!

Shape: (8, 4)

First few rows:
      Name  Age  Salary  Score
0    Alice   25   50000     85
1      Bob   30   60000     90
2  Charlie   35   70000     88
3    Diana   28   55000     92
4      Eve   32   65000     87
```

```
## Step 5: Traditional Statistical Analysis (Baseline)
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?


AIC
Search Agents...
New Agent
Agents
CSV file statistical an... 14m
Task3_CSV_Data_Analysis.ipynb
Task3_CSV_Data_Analysis.ipynb > Task 3: CSV Data Analysis with Gemini > Step 7: Final Output Summary
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.venv (Python 3.9.6)
Auto
1 / 1 Undo Cell Keep Cell
Undo ⌘N Keep ⌘Y
markdown
Review
Python
Reject, suggest, follow up?
Show Recommendations
Install
Cursor Tab Spaces: 4 Cell 14 of 15

CSV file statistical analysis
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Task 3: CSV Data Analysis
❖ Scenario:
You are processing structured data from a CSV file.
❖ Task:
Use Gemini in Colab to read a CSV file and calculate mean, min, and max.
❖ Expected Output:
➢ Correct output
➢ Screenshot

```
Salary  63750.00  50000 80000
Score   89.63     85    95
```

To Use:

1. Upload the notebook to Google Colab
2. Get your Gemini API key from Google AI Studio
3. Replace `YOUR_API_KEY_HERE` in the configuration cell
4. Run all cells — the notebook will calculate and display mean, min, and max values

The notebook is ready to use. Run it in Colab and take a screenshot of the final output showing the statistical analysis results.

3 Files
Task3_CSV_Data_An... +14 -6
sample_data.csv +9 -1
README_Task3.md +93 -1

```
## Step 5: Traditional Statistical Analysis (Baseline)

First, let's calculate mean, min, and max using traditional methods for comparison.
```

```python
# Calculate statistics for numeric columns only
numeric_cols = df.select_dtypes(include=[np.number]).columns

print("=" * 60)
print("TRADITIONAL STATISTICAL ANALYSIS")
print("=" * 60)

stats_df = pd.DataFrame({
    'Column': numeric_cols,
    'Mean': [df[col].mean() for col in numeric_cols],
    'Min': [df[col].min() for col in numeric_cols],
    'Max': [df[col].max() for col in numeric_cols]
})

display(stats_df)

print("\nDetailed Statistics:")
print(df[numeric_cols].describe())
```

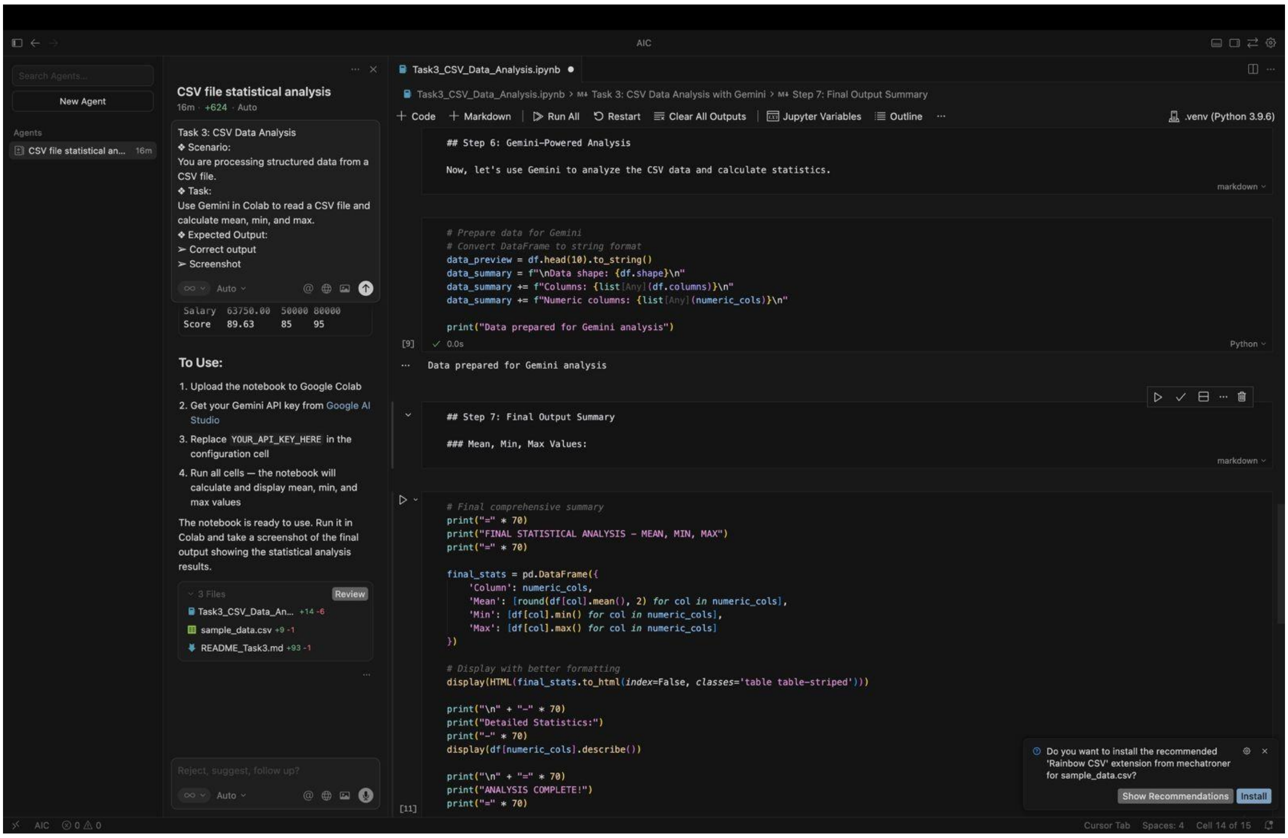
[8] ✓ 0.0s

```
============================================================
TRADITIONAL STATISTICAL ANALYSIS
============================================================

   Column       Mean    Min    Max
0     Age     32.750     25     45
1  Salary  63750.000  50000  80000
2   Score     89.625     85     95

Detailed Statistics:
             Age        Salary      Score
count   8.000000      8.000000   8.000000
mean   32.750000  63750.000000  89.625000
std     6.408699   9895.886591   3.113909
min    25.000000  50000.000000  85.000000
25%    28.750000  57250.000000  87.750000
50%    31.000000  62500.000000  89.500000
75%    35.750000  70500.000000  91.250000
max    45.000000  80000.000000  95.000000
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?



CSV file statistical analysis

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Task 3: CSV Data Analysis
❖ Scenario:
You are processing structured data from a CSV file.
❖ Task:
Use Gemini in Colab to read a CSV file and calculate mean, min, and max.
❖ Expected Output:
➢ Correct output
➢ Screenshot

```
Salary  63750.00  50000 80000
Score   89.63     85    95
```

To Use:

1. Upload the notebook to Google Colab
2. Get your Gemini API key from Google AI Studio
3. Replace `YOUR_API_KEY_HERE` in the configuration cell
4. Run all cells — the notebook will calculate and display mean, min, and max values

The notebook is ready to use. Run it in Colab and take a screenshot of the final output showing the statistical analysis results.

3 Files Review
Task3_CSV_Data_An... +14 -6
sample_data.csv +9 -1
README_Task3.md +93 -1

Reject, suggest, follow up?

```
## Step 6: Gemini-Powered Analysis

Now, let's use Gemini to analyze the CSV data and calculate statistics.
```

```
# Prepare data for Gemini
# Convert DataFrame to string format
data_preview = df.head(10).to_string()
data_summary = f"\nData shape: {df.shape}\n"
data_summary += f"Columns: {list[Any](df.columns)}\n"
data_summary += f"Numeric columns: {list[Any](numeric_cols)}\n"

print("Data prepared for Gemini analysis")
```

[9] ✓ 0.0s

```
Data prepared for Gemini analysis
```

```
## Step 7: Final Output Summary

### Mean, Min, Max Values:
```

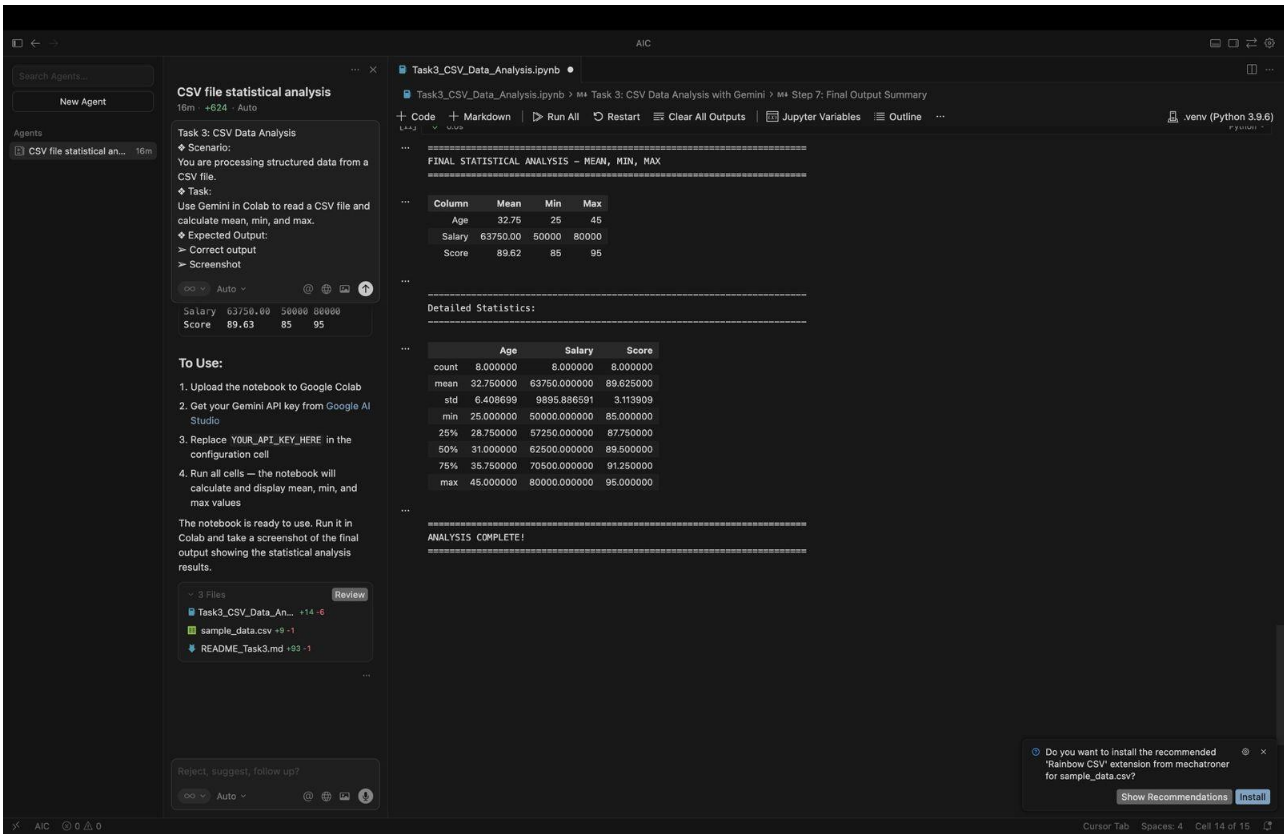
```
# Final comprehensive summary
print("=" * 70)
print("FINAL STATISTICAL ANALYSIS - MEAN, MIN, MAX")
print("=" * 70)

final_stats = pd.DataFrame({
    'Column': numeric_cols,
    'Mean': [round(df[col].mean(), 2) for col in numeric_cols],
    'Min': [df[col].min() for col in numeric_cols],
    'Max': [df[col].max() for col in numeric_cols]
})

# Display with better formatting
display(HTML(final_stats.to_html(index=False, classes='table table-striped')))

print("\n" + "-" * 70)
print("Detailed Statistics:")
print("-" * 70)
display(df[numeric_cols].describe())

print("\n" + "=" * 70)
print("ANALYSIS COMPLETE!")
print("=" * 70)
```

[11]

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?

Show Recommendations | Install

OUTPUT:


AIC
Search Agents...
New Agent
Agents
CSV file statistical an... 16m
Task3_CSV_Data_Analysis.ipynb
Task3_CSV_Data_Analysis.ipynb > M↓ Task 3: CSV Data Analysis with Gemini > M↓ Step 7: Final Output Summary
+ Code
+ Markdown
Run All
Restart
Clear All Outputs
Jupyter Variables
Outline
.venv (Python 3.9.6)
Auto
Cursor Tab
Spaces: 4
Cell 14 of 15

CSV file statistical analysis

16m · +624 · Auto

Task 3: CSV Data Analysis
❖ Scenario:
You are processing structured data from a CSV file.
❖ Task:
Use Gemini in Colab to read a CSV file and calculate mean, min, and max.
❖ Expected Output:
➢ Correct output
➢ Screenshot

Salary 63750.00 50000 80000
Score 89.63 85 95

To Use:

1. Upload the notebook to Google Colab
2. Get your Gemini API key from Google AI Studio
3. Replace `YOUR_API_KEY_HERE` in the configuration cell
4. Run all cells — the notebook will calculate and display mean, min, and max values

The notebook is ready to use. Run it in Colab and take a screenshot of the final output showing the statistical analysis results.

3 Files Review
Task3_CSV_Data_An... +14 -6
sample_data.csv +9 -1
README_Task3.md +93 -1

Reject, suggest, follow up?

```
======================================================================
FINAL STATISTICAL ANALYSIS - MEAN, MIN, MAX
======================================================================
```

Column	Mean	Min	Max
Age	32.75	25	45
Salary	63750.00	50000	80000
Score	89.62	85	95

```

----------------------------------------------------------------------
Detailed Statistics:
----------------------------------------------------------------------
```

	Age	Salary	Score
count	8.000000	8.000000	8.000000
mean	32.750000	63750.000000	89.625000
std	6.408699	9895.886591	3.113909
min	25.000000	50000.000000	85.000000
25%	28.750000	57250.000000	87.750000
50%	31.000000	62500.000000	89.500000
75%	35.750000	70500.000000	91.250000
max	45.000000	80000.000000	95.000000

```

======================================================================
ANALYSIS COMPLETE!
======================================================================
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?

Show Recommendations | Install

CODE EXPLANATION:

This code performs statistical analysis on numeric columns of a DataFrame (df). First, it identifies all columns that contain numerical data using select_dtypes(include=[np.number]). Then, for each numeric column, it calculates the mean, minimum, and maximum values and stores them in a new DataFrame called stats_df. This DataFrame is displayed to show a clean summary of basic statistics.

Q)Task 4: Sorting Lists – Manual vs Built-in

❖ Scenario:

You are reviewing algorithm choices for efficiency.

❖ Task:

Use Gemini to generate:

➢ Bubble sort

➢ Python’s built-in sort()

➢ Compare both implementations.

❖ Expected Output:

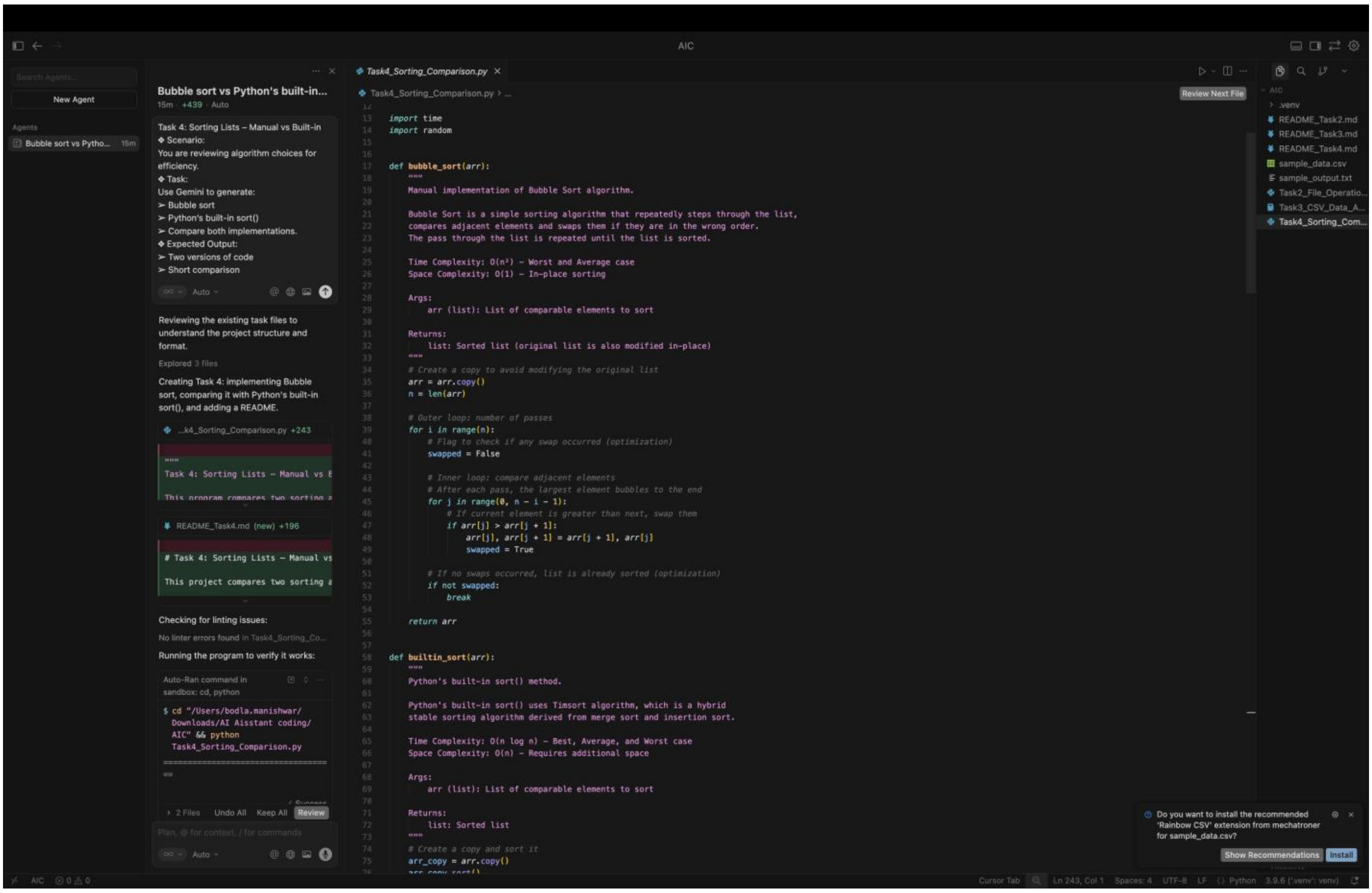
➢ Two versions of code

➢ Short comparison

PROMPT:

Generate Python code to sort a list using bubble sort and Python’s built-in sort() method. Show both implementations clearly and provide a short comparison explaining their efficiency and usage.

CODE:



Bubble sort vs Python's built-in...

15m · +439 · Auto

Task 4: Sorting Lists – Manual vs Built-in
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Use Gemini to generate:
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Reviewing the existing task files to understand the project structure and format.

Explored 3 files

Creating Task 4: implementing Bubble sort, comparing it with Python's built-in sort(), and adding a README.

...k4_Sorting_Comparison.py +243

README_Task4.md (new) +196

```
# Task 4: Sorting Lists – Manual vs

This project compares two sorting a
```

Checking for linting issues:

No linter errors found in Task4_Sorting_Co...

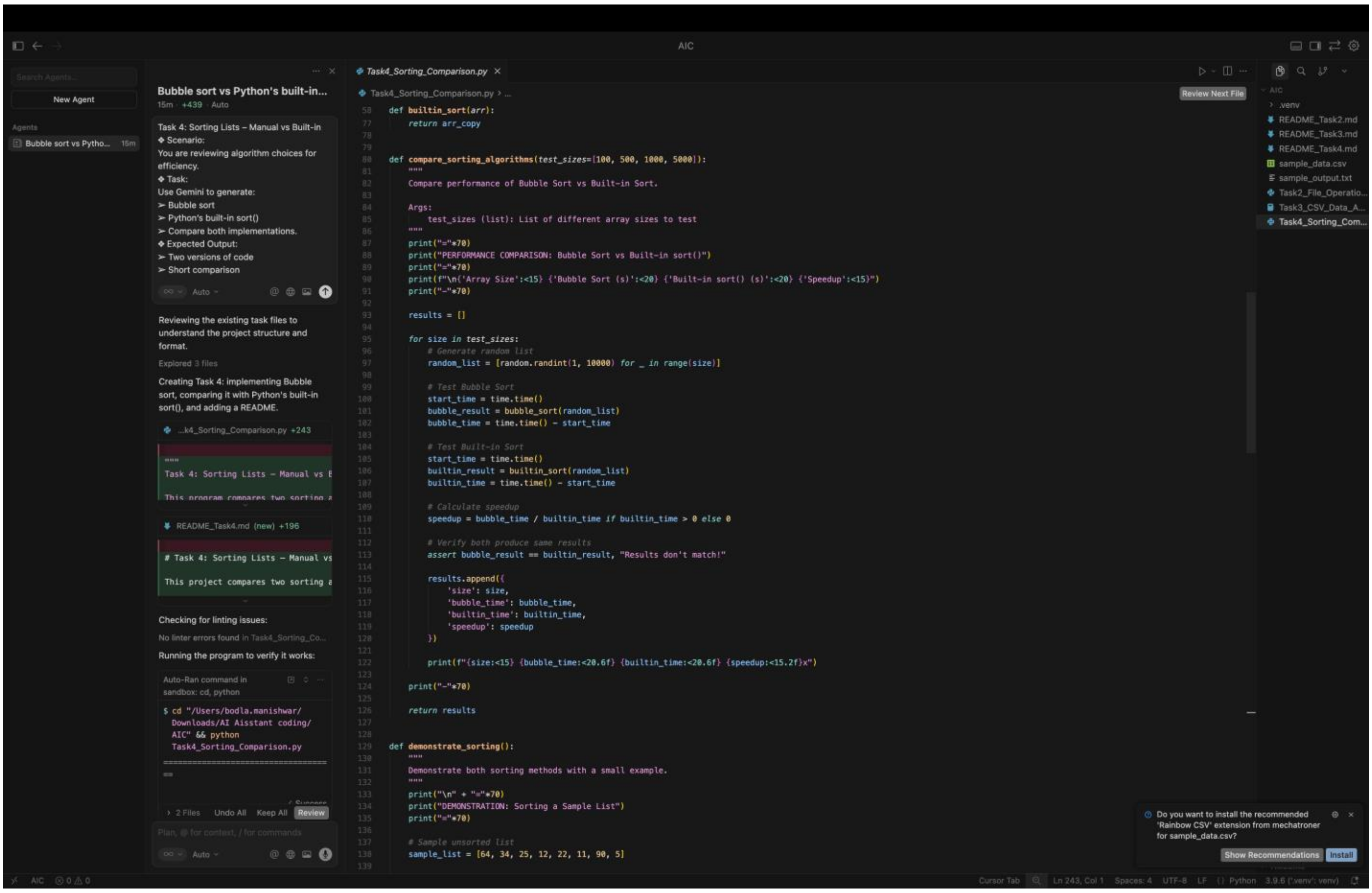
Running the program to verify it works:

Auto-Ran command in sandbox: cd, python

```
$ cd "/Users/bodla.manishwar/
  Downloads/AI Aisstant coding/
  AIC" && python
  Task4_Sorting_Comparison.py
====================================
==
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?

```python
import time
import random


def bubble_sort(arr):
    """
    Manual implementation of Bubble Sort algorithm.

    Bubble Sort is a simple sorting algorithm that repeatedly steps through the list,
    compares adjacent elements and swaps them if they are in the wrong order.
    The pass through the list is repeated until the list is sorted.

    Time Complexity: O(n²) - Worst and Average case
    Space Complexity: O(1) - In-place sorting

    Args:
        arr (list): List of comparable elements to sort

    Returns:
        list: Sorted list (original list is also modified in-place)
    """
    # Create a copy to avoid modifying the original list
    arr = arr.copy()
    n = len(arr)

    # Outer loop: number of passes
    for i in range(n):
        # Flag to check if any swap occurred (optimization)
        swapped = False

        # Inner loop: compare adjacent elements
        # After each pass, the largest element bubbles to the end
        for j in range(0, n - i - 1):
            # If current element is greater than next, swap them
            if arr[j] > arr[j + 1]:
                arr[j], arr[j + 1] = arr[j + 1], arr[j]
                swapped = True

        # If no swaps occurred, list is already sorted (optimization)
        if not swapped:
            break

    return arr


def builtin_sort(arr):
    """
    Python's built-in sort() method.

    Python's built-in sort() uses Timsort algorithm, which is a hybrid
    stable sorting algorithm derived from merge sort and insertion sort.

    Time Complexity: O(n log n) - Best, Average, and Worst case
    Space Complexity: O(n) - Requires additional space

    Args:
        arr (list): List of comparable elements to sort

    Returns:
        list: Sorted list
    """
    # Create a copy and sort it
    arr_copy = arr.copy()
```



Bubble sort vs Python's built-in...

15m · +439 · Auto

Task 4: Sorting Lists – Manual vs Built-in
❖ Scenario:
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Reviewing the existing task files to understand the project structure and format.

Explored 3 files

Creating Task 4: implementing Bubble sort, comparing it with Python's built-in sort(), and adding a README.

...k4_Sorting_Comparison.py +243

```
"""
Task 4: Sorting Lists – Manual vs E

This program compares two sorting a
```

README_Task4.md (new) +196

```
# Task 4: Sorting Lists – Manual vs

This project compares two sorting a
```

Checking for linting issues:

No linter errors found in Task4_Sorting_Co...

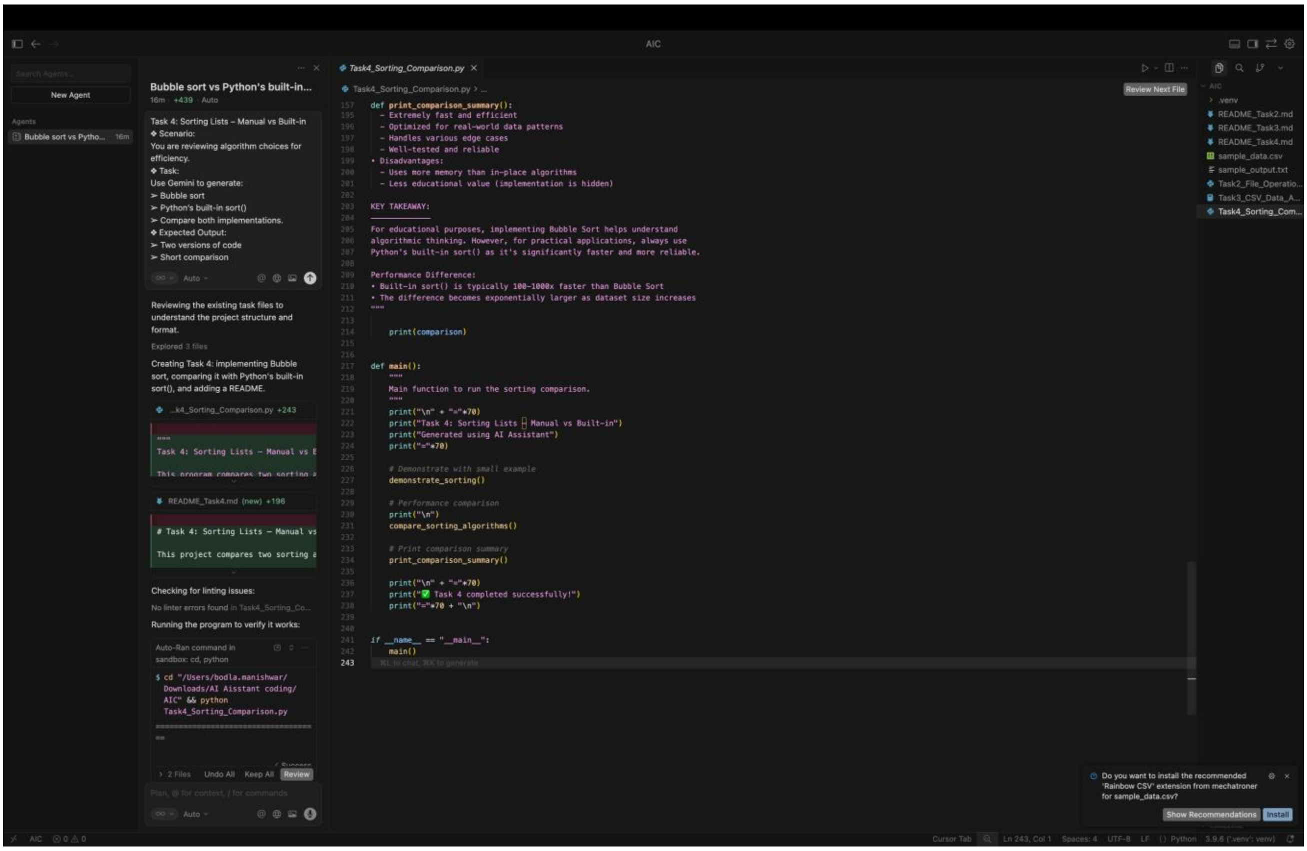
Running the program to verify it works:

Auto-Ran command in sandbox: cd, python

```
$ cd "/Users/bodla.manishwar/
  Downloads/AI Aisstant coding/
  AIC" && python
  Task4_Sorting_Comparison.py
======================================
==
```

```python
def builtin_sort(arr):
    return arr_copy


def compare_sorting_algorithms(test_sizes=[100, 500, 1000, 5000]):
    """
    Compare performance of Bubble Sort vs Built-in Sort.

    Args:
        test_sizes (list): List of different array sizes to test
    """
    print("="*70)
    print("PERFORMANCE COMPARISON: Bubble Sort vs Built-in sort()")
    print("="*70)
    print(f"\n{'Array Size':<15} {'Bubble Sort (s)':<20} {'Built-in sort() (s)':<20} {'Speedup':<15}")
    print("-"*70)

    results = []

    for size in test_sizes:
        # Generate random list
        random_list = [random.randint(1, 10000) for _ in range(size)]

        # Test Bubble Sort
        start_time = time.time()
        bubble_result = bubble_sort(random_list)
        bubble_time = time.time() - start_time

        # Test Built-in Sort
        start_time = time.time()
        builtin_result = builtin_sort(random_list)
        builtin_time = time.time() - start_time

        # Calculate speedup
        speedup = bubble_time / builtin_time if builtin_time > 0 else 0

        # Verify both produce same results
        assert bubble_result == builtin_result, "Results don't match!"

        results.append({
            'size': size,
            'bubble_time': bubble_time,
            'builtin_time': builtin_time,
            'speedup': speedup
        })

        print(f"{size:<15} {bubble_time:<20.6f} {builtin_time:<20.6f} {speedup:<15.2f}x")

    print("-"*70)

    return results


def demonstrate_sorting():
    """
    Demonstrate both sorting methods with a small example.
    """
    print("\n" + "="*70)
    print("DEMONSTRATION: Sorting a Sample List")
    print("="*70)

    # Sample unsorted list
    sample_list = [64, 34, 25, 12, 22, 11, 90, 5]

```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?



Bubble sort vs Python's built-in...

16m · +439 · Auto

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Reviewing the existing task files to understand the project structure and format.

Explored 3 files

Creating Task 4: implementing Bubble sort, comparing it with Python's built-in sort(), and adding a README.

...k4_Sorting_Comparison.py +243

README_Task4.md (new) +196

Checking for linting issues:

No linter errors found in Task4_Sorting_Co...

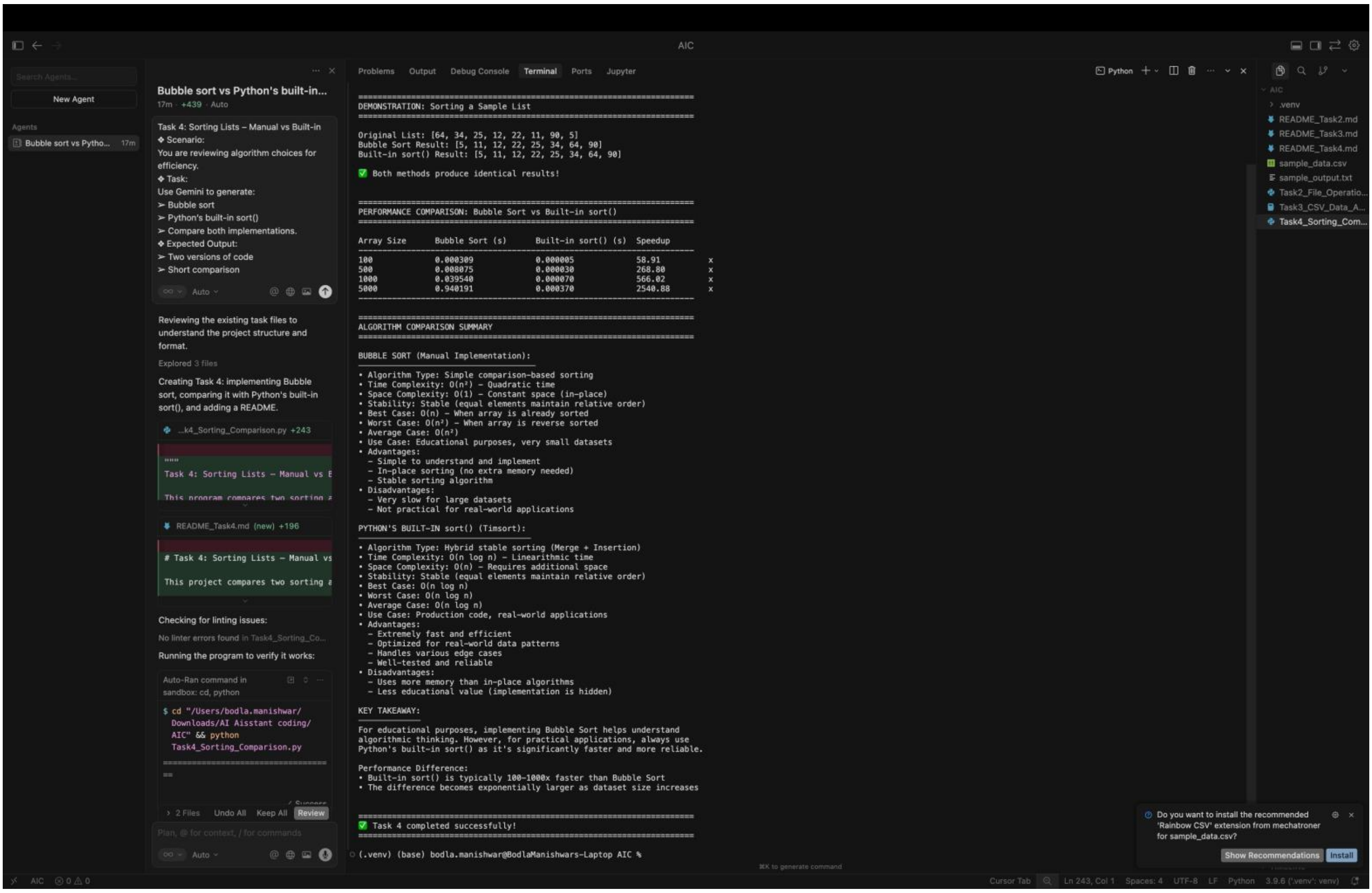
Running the program to verify it works:

Auto-Ran command in sandbox: cd, python

```python
def print_comparison_summary():
  - Extremely fast and efficient
  - Optimized for real-world data patterns
  - Handles various edge cases
  - Well-tested and reliable
• Disadvantages:
  - Uses more memory than in-place algorithms
  - Less educational value (implementation is hidden)

KEY TAKEAWAY:
─────────────
For educational purposes, implementing Bubble Sort helps understand
algorithmic thinking. However, for practical applications, always use
Python's built-in sort() as it's significantly faster and more reliable.

Performance Difference:
• Built-in sort() is typically 100-1000x faster than Bubble Sort
• The difference becomes exponentially larger as dataset size increases
"""

    print(comparison)


def main():
    """
    Main function to run the sorting comparison.
    """
    print("\n" + "="*70)
    print("Task 4: Sorting Lists ▯ Manual vs Built-in")
    print("Generated using AI Assistant")
    print("="*70)

    # Demonstrate with small example
    demonstrate_sorting()

    # Performance comparison
    print("\n")
    compare_sorting_algorithms()

    # Print comparison summary
    print_comparison_summary()

    print("\n" + "="*70)
    print("✅ Task 4 completed successfully!")
    print("="*70 + "\n")


if __name__ == "__main__":
    main()
    ⌘L to chat, ⌘K to generate
```

Do you want to install the recommended 'Rainbow CSV' extension from mechatroner for sample_data.csv?

OUTPUT:



Bubble sort vs Python's built-in...

17m · +439 · Auto

Task 4: Sorting Lists – Manual vs Built-in

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```
"""
Task 4: Sorting Lists – Manual vs B

This program compares two sorting a
```

README_Task4.md (new) +196

```
# Task 4: Sorting Lists – Manual vs

This project compares two sorting a
```

Checking for linting issues:

No linter errors found in Task4_Sorting_Co...

Running the program to verify it works:

Auto-Ran command in sandbox: cd, python

```
$ cd "/Users/bodla.manishwar/Downloads/AI Aisstant coding/AIC" && python Task4_Sorting_Comparison.py

====================================
==
```

```
======================================================================
DEMONSTRATION: Sorting a Sample List
======================================================================

Original List: [64, 34, 25, 12, 22, 11, 90, 5]
Bubble Sort Result: [5, 11, 12, 22, 25, 34, 64, 90]
Built-in sort() Result: [5, 11, 12, 22, 25, 34, 64, 90]

✅ Both methods produce identical results!


======================================================================
PERFORMANCE COMPARISON: Bubble Sort vs Built-in sort()
======================================================================

Array Size      Bubble Sort (s)      Built-in sort() (s)  Speedup
----------------------------------------------------------------------
100             0.000309             0.000005             58.91          x
500             0.008075             0.000030             268.80         x
1000            0.039540             0.000070             566.02         x
5000            0.940191             0.000370             2540.88        x
----------------------------------------------------------------------

======================================================================
ALGORITHM COMPARISON SUMMARY
======================================================================

BUBBLE SORT (Manual Implementation):
─────────────────────────────────────
• Algorithm Type: Simple comparison-based sorting
• Time Complexity: O(n²) - Quadratic time
• Space Complexity: O(1) - Constant space (in-place)
• Stability: Stable (equal elements maintain relative order)
• Best Case: O(n) - When array is already sorted
• Worst Case: O(n²) - When array is reverse sorted
• Average Case: O(n²)
• Use Case: Educational purposes, very small datasets
• Advantages:
  - Simple to understand and implement
  - In-place sorting (no extra memory needed)
  - Stable sorting algorithm
• Disadvantages:
  - Very slow for large datasets
  - Not practical for real-world applications

PYTHON'S BUILT-IN sort() (Timsort):
────────────────────────────────────
• Algorithm Type: Hybrid stable sorting (Merge + Insertion)
• Time Complexity: O(n log n) - Linearithmic time
• Space Complexity: O(n) - Requires additional space
• Stability: Stable (equal elements maintain relative order)
• Best Case: O(n log n)
• Worst Case: O(n log n)
• Average Case: O(n log n)
• Use Case: Production code, real-world applications
• Advantages:
  - Extremely fast and efficient
  - Optimized for real-world data patterns
  - Handles various edge cases
  - Well-tested and reliable
• Disadvantages:
  - Uses more memory than in-place algorithms
  - Less educational value (implementation is hidden)

KEY TAKEAWAY:
─────────────
For educational purposes, implementing Bubble Sort helps understand
algorithmic thinking. However, for practical applications, always use
Python's built-in sort() as it's significantly faster and more reliable.

Performance Difference:
• Built-in sort() is typically 100-1000x faster than Bubble Sort
• The difference becomes exponentially larger as dataset size increases


======================================================================
✅ Task 4 completed successfully!
======================================================================
(.venv) (base) bodla.manishwar@BodlaManishwars-Laptop AIC %
```

CODE EXPLANATION:

This program compares Bubble Sort and Python's built-in sort(). Bubble Sort manually compares and swaps elements to arrange them in order, but it is slow for large lists because it has $O(n^2)$ time complexity. Python's built-in sort() uses an efficient algorithm and sorts data much faster with $O(n \log n)$ time complexity. The program measures execution time for both methods and shows that the built-in sort is much faster and more suitable for real-world use.