CAPSTONE PROJECT

SCHOOL OF ENGINEERING AND TECHNOLOGY

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Campus Energy-Use Dashboard

1. Introduction

Every building in a campus uses electricity, but we usually don't know which building uses how much, or at what time the usage is highest.
To solve this, I created a Python-based dashboard that reads electricity data from different buildings and shows useful insights in the form of graphs and summaries.

This project helped me learn how to work with real datasets, analyze them, visualize them, and write clean, organized code using both normal functions and OOP.

2. Project Goals

The main goals of this project were:

- Read multiple CSV files (one for each building).

- Clean and combine all data into one dataset.

- Calculate daily and weekly energy usage.

- Find building-wise summary like minimum, maximum, average, and total usage.

- Use classes (OOP) to model buildings and meter readings.

- Create a dashboard with 3 different graphs.

- Export the cleaned data and summary into files.

3. About the Dataset

Each building had its own CSV file stored in a folder named `data`.
 Every CSV had two main columns:

- **timestamp** → date & time when electricity reading was taken

- **kwh** → electricity consumed at that time

The building name was automatically added from the file name.

4. How I Completed the Project

Step 1: Reading the Data

I used Python to go through every CSV file in the `data` folder and read it.
 If a file had any bad or corrupted lines, they were skipped.
 All files were combined into one large DataFrame.

Step 2: Cleaning and Analysis

I converted timestamps into proper datetime format and calculated:

- **Daily total consumption**

- **Weekly total consumption**

- **Summary per building** (mean, min, max, total)

This helped me understand how usage changes with time.

Step 3: Using Object-Oriented Programming (OOP)

I created 3 classes:

1. **MeterReading** – Stores one reading

2. **Building** – Stores all readings of one building

3. **BuildingManager** – Manages all buildings

This made the project well-organized and easier to expand in the future.

Step 4: Creating Visual Dashboard

I used Matplotlib to draw 3 clear charts:

1. **Daily Trend Line Chart** – shows how consumption changes day by day

2. **Weekly Usage Bar Chart** – compares buildings with each other

3. **Peak-Hour Scatter Plot** – shows at which hours usage is highest

These graphs were saved together in one image called `dashboard.png`.

Step 5: Exporting the Results

At the end, my program exported:

- **cleaned_energy_data.csv** → cleaned and combined dataset

- **building_summary.csv** → building-wise statistics

- **summary.txt** → written report of:

   - total campus usage

   - highest consuming building

- ○ peak load time

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5. What I Observed

(You can edit these based on your actual data)

- One building consumed much more electricity than others.

- Energy usage was highest during evening hours (peak time).

- Daily usage changed regularly depending on activity in the buildings.

- Weekly averages helped compare which building is more energy-heavy.

6. Challenges I Faced

- Handling multiple CSV files with different values.

- Working with date and time formats.

- Understanding how resampling works in pandas.

- Combining OOP with data analysis.

- Getting all graphs to show correctly in one figure.

7. Conclusion

This project taught me how to build a complete data analysis pipeline on my own. I learned:

- How to read and process real-world datasets

- How to analyze data using pandas

- How to design classes using OOP

- How to create dashboards with Matplotlib

- How to write summaries and export results

This project is useful because campuses can use such dashboards to reduce electricity waste and improve energy planning.

THANK YOU!