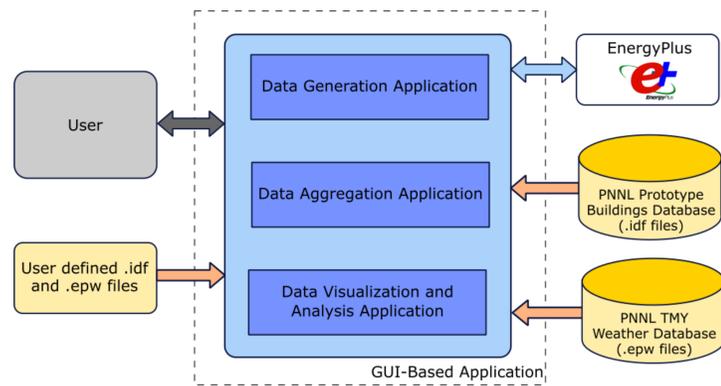


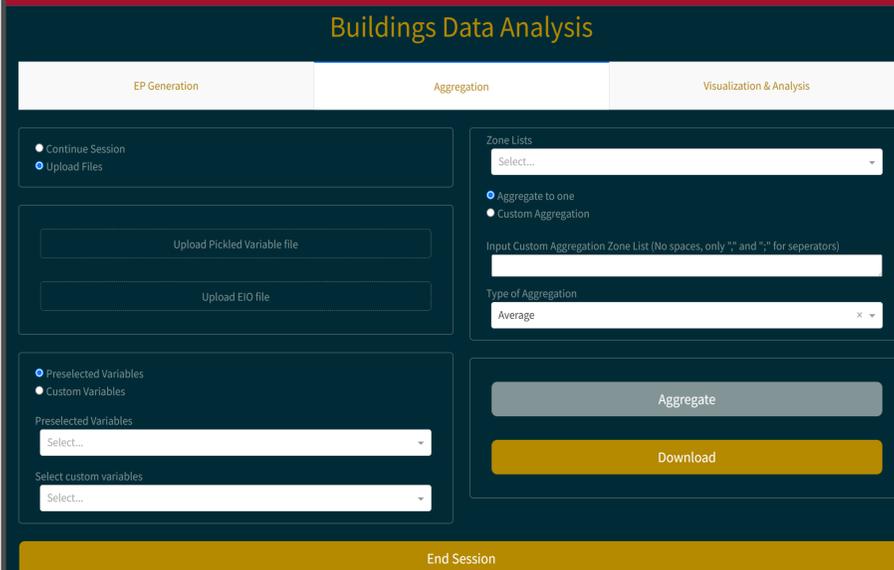
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BACKGROUND AND MOTIVATION

- According to the US Energy Information Administration, buildings account for 40% of the total electricity consumed during the year 2022.
- Out of this, on average 45% is used for space heating and cooling. This has led to a surge in research on enhancing building energy efficiency and grid-edge capabilities. These efforts often rely on EnergyPlus simulations for datasets.
- We develop an open-source GUI-based application that makes the process of producing and interpreting data using EnergyPlus effortless.

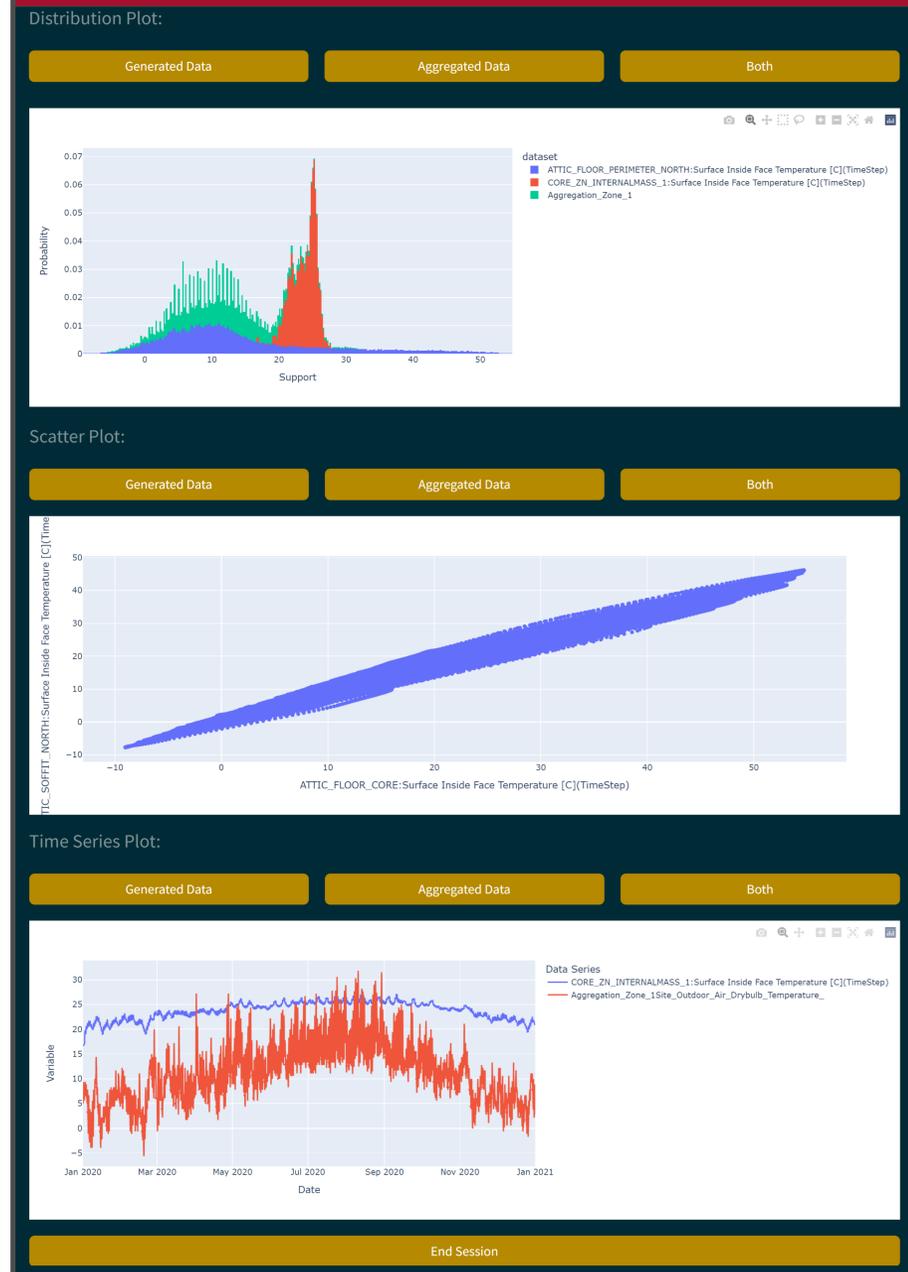


AGGREGATION INTERFACE

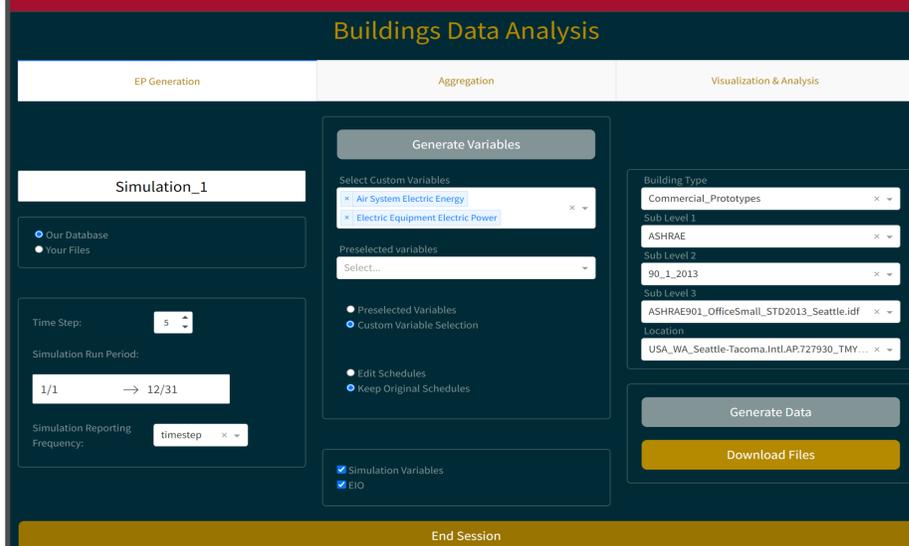


- The application provides an interface to combine thermal zones into one or more aggregate zones.
- The application uses a pickle file containing data for all variables simulated by the Data Generation application.
- The thermal zones can be aggregated to 'one zone' or 'custom aggregation zones' according to user.
- The aggregation can be done using three methods: average, weighted average based on zone floor area, or weighted average based on zone volume.
- Aggregating data in this manner allows for the reduced-order, lightweight modeling of the thermodynamics of a building.

VISUALIZATION PLOTS

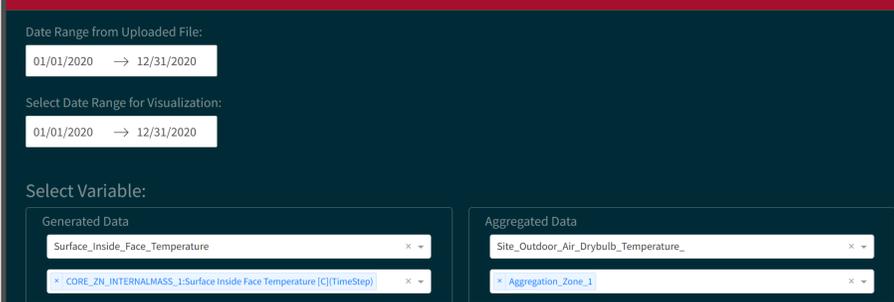


GENERATION INTERFACE



- The application runs a modified EnergyPlus simulation.
- Users may provide their own input files or select from the PNNL prototypical buildings and TMY3 weather database.
- Users may also customize simulation time-step, simulation period, and modify schedules for people and different equipment.
- 'Generate Variables' provides the user a list of all possible simulation variables for the given IDF file.
- Selected variables or preselected variables can be generated with the given set of conditions and can be downloaded.

VISUALIZATION INTERFACE



- The Data Visualization and Analysis App provides the user with tools to visualize and analyze the data generated through previous Apps.
- The user may create any of the following:
 1. create time-series plots for any variable of desired duration.
 2. scatter plots between any two variables to help determine their relationship.
 3. compute basic statistics for any variable along with its histogram and its distribution parameters

CONCLUSION

- Producing data with EnergyPlus is a tedious task that involves writing input text files. Similarly, organizing and visualizing the data requires handling large amounts of time series data, also in text format.
- Introducing a GUI-based application interface simplifies the user's interaction with EnergyPlus, reducing their workload.
- Our application, built with Opyplus and Dash-Plotly packages in Python, improves the process of using synthetic data for research of building energy consumption.