PowerViz – Energy Consumption Visualization Framework for Smart Home

Introduction

Nowadays, with cheaper sensing and actuation devices, the number of connected devices has exponentially increased in day-to-day life. In the context of smart homes, various home appliances are available. These appliances connect to the home network and provide a mobile application as a remote control. Also, these appliances have some smart sensors to work automatically without interaction from the user. In the past few years, plenty of literature has been published about the security threat these connected devices bring. And a bunch of visualization software or web-based dashboard has been developed to show sensor data. Therefore, we found some gaps in visualization and analytical study in the domain of power consumption of such smart homes full of intelligent appliances.

Dataset

To make such a visualization system, we found a dataset of **Smart Home Dataset with weather Information** [1]. It is a CSV file with 32 columns containing a timestamp, weather information, and total power consumption followed by the power consumption of each home appliance (dishwasher, furnace, fridge, etc.). The reading is collected from a smart meter with a 1-minute granularity of up to 350 days. Therefore, it's a sufficiently large dataset of size 130MB to build this visualization system.

Proposed software

We want to build this analytical visualization system with the help of **plotly** [2]. We may look into different libraries based on the requirements on the go.

1. **Data overview**: Initially, the summary (monthly average) of the entire dataset will be shown in the brush and zoom technique. Users will be able to get an overall idea of the dataset and can figure out which area needs to be inspected.
2. **In-depth view**: At the time of inspection, the dataset of a particular region (like a few hours or a specific month) will be plotted into a parallel coordinate.
3. **User interaction**:
    a. In the overview mode user can browse the dataset.
    b. In depth view user will be able to select the relevant plot axis (out of 32)

Team members

Member	Task
Antreev (190163) antreev@iitk.ac.in	Process queries the dataset
Akshay Gupta (190003) akshay@iitk.ac.in	User interactive brush and zoom
Anshumann (190162) anshmn@iitk.ac.in	User interactive brush and zoom
Akshan Agrawal (180061) akshan@iitk.ac.in	User interactive parallel coordinates plot
Suvam (22111277) suvambasak22@iitk.ac.in	User interactive parallel coordinates plot

Reference

1. https://www.kaggle.com/datasets/taranvee/smart-home-dataset-with-weather-information?select=HomeC.csv
2. https://plotly.com/python/