UNCG Energy Consumption Documentation

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Hackathon Team 8

Harinder Badesha

Sanam Khalili

Isaac Taylor

Nadia Doudou

Ali Altamimi

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1.0 Introduction:

1.1 Statement Purpose:

The purpose of this application is to create an interactive dashboard to summarize high-frequency energy consumption data for UNCG's campus across 81 electricity meters. It is intended to help visualize the requirements and usage of energy consumption and efficiency across the campus.

1.2 Intended Audience:

This application is intended for the UNCG University, its students and its faculty staff to get a better understanding of the requirements, usage of energy consumption and efficiency across the campus.

1.3 Project Scope:

To meet the goal of an interactive dashboard, we will use python, plotly and dash to create the interactive application. We will use dropdown features for users to decide which dataset they want to visualize. We will use the dataset given to us to visualize and graph the static plot of gathered data of total consumption and hourly consumption, the predictive plot and the average plot with time ranging to years, months, weeks, days, and hours. All of these options will be selectable by the user.

1.4 References:

- https://www.youtube.com/watch?v=hSPmj7mK6ng&t=393s
- https://dash.plotly.com/

2.0 Overall Description:

2.1 Product Features:

1. The application has two tabs, one for Task 1 and the other for Task 2. In the first tab, users will have an option to see the Real-Time Interactive Plot and in the second tab, users will have an option to Average actual energy consumption and Average prediction energy consumption. In each tab, users will have an option to select a "meter" which is a dropdown feature that changes to each different dataset. It also includes a checklist to choose from including confidence intervals, prediction and buttons to change the time range(X-axis) and buttons to change energy consumption to total, average or hourly(Y-axis). In the second tab, we visualize the average actual(dot) and predicted(line) energy consumption by hour of day, days of week, week by year, and months in 2020.

2.2 Code Description/Classes:

In the program, we use 1 class and 4 files to develop this application. The 4 files included and that will be described are Index.py, app.py, Dataloader.py, app1.py, app2.py.

Index.Py:

- Is the main file to run the application, Index combines app1.py and app2.py together to display them into one application/ interactive dashboard.

- Methods used in this file include displaying the homepage with the first tab being the default. (line 27)(*def display_page()*):

DataLoader.py:

- This python file loads up all data csv files from the "data" folder. While loading all datasets, it helps the webpage run faster.

- The important method used in this file is the *load_file* method which specifies that if the data is already loaded in, it will load all the files in the background for faster runtime.

App1.py:

- This file constructs the Real-Time interactive plot(Task 1) in the first tab of the application.

- This includes construction of radio buttons, checklists, and timerange sliders for users to interact with. Features in this file include callbacks which take input and output of user selections.

- The main method in this file includes *update_graph* which constructs the plot itself to visualize the energy consumption of UNCG buildings.

App2.py:

- This file is similar to app1.py but instead constructs the average actual and predicted energy consumption of UNCG in the year 2020 for the second tab of the application.

- This includes construction of just radio buttons for users to interact with and a main method *update_graph2* which constructs the plot to visualize the average energy consumptions.

2.3 Operating Environment:

This application was constructed and is compatible with windows and MacOS.

3.0 Functional Requirements:

3.1 Primary:

- pandas==1.1.4
- plotly==4.12.0
- dash==1.17.0
- numpy==1.19.4
- statsmodels==0.12.1
- pytz==2020.4
- matplotlib==3.3.3
- scipy==1.5.4
- scikit-learn==0.23.2
- pip==20.2.4
- Brotli==1.0.9
- setuptools==49.2.1
- future==0.18.2