K.R. MANGALAM UNIVERSITY
THE COMPLETE WORLD OF EDUCATION

Campus Energy Dashboard Capstone Project Report

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Course: B.Tech CSE (AI & ML)

Section: B

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1. Introduction

Energy management is essential in educational campuses to reduce electricity bills and promote sustainable practices. This capstone project focuses on analyzing energy consumption across multiple campus buildings using CSV data, Python coding, object-oriented programming, and data visualization techniques.

2. Methodology

✔ Data Ingestion using Pandas
✔ Cleaning and combining CSV files

✔ Aggregation (daily and weekly consumption)

✔ Object-Oriented Modeling using Building
and MeterReading classes ✔ Data
visualization using Matplotlib

✔ Generation of summary reports and dashboards

All tasks follow the structure defined in the assignment instructions.

3. Findings and Insights

- Highest energy consumption building: Hostel

- Peak energy load observed at: 08:00 AM

- Low consumption buildings: Library

- Daily and weekly average consumption patterns were similar (~206 kWh)

- Dashboard visualization clearly distinguishes building consumption differences

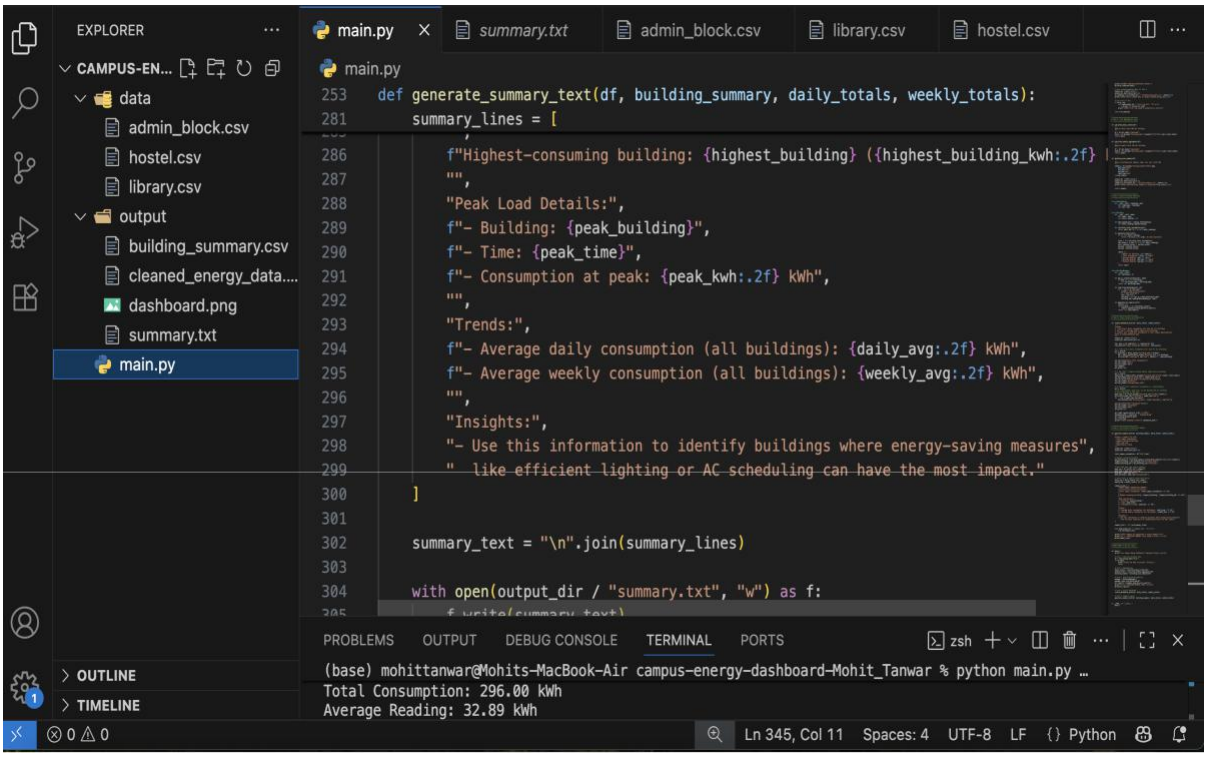
4. Conclusion

The project successfully demonstrates how data analytics and visualization can help management identify energy usage patterns and implement smarter power-saving decisions. Future

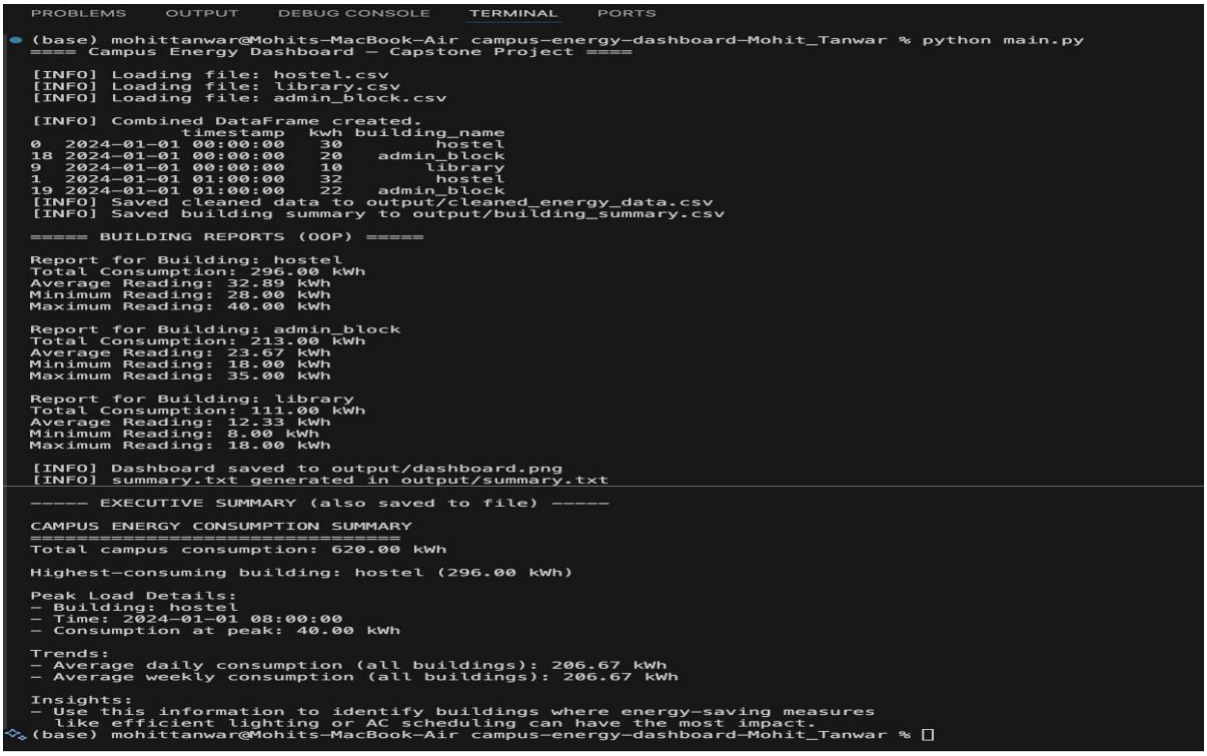
improvements include using real-time sensors, IoT meters, and storing readings in cloud databases for automated dashboards.

SCREENSHOTS

Project Structure and main.py in VS Code

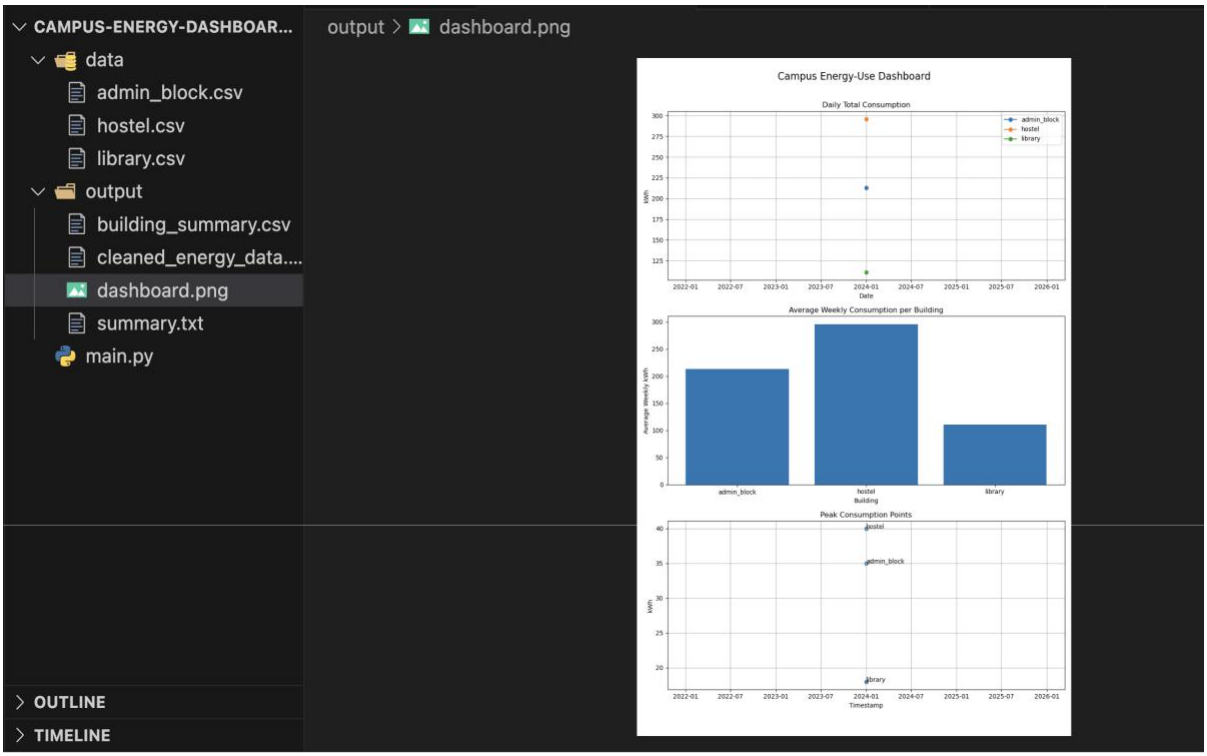


Terminal Output – Script Execution and Summary

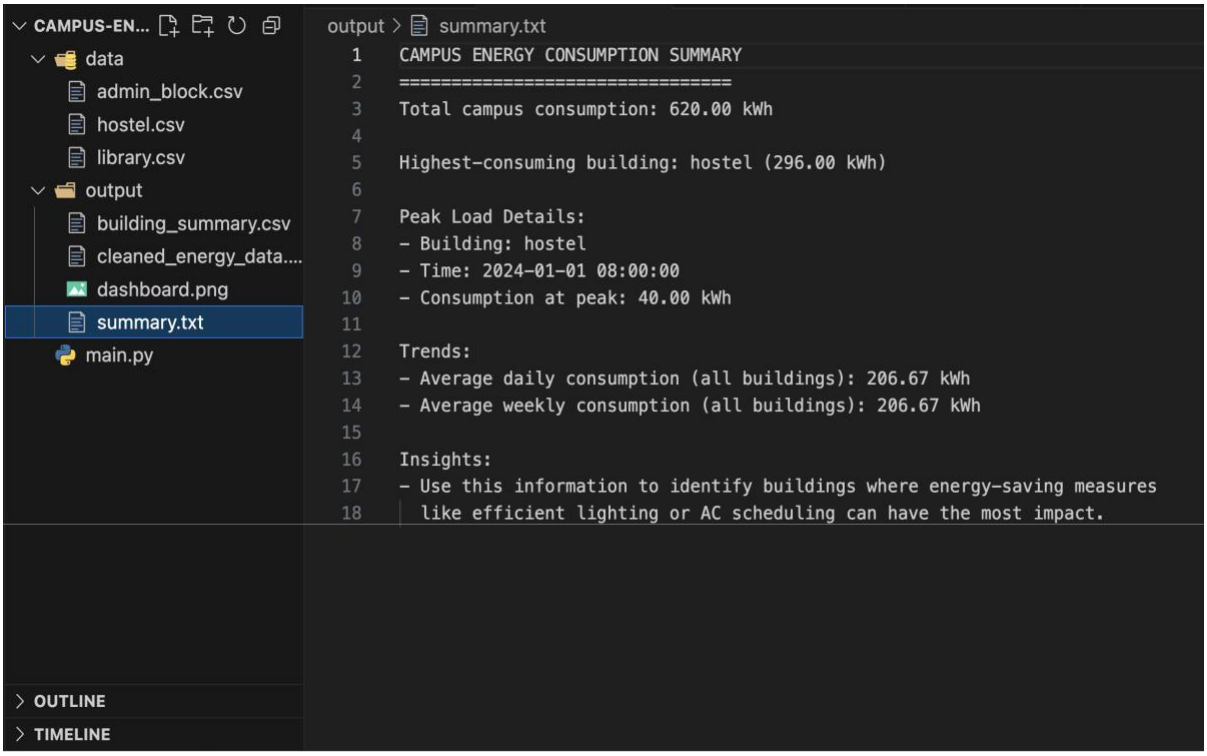


```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS

(base) mohittanwar@Mohits-MacBook-Air campus-energy-dashboard-Mohit_Tanwar % python main.py
==== Campus Energy Dashboard – Capstone Project ====

[INFO] Loading file: hostel.csv
[INFO] Loading file: library.csv
[INFO] Loading file: admin_block.csv

[INFO] Combined DataFrame created.
             timestamp  kwh building_name
0  2024-01-01 00:00:00   30        hostel
18 2024-01-01 00:00:00   20   admin_block
9  2024-01-01 00:00:00   10       library
1  2024-01-01 01:00:00   32        hostel
19 2024-01-01 01:00:00   22   admin_block
[INFO] Saved cleaned data to output/cleaned_energy_data.csv
[INFO] Saved building summary to output/building_summary.csv

===== BUILDING REPORTS (OOP) =====

Report for Building: hostel
Total Consumption: 296.00 kWh
Average Reading: 32.89 kWh
Minimum Reading: 28.00 kWh
Maximum Reading: 40.00 kWh

Report for Building: admin_block
Total Consumption: 213.00 kWh
Average Reading: 23.67 kWh
Minimum Reading: 18.00 kWh
Maximum Reading: 35.00 kWh

Report for Building: library
Total Consumption: 111.00 kWh
Average Reading: 12.33 kWh
Minimum Reading: 8.00 kWh
Maximum Reading: 18.00 kWh

[INFO] Dashboard saved to output/dashboard.png
[INFO] summary.txt generated in output/summary.txt

----- EXECUTIVE SUMMARY (also saved to file) -----

CAMPUS ENERGY CONSUMPTION SUMMARY
==================================
Total campus consumption: 620.00 kWh

Highest-consuming building: hostel (296.00 kWh)

Peak Load Details:
- Building: hostel
- Time: 2024-01-01 08:00:00
- Consumption at peak: 40.00 kWh

Trends:
- Average daily consumption (all buildings): 206.67 kWh
- Average weekly consumption (all buildings): 206.67 kWh

Insights:
- Use this information to identify buildings where energy-saving measures
  like efficient lighting or AC scheduling can have the most impact.
(base) mohittanwar@Mohits-MacBook-Air campus-energy-dashboard-Mohit_Tanwar %
```

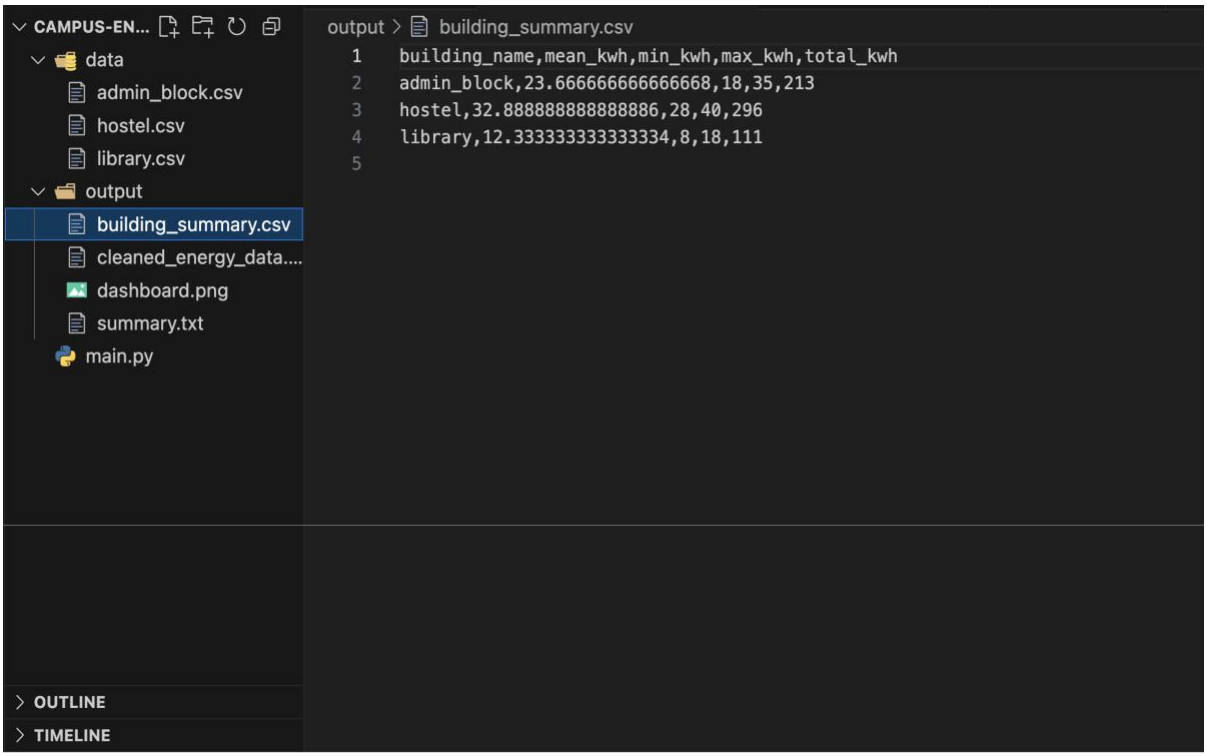
Dashboard Image Open in VS Code



summary.txt – Campus Energy Consumption Summary



building_summary.csv – Building-wise Statistics



Campus Energy-Use Dashboard (Full PNG)