McCOY ENERGY
WEB DASHBOARD SYSTEM
&
DATA WAREHOUSING

22sum - CIS 5369
INDEPENDENT STUDY CIS

Project Work Report

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Table of Contents

Introduction

For the CIS5369 Independent Study project, I have opted to work on the McCoy Energy web dashboard to visualize and display the trends of the electricity consumption and the temperature trends through the sensor provided data for the McCoy College of Business Building. I have also opted to work on the Data Warehousing model which is to be constructed for better storing of the Consumption and Temperature data.

Softwares, Programming Languages & Libraries Used

1. *Google Cloud Platform (GCP)* offered by Google is a cloud service that offers computing, storage, big data, networking, and many more, as well as the cloud management, security protocols and services and developer tools. *Google Cloud SDK or CLI* gives the ability to create and manage App Engine

2. *JetBrains Pycharm* is a dedicated Python Integrated Development Environment (IDE) that provides a wide range of essential tools for Python developers that are tightly integrated to create a convenient environment for productive Python, web, and data science development.

3. *Python* is the computer programming language often used to build websites and software, automate tasks, and conduct data analysis.

4. *HTML* provides the basic structure of sites, which is enhanced and modified by other technologies like CSS and JavaScript. *CSS* is used to control presentation, formatting, and layout. *JavaScript* is used to control the behavior of different elements.

5. *JSON, FLASK, PLOTLY EXPRESS, SQLALCHEMY* are the other libraries being used.

6. *Pandas is the* high-level data manipulation tool that is built on the numpy package library. *Numpy* is a library for Python that adds support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.

7. *Structured Query Language (SQL)* a programming language used to manage relational databases and perform operations on data.

8. *MySQL Workbench* is a Oracle Corporation based visual database design tool that integrates the SQL development, design, administration and maintenance of SQL relational database management system.

My Work & Implementation

For the **McCoy Energy Web Dashboard System** The deployment of the system is through the GCP App Engine. Here I have studied and successfully modeled the FLASK app module structure as the layout connection that renders all the HTML pages into one single website using python. Alongside the FLASK App part in the python file, SQLAlchemy library is being used to access the data from the GCP based MySQL Server's database. For accessing the database after the SQLAlchemy library is imported I specify the MySQL server hostname from the GCP console along with the specific database and table names and we have to mention the username and password we have specified while creating the SQL Database in the GCP console. After entering all the details in the python code file we then create a sqlalchemy engine by adding the drivename alongside other details.

As we have constructed a Data Warehousing Model I used the PANDAS library along with SQL Query statements to segregate the whole data based on the type_key as we have the three different types of energy consumptions which are Chilled Water, Steam and Electricity data in a single column labeled energy consumption. After the SQL Query to read the data I assigned 3 different dataframes to 3 different Energies . In the case of the Flask App it is divided into multiple routes which are responsible for a specific path and the function under that path renders a specific HTML page. The "\dashboard" route uses the data frame that contains the results and I convert the values of some columns based on the given data dictionary and then use it to Plot the various graphs based on the respective data by using PLOTLY Express Library in python. For plotting of the figure, first I defined a figure with the number of subplots by mentioning the number of rows and columns. Along with this I use the NUMPY library function for modeling and plotting one of my subplots which shows the weekends and working days.

In the case of the HTML pages in common I have designed a CUSTOM logo for the Dashboard system, and clicking on the home logo will redirect back to home page and have made sure that each Page has a title in the tab bar and also style each page by adding some BOOTSTRAPPING elements and styling them with CSS. The index / home page shows the Title and some description on what the entire dashboard is all about.

In detail, The Dashboard Html page is divided into 4 sections, one section contains Date, Time and Weather of San marcos. The Second Section of the page consists of Two split sections with the sections on the left containing only 1 graph and the one on the right containing 4 graphs in an OverScroll mode. The third section holds some Energy consumption tips and the final section holds the logo of other university buildings if this is planned for future use. Furthermore, Specifically for the Dashboard Page of the Web Dashboard System I have used a total of three JavaScript elements. The first JavaScript element takes the data from the dataframe that contains the data from the database and uses the GOOGLE Visualization charts to display the total

consumption of energies in a pie chart using dictionaries and for loops. The Second JavaScript Element is used to display the LIVE Date and Time by making use of the system's local time it is on. For the third and final JS element I am using a Weather Crossing WEB API which uses an API KEY, Location and Unitgroup and have specified the forecast days to display the weather forecast.

The Data page has 3 column layout with each column having a heading being a hyperlink which redirects to my Texas State OneDrive where I have stored the Data we are using for Visualization, predictions and analysis part for access to others. The Contact Us page consists of 2 columns with a column with a mail address and the other with the phone number. The predictions page has a 2 Column layout with each specific image having a description about it. Also each of the pages has a footer at the bottom with the Copyright label mentioned.

There is also a python file where I worked on loading the data from the WEB API to the SQL database. For doing this I learned and worked on JSON file i.e. the link that I get from the Visual Crossing Website is in the form of JSON, so first I had to check if it is forecasting and if it is then decode the data from JSON into "UTF-8" then connect to the MySQL database in the same method that I worked in the FLASK App and then load the elements of the JSON decoded data into the specific columns by specifying the column names.

Before deploying FLASK App on Google Cloud I had to create a Google Cloud Account, then Install the gcloud Software Development Kit (SDK) or the Command Line Interface (CLI) this gives me the ability to create and manage App engine and after doing a bit of research I found that I could use it for everything from creating projects, storage buckets which are similar to Amazon S3 and database instances similar to the Amazon RDBMS and many more. After the Installation of the gcloud SDK I had to use it to install the App Engine Extension to deploy our app. Before deploying the app on gcloud I had to create a "app.yaml" file, this specific file tells the App engine what version of the programming language we are using such as "*runtime: python39*" which is the runtime version we are using in this project. When trying to deploy we have to set the project we are working on as the default and also enable billing, cloud build API, only by doing all this I was able to deploy the google cloud app.

I have uploaded all my source code in my Github Account, the following is the corresponding link: https://github.com/Neeraj441/mccoy_dashboard. I have also worked on Data Warehousing along with pooja where I learned the theoretical and practical usages of the schema, ETL scripts, also I'm using the Data Warehousing Model in the dashboard to visualize the data. While working on this I have also enhanced my skills on the basic concepts of SQL, PANDAS and NUMPY. I have also improvised myself with MySQL Workbench Software. I have also worked on altering and updating and merging multiple tables.

Appendices

Pages 5 & 6 are the images of main.py python code which corresponds to the FLASK App, database connectivity, retrieving data and also using PLOTLY to add elements of graphs to a particular app route html page.

```python
import json
from datetime import datetime
import numpy as np
import pandas as pd
import plotly as px
import plotly.graph_objects as go
import sqlalchemy
from flask import Flask, render_template
from plotly.subplots import make_subplots
import plotly.io as pio
pio.templates

host = '/cloudsql/turnkey-crowbar-351921:us-central1:instance2'
db = 'new_schema'
table = 'mccoytotalsandsmweather'
user = 'root'
pasw = 'instance2'
query_string = dict({'unix_socket': host})
engine = sqlalchemy.create_engine(
    sqlalchemy.engine.url.URL(
        drivername='mysql+pymysql',
        username=user,
        password=pasw,
        database=db,
        query=query_string,
    ),
    pool_size=5,
    max_overflow=2,
    pool_timeout=30,
    pool_recycle=1800
)
app = Flask(__name__)


@app.route('/')
def index():
    return render_template('index.html')


@app.route('/dashboard')
def tempchart():
    connection = engine.connect()
    results = connection.execute("SELECT * FROM " + table)
    df = pd.DataFrame(results.fetchall())

    df['MCCOY.CHW.BTUS.DAY'] = df['MCCOY.CHW.BTUS.DAY'].multiply(other=0.000293)
    df['btus'] = df['btus'].multiply(other=0.000293)
    df['MCCOY.STEAM.BTUS.DAY'] = df['MCCOY.STEAM.BTUS.DAY'].multiply(other=0.000293)

```

```python
    data = {'Consumption': 'kW', 'STEAM': df['MCCOY.STEAM.BTUS.DAY'].sum(),
            'ELEC': df['btus'].sum(),
            'CHW': df['MCCOY.CHW.BTUS.DAY'].sum()}

    fig = make_subplots(
        rows=4, cols=2,
        specs=[
            [{"colspan": 2}, None],
            [{"secondary_y": True, "colspan": 2}, None],
            [{"colspan": 2}, None],
            [{"colspan": 2}, None],
        ],
        subplot_titles=("Consumption/Day by system",
                        "Consumption and Temperature",
                        "Maximum, Average and Minimum Temperatures",
                        "Weekends and Working Days"))

    fig.add_trace(go.Bar(x=df['rec_day'], y=df['MCCOY.CHW.BTUS.DAY'], legendgroup=1, name="Cooling"), row=1, col=1)
    fig.add_trace(go.Bar(x=df['rec_day'], y=df['btus'], legendgroup=1, name="Electrical"), row=1, col=1)
    fig.add_trace(go.Bar(x=df['rec_day'], y=df['MCCOY.STEAM.BTUS.DAY'], legendgroup=1, name="Heating"), row=1, col=1)

    fig.add_trace(go.Bar(x=df['rec_day'], y=df["btus"], name="Electricity", showlegend=True, legendgroup=2),
                  row=2, col=1, secondary_y=False)
    fig.add_trace(go.Scatter(x=df['rec_day'], y=df["TempAvg"], name="Avg Temp", showlegend=True, legendgroup=2),
                  row=2, col=1, secondary_y=True)

    fig.add_trace(go.Scatter(x=df['rec_day'], y=df['Temp Max'], name='Maximum',
                             line=dict(width=1.5, color='#110b87'),
                             showlegend=True, legendgroup=3),
                  row=3, col=1)
    fig.add_trace(go.Scatter(x=df['rec_day'], y=df['TempAvg'], name='Average'
                             , line=dict(width=1.5, color='#5a719c'),
                             showlegend=True, legendgroup=3),
                  row=3, col=1)
    fig.add_trace(go.Scatter(x=df['rec_day'], y=df['TempMin'], name='Minimum',
                             line=dict(width=2, color='#cc503e'), showlegend=True, legendgroup=3),
                  row=3, col=1)

    # Plotting Weekdays and Weekends
    df1 = pd.DataFrame({
        'date': (df['rec_day']),
        'value': (df['btus'])
    })

    # define the y-axis limits
    ymin, ymax = df1['value'].min() - 5, df1['value'].max() + 5

    # create an auxiliary time series for highlighting the weekends, equal
    # to "ymax" on Saturday and Sunday, and to "ymin" on the other days
    df1['date'] = pd.to_datetime(df1.date, format='%Y-%m-%d', errors='coerce')
    df1['weekend'] = np.where(df1['date'].dt.day_name().isin(['Sunday', 'Saturday']), ymax, ymin)
```

```python
    # Plotting Weekends (Saturday, Sunday)
    fig.add_trace(
        go.Scatter(
            x=df1['date'],
            y=df1['weekend'],
            fill='tonext',
            fillcolor='#d9d9d9',
            mode='lines',
            line=dict(width=0, shape='hvh'),
            showlegend=True,
            hoverinfo=None, name='Weekends', legendgroup=4), row=4, col=1)

    # plot the time series as a line chart
    fig.add_trace(
        go.Scatter(
            x=df1['date'],
            y=df1['value'],
            mode='lines+markers',
            marker=dict(size=1, color='#cc503e'),
            line=dict(width=1.5, color='#cc503e'),
            showlegend=True, name='Electricity', legendgroup=4), row=4, col=1)

    # Update xaxis properties
    fig.update_xaxes(title_text="Date", row=1, col=1, rangeselector=dict(
        buttons=list([
            dict(count=1, label="1 Month", step="month", stepmode="backward"),
            dict(count=6, label="6 months", step="month", stepmode="backward"),
            dict(count=1, label="1 Year", step="year", stepmode="backward"),
            dict(label="All", step="all")
        ])
    ))
    fig.update_xaxes(title_text="Date", row=2, col=1, rangeselector=dict(
        buttons=list([
            dict(count=1, label="1 Month", step="month", stepmode="backward"),
            dict(count=6, label="6 months", step="month", stepmode="backward"),
            dict(count=1, label="1 Year", step="year", stepmode="backward"),
            dict(label="All", step="all")
        ])
    ))
    fig.update_xaxes(title_text="Date", row=3, col=1, rangeselector=dict(
        buttons=list([
            dict(count=1, label="1 Month", step="month", stepmode="backward"),
            dict(count=6, label="6 Months", step="month", stepmode="backward"),
            dict(count=1, label="1 Year", step="year", stepmode="backward"),
            dict(label="All", step="all")
        ])
    ))
```

```python
    fig.update_xaxes(title_text="Date", row=4, col=1, rangeselector=dict(
        buttons=list([
            dict(count=1, label="1 Month", step="month", stepmode="backward"),
            dict(count=6, label="6 months", step="month", stepmode="backward"),
            dict(count=1, label="1 Year", step="year", stepmode="backward"),
            dict(label="All", step="all")
        ])
    ))

    # Update yaxis properties
    fig.update_yaxes(title_text="Consumption (kW's)", row=1, col=1)
    fig.update_yaxes(title_text="Electricity Consumption (kW's)", row=2, col=1, secondary_y=False)
    fig.update_yaxes(title_text="Temperature (FAHRENHEIT)", row=2, col=1, secondary_y=True)
    fig.update_yaxes(title_text="Temperature (FAHRENHEIT)", row=3, col=1)
    fig.update_yaxes(title_text="Electricitsy Consumption (kW's)", row=4, col=1)

    # paper_bgcolor='rgba(0, 0, 0,0)', plot_bgcolor='rgba(0, 0, 0,0)'

    fig.update_layout(height=1700, width=930, legend_tracegroupgap=390,
                      barmode='relative')

    graphJSON = json.dumps(fig, cls=px.utils.PlotlyJSONEncoder)
    return render_template('dashboard.html', graphJSON=graphJSON, data=data)

@app.route('/about_us')
def about_us():
    return render_template('about_us.html')

@app.route('/contact_us')
def contact_us():
    return render_template('contact_us.html')


@app.route('/data')
def data():
    return render_template('data.html')


@app.route('/predictions')
def predictions():
    return render_template('predictions.html')


@app.route('/data_warehousing')
def data_warehousing():
    return render_template('data_warehousing.html')


if __name__ == '__main__':
    app.run(host='127.0.0.1', port=8080, debug=True)
```

The <head>, <footer> HTML Code Elements are Common to all HTML Pages and one or two of the pages have an addition of any <scripts> attached to them. Also the Navigation Bar section from the <body> Element is also common across all the HTML Pages. Below is the Image of the Code Holding the common Elements.

```html
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="author" content="Neeraj Kumar Reddy Panta">
  <meta name="generator" content="">
  <meta name="twitter:card" content="summary_large_image"/>
  <meta name="twitter:image:src" content="">
  <meta property="og:image" content="">
  <meta name="twitter:title" content="Home">
  <meta name="viewport" content="width=device-width, initial-scale=1, minimum-scale=1">
  <link rel="shortcut icon" href="../static/assets/images/McCoy_Energy.png" type="image/x-icon">
  <meta name="description" content="">

  <title>Home</title>
  <link rel="stylesheet" href="../static/assets/web/assets/mobirise-icons2/mobirise2.css">
  <link rel="stylesheet" href="../static/assets/bootstrap/css/bootstrap.min.css">
  <link rel="stylesheet" href="../static/assets/bootstrap/css/bootstrap-grid.min.css">
  <link rel="stylesheet" href="../static/assets/bootstrap/css/bootstrap-reboot.min.css">
  <link rel="stylesheet" href="../static/assets/dropdown/css/style.css">
  <link rel="stylesheet" href="../static/assets/socicon/css/styles.css">
  <link rel="stylesheet" href="../static/assets/theme/css/style.css">
  <link rel="preload" href="https://fonts.googleapis.com/css?family=Jost:100,200,300,400,500,600,700,800,900,100i,200i,300i,400i,500i,600i,700i,800i,900i&display=swap"
                        as="style" onload="this.onload=null;this.rel='stylesheet'">
  <noscript>
    <link rel="stylesheet" href="https://fonts.googleapis.com/css?family=Jost:100,200,300,400,500,600,700,800,900,100i,200i,300i,400i,500i,600i,700i,800i,900i&display=swap">
  </noscript>
  <link rel="preload" as="style" href="../static/assets/mobirise/css/mbr-additional.css">
    <link rel="stylesheet" href="../static/assets/mobirise/css/mbr-additional.css" type="text/css">
</head>

<body>
  <section data-bs-version="5.1" class="menu cid-ta7raJayxn" once="menu" id="menu1-1c">
    <nav class="navbar navbar-dropdown navbar-expand-lg">
        <div class="container-fluid">
            <div class="navbar-brand">
                <span class="navbar-logo">
                    <a href="/">
                        <img src="../static/assets/images/McCoy_Energy.png" alt="Home" style="height: 3.8rem;">
                    </a>
                </span>
            </div>
            <button class="navbar-toggler" type="button" data-toggle="collapse" data-bs-toggle="collapse" data-target="#navbarSupportedContent"
                data-bs-target="#navbarSupportedContent" aria-controls="navbarNavAltMarkup" aria-expanded="false" aria-label="Toggle navigation">
                <div class="hamburger">
                    <span></span>
                    <span></span>
                    <span></span>
                    <span></span>
                </div>
            </button>
            <div class="collapse navbar-collapse" id="navbarSupportedContent">
                <ul class="navbar-nav nav-dropdown nav-right" data-app-modern-menu="true">
                    <li class="nav-item">
                        <a class="nav-link link text-black text-primary display-4" href="/dashboard">Dashboard</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link link text-black text-primary display-4" href="/predictions">Predictions</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link link text-black text-primary display-4" href="/data">Data</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link link text-black text-primary display-4" href="/data_warehousing">Data Warehousing</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link link text-black text-primary display-4" href="/contact_us">Contact Us</a>
                    </li>
                </ul>
            </div>
        </div>
    </nav>
</section>

<section data-bs-version="5.1" class="footer7 cid-tc01c81ppD" once="footers" id="footer7-22">
    <div class="container">
        <div class="media-container-row align-center mbr-white">
            <div class="col-12">
                <p class="mbr-text mb-0 mbr-fonts-style display-4">
                    © Copyright 2025 McCoy College of Business. All Rights Reserved.
                </p>
            </div>
        </div>
    </div>
</section>
```

Below is the Figure containing Home / Index HTML Page <body> Code that displays the Content of the Page.

```
<section data-bs-version="5.1" class="header19 cid-ta7litEERA mbr-fullscreen" id="header19-14">
    <div class="container">
        <div class="media-container">
            <div class="col-md-12 align-center">
                <h1 class="mbr-section-title mbr-white mbr-bold mbr-fonts-style mb-3 display-1">McCOY ENERGY DASHBOARD SYSTEM</h1>
                <p class="mbr-text mbr-white mbr-fonts-style display-7">System to Visualize and Graphs and look through details on the Energy Consumption
                    and Temperature readings of the McCoy College of Business Administration Building.
                </p>
                <div class="row justify-content-center">
                    <div class="col-12 col-md-6 col-lg-3">
                        <div class="card-wrapper">
                            <div class="card-box align-center">
                                <a href="/dashboard"><span class="mbr-iconfont mobi-mbri-growing-chart mobi-mbri"></span></a>
                                <h4 class="card-title align-center mbr-black mbr-fonts-style display-7"><strong>Visualizations </strong></h4>
                            </div>
                        </div>
                    </div>
                    <div class="col-12 col-md-6 col-lg-3">
                        <div class="card-wrapper">
                            <div class="card-box align-center">
                                <a href="/data"><span class="mbr-iconfont mobi-mbri-database mobi-mbri"></span></a>
                                <h4 class="card-title align-center mbr-black mbr-fonts-style display-7"><strong>Data</strong></h4>
                            </div>
                        </div>
                    </div>
                    <div class="mbr-section-btn align-center"><a class="btn btn-primary display-7" href="/about_us">About Us</a></div>
                </div>
            </div>
        </div>
    </div>
</section>
```

Below Figure Holds the main <body> content of About US HTML page.

```
<section data-bs-version="5.1" class="people5 mbr-embla cid-tahar0kWXZ mbr-parallax-background" id="people5-1w">
    <div class="mbr-overlay" style="opacity: 0.4; background-color: rgb(255, 255, 255);">
    </div>
    <div class="position-relative text-center">
        <h3 class="mb-4 mbr-fonts-style display-2"><strong>Team</strong></h3>
        <div class="embla" data-skip-snaps="true" data-align="center" data-auto-play-interval="5" data-draggable="true">
            <div class="embla__viewport container-fluid">
                <div class="embla__container">
                    <div class="embla__slide slider-image item" style="margin-left: 8rem; margin-right: 7rem;">
                        <div class="user">
                            <div class="user_image">
                                <div class="item-wrapper position-relative">
                                    <img src="../static/assets/images/me-600x570.jpg" alt="Mobirise Website Builder">
                                </div>
                            </div>
                            <div class="user_text mb-4">
                                <p class="mbr-fonts-style display-7"><em>Texas State University
                                <br>Major: Data Analytics and information Systems
                                <br>Batch of Spring 2022</em></p>
                            </div>
                            <div class="user_name mbr-fonts-style mb-2 display-7"><strong>Neeraj Kumar Reddy Panta</strong></div>
                            <div class="user_desk mbr-fonts-style display-7">WEBSITE DESIGNER, MAIN DEVELOPER </div>
                        </div>
                    </div>
                    <div class="embla__slide slider-image item" style="margin-left: 0rem; margin-right: 0rem;">
                        <div class="user">
                            <div class="user_image">
                                <div class="item-wrapper position-relative">
                                    <img src="../static/assets/images/shefalika-131x131.jpg" alt="Mobirise Website Builder">
                                </div>
                            </div>
                            <div class="user_text mb-4">
                                <p class="mbr-fonts-style display-7"><em>Texas State University
                                <br>Major: Data Analytics and information Systems
                                <br>Batch of Spring 2022</em></p>
                            </div>
                            <div class="user_name mbr-fonts-style mb-2 display-7"><strong>Shefalika S Upadhyay</strong></div>
                            <div class="user_desk mbr-fonts-style display-7">
                                DEVELOPER
                            </div>
                        </div>
                    </div>
                </div>
            </div>
            <button class="embla__button embla__button--prev">
                <span class="mobi-mbri mobi-mbri-arrow-prev mbr-iconfont" aria-hidden="true"></span>
                <span class="sr-only visually-hidden visually-hidden">Previous</span>
            </button>
            <button class="embla__button embla__button--next">
                <span class="mobi-mbri mobi-mbri-arrow-next mbr-iconfont" aria-hidden="true"></span>
                <span class="sr-only visually-hidden visually-hidden">Next</span>
            </button>
        </div>
    </div>
</section>
```

Figure containing Dashboard HTML page <script> code responsible for the Total Consumption PIE Chart.

```
<script type="text/javascript" src="https://www.gstatic.com/charts/loader.js"></script>
    <script type="text/javascript">
      google.charts.load("current", {packages:["corechart"]});
      google.charts.setOnLoadCallback(drawChart);
      function drawChart() {
        var data = google.visualization.arrayToDataTable([
            {% for key, value in data.items() %}
                {% if value is string %}
                    ['{{ key }}', '{{ value }}'],
                {% else %}
                    ['{{ key }}', {{ value }}],
                {% endif %}
            {% endfor %}
        ]);

        var options = {
          is3D: true,
          pieHole: 1,
          pieStartAngle: 125,
            legend: 'bottom',
            backgroundColor: '#bfcece'
        };

        var chart = new google.visualization.PieChart(document.getElementById('piechart_3d'));
        chart.draw(data, options);
      }
    </script>
```

Below Figure holds the Code for the Date, Time & Weather <section> of Dashboard html Page.

```
<section data-bs-version="5.1" class="features23 cid-ta6JRPGLRz mbr-parallax-background" id="features23-11">
    <div class="mbr-overlay" style="opacity: 0.8; background-color: rgb(255, 255, 255);">
    </div>
    <div class="container">
        <div class="card-wrapper">
            <div class="card-box align-left"></div>
        </div>
        <!-- col-12 col-md-6 col-lg-4 -->
        <div class="row justify-content-center content-row mb-0 mt-12">
            <div class="card p-4 p-md-3 col-md-6 col-lg-5">
                <div class="card-box">
                    <div class="title">
                        <div class="datetime" id="currentDate"></div>
                        <script>
                            function refreshTime() {
                                const timeDisplay = document.getElementById("currentDate");
                                const dateString = new Date().toLocaleString();
                                const formattedString = dateString.replace(", ", " - ");
                                timeDisplay.textContent = formattedString;
                            }
                            setInterval(refreshTime, 1000);
                        </script>
                    </div>
                </div>
            </div>
            <div class="card p-4 p-md-3 col-md-6 col-lg-5">
                <div class="card-box">
                    <div class="weatherWidget" ></div>
                    <script>
                        window.weatherWidgetConfig =  window.weatherWidgetConfig || [];
                        window.weatherWidgetConfig.push({
                        selector:".weatherWidget",
                        apiKey:"V9DMTC7MX6AXKXZNARMP5JL8K", //Sign up for your personal key
                        location:"SanMarcos, TX", //Enter an address
                        unitGroup:"us", //"us" or "metric"
                        forecastDays:5, //how many days forecast to show
                        title:"San Marcos, TX", //optional title to show in the
                        showTitle:true,
                        showConditions:true
                        });
                        (function() {
                            var d = document, s = d.createElement('script');
                            s.src = 'https://www.visualcrossing.com/widgets/forecast-simple/weather-forecast-widget-simple.js';
                            s.setAttribute('data-timestamp', +new Date());
                            (d.head || d.body).appendChild(s);
                        })();
                    </script>
                </div>
            </div>
        </div>
    </div>
    </div>
</section>
```

Below Figure is the HTML <section> Code of the Dashboard Page that Integrates the main.py that contains FLASK App which has the plotly code for plotting the Graphs.

```
<section data-bs-version="5.1" class="features4 cid-ta6IpcbDxd" id="features4-w">
    <div class="mbr-overlay"></div>
    <div class="container-fluid">
        <div class="mbr-section-head">
            <h4 class="mbr-section-title mbr-fonts-style align-center mb-0 display-5">
                <strong>McCoy Building Energy, Temperature Charts and Statistics</strong></h4>
        </div>
        <div class="row mt-4">
            <div class="item features-image col-12 col-md-6 col-lg-4">
                <div class="item-wrapper">
                    <div class="item-img">
                        <p class="mbr-section-title mbr-fonts-style align-center mb-0">
                            <strong>Total Consumption from Oct 2021 to Apr 2022 in kW's</strong></p>
                        <div id="piechart_3d" style="position: relative; height: 100%; width: 100%;"></div>
                    </div>
                </div>
            </div>
            <div class="item features-image col-12 col-md-6 col-lg-8">
                <div class="item-wrapper" style="overflow:scroll;">
                    <div class="item-img">
                        <div id="chart" class="chart" ></div>
                        <script src="https://cdn.plot.ly/plotly-latest.min.js"></script>
                        <script type="text/javascript">
                            var graphs = {{graphJSON | safe}};
                            Plotly.plot('chart',graphs,{});
                        </script>
                    </div>
                </div>
            </div>
        </div>
    </div>
</section>
```

Below Figure contains the <section> code for the Data HTML Page.

```
<section data-bs-version="5.1" class="content2 cid-ta7LsMVGHO" id="content2-1r">
    <div class="mbr-overlay"></div>
    <div class="container">
        <div class="mbr-section-head">
            <h4 class="mbr-section-title mbr-fonts-style align-center mb-0 display-2"><strong>Data</strong></h4>
            <h5 class="mbr-section-subtitle mbr-fonts-style align-center mb-0 mt-2 display-5">Here you can locate and access Historical and Present Data </h5>
        </div>
        <div class="row mt-4">
            <div class="item features-image col-12 col-md-6 col-lg-4">
                <div class="item-wrapper">
                    <div class="item-img">
                        <img src="../static/assets/images/mbr-815x576.jpg" alt="" title="">
                    </div>
                    <div class="item-content">
                        <h5 class="item-title mbr-fonts-style display-5"><a href="https://txst-my.sharepoint.com/:f:/g/personal/gdf30_txstate_edu/EqQbs5xUm_FIpZbl2ps
                                                                                "EQVMB6MSn32FH_z617iecd7IttA?e=nvOEIM" class="text-primary">Weather Data</a></h5>
                        <p class="mbr-text mbr-fonts-style mt-3 display-7">In the Above Link you will find the last six months of Temperature Data for McCoy Building.</p>
                    </div>
                </div>
            </div>
            <div class="item features-image col-12 col-md-6 col-lg-4">
                <div class="item-wrapper">
                    <div class="item-img">
                        <img src="../static/assets/images/mbr-815x543.jpg" alt=" " title="">
                    </div>
                    <div class="item-content">
                        <h5 class="item-title mbr-fonts-style display-5"><a href="https://txst-my.sharepoint.com/:f:/g/personal/gdf30_txstate_edu/Ep8J2mNSYZBCroa_gjPZ0WAB3
                                                                                "1eHuRS83mtxUhFdP3YNgQ?e=1qZ8RT" class="text-primary">Consumption Data</a></h5>
                        <p class="mbr-text mbr-fonts-style mt-3 display-7">In the Above Link you will find the last six months of Consumption Data for McCoy Building.<br>
                        </p>
                    </div>

                </div>
            </div>
            <div class="item features-image col-12 col-md-6 col-lg-4">
                <div class="item-wrapper">
                    <div class="item-img">
                        <img src="../static/assets/images/mbr-815x545.jpg" alt="" title="">
                    </div>
                    <div class="item-content">
                        <h5 class="item-title mbr-fonts-style display-5"><a href="https://txst-my.sharepoint.com/:f:/g/personal/gdf30_txstate_edu/EtSvir5OL0ZEnoWdb-OLi1YBQ
                                                                                "5v5Jhka4X42N4V3fKdL5w?e=JrvrmU" class="text-primary">Other Data</a></h5>
                        <p class="mbr-text mbr-fonts-style mt-3 display-7">In the Above Link you will find the last six months of Humidity and Other Data for McCoy Building.</p>
                    </div>
                </div>
            </div>
        </div>
    </div>
</section>
```

Below Figure shows the <section> code for the Contact US HTML Page.

```
<section data-bs-version="5.1" class="contacts1 cid-ta7J2cm5SD mbr-parallax-background" id="contacts1-1q">

    <div class="mbr-overlay" style="opacity: 0.4; background-color: rgb(255, 255, 255);">
    </div>
    <div class="container">
        <div class="mbr-section-head">
            <h3 class="mbr-section-title mbr-fonts-style align-center mb-0 display-2">
                <strong>Contacts</strong>
            </h3>

        </div>
        <div class="row justify-content-center mt-4">
            <div class="card col-12 col-lg-6">
                <div class="card-wrapper">
                    <div class="card-box align-center">
                        <div class="image-wrapper">
                            <span class="mbr-iconfont mobi-mbri-letter mobi-mbri"></span>
                        </div>
                        <h4 class="card-title mbr-fonts-style mb-2 display-2">
                            <strong>Email</strong>
                        </h4>
                        <p class="mbr-text mbr-fonts-style mb-2 display-4">
                            We will reply as soon as possible</p>
                        <h5 class="link mbr-fonts-style display-7">
                            <a href="mailto:abcde@txstate.edu" class="text-primary">Send us an email to: abcde@txstate.edu</a>  
                        </h5>
                    </div>
                </div>
            </div>
            <div class="card col-12 col-lg-6">
                <div class="card-wrapper">
                    <div class="card-box align-center">
                        <div class="image-wrapper">
                            <span class="mbr-iconfont mobi-mbri-mobile-2 mobi-mbri"></span>
                        </div>
                        <h4 class="card-title mbr-fonts-style align-center mb-2 display-2">
                            <strong>Phone</strong>
                        </h4>
                        <p class="mbr-text mbr-fonts-style mb-2 display-4">
                            Mon - Fri 09:00 - 18:00</p>
                        <h5 class="link mbr-black mbr-fonts-style display-7">
                            <a href="tel:+12345678910" class="text-primary">Call (512) 123 45 67</a>
                        </h5>
                    </div>
                </div>
            </div>
        </div>
    </div>
</section>
```

Below Figure is the <section> Code for the Predictions HTML Page.

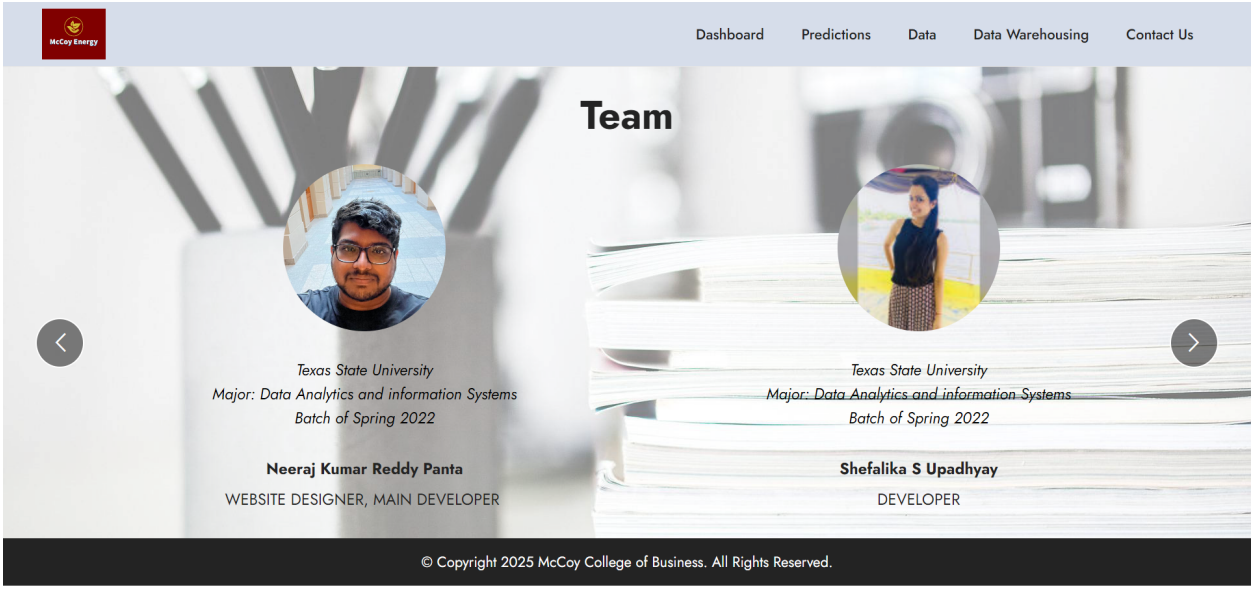
```
<section data-bs-version="5.1" class="content2 cid-tbYzHMbilk" id="content2-1x">
    <div class="mbr-overlay"></div>
    <div class="container">
        <div class="mbr-section-head">
            <h4 class="mbr-section-title mbr-fonts-style align-center mb-0 display-2"><strong>Predictions</strong></h4>
            <h5 class="mbr-section-subtitle mbr-fonts-style align-center mb-0 mt-2 display-5">Brief Summary and Info on Predictions </h5>
        </div>
        <div class="row mt-4">
            <div class="item features-image col-12 col-md-6 col-lg-6 active">
                <div class="item-wrapper">
                    <div class="item-img">
                        <img src="../static/assets/images/mbr-815x545.jpg" alt="" title="" data-slide-to="3" data-bs-slide-to="3">
                    </div>
                    <div class="item-content">
                        <p class="mbr-text mbr-fonts-style mt-3 display-7">Few Lines of Information regarding the Image.</p>
                    </div>
                </div>
            </div><div class="item features-image col-12 col-md-6 col-lg-6">
                <div class="item-wrapper">
                    <div class="item-img">
                        <img src="../static/assets/images/mbr-815x576.jpg" alt="" title="" data-slide-to="0" data-bs-slide-to="0">
                    </div>
                    <div class="item-content">
                        <p class="mbr-text mbr-fonts-style mt-3 display-7">Few Lines of Information regarding the Image.</p>
                    </div>
                </div>
            </div>
        </div>
    </div>
</section>
```

Results

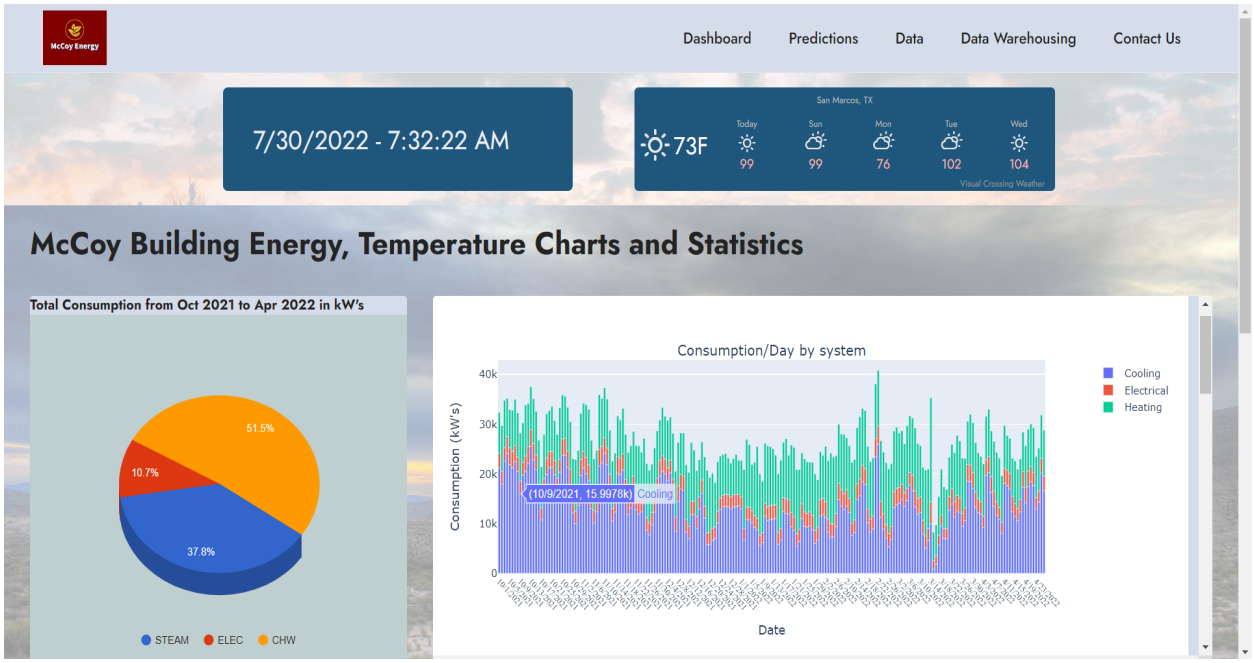
Link for the Website: https://turnkey-crowbar-351921.uc.r.appspot.com/

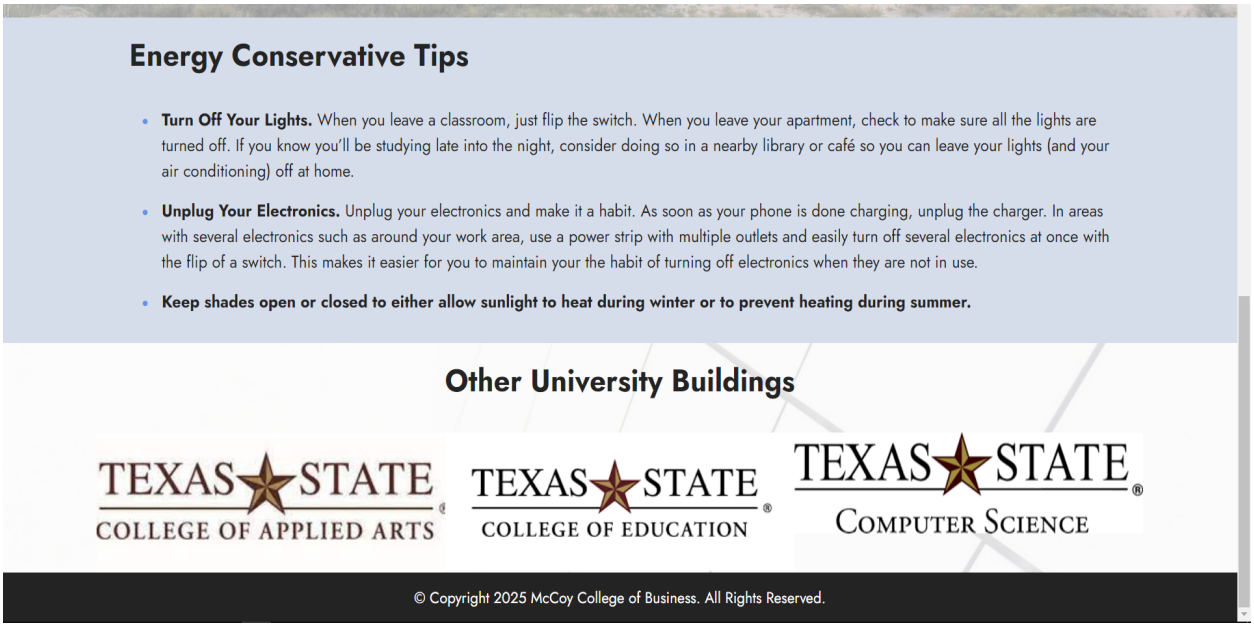
Home / Index Page

About Us Page

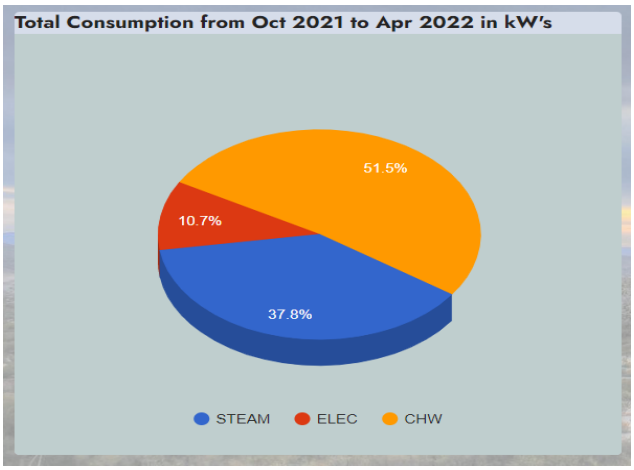


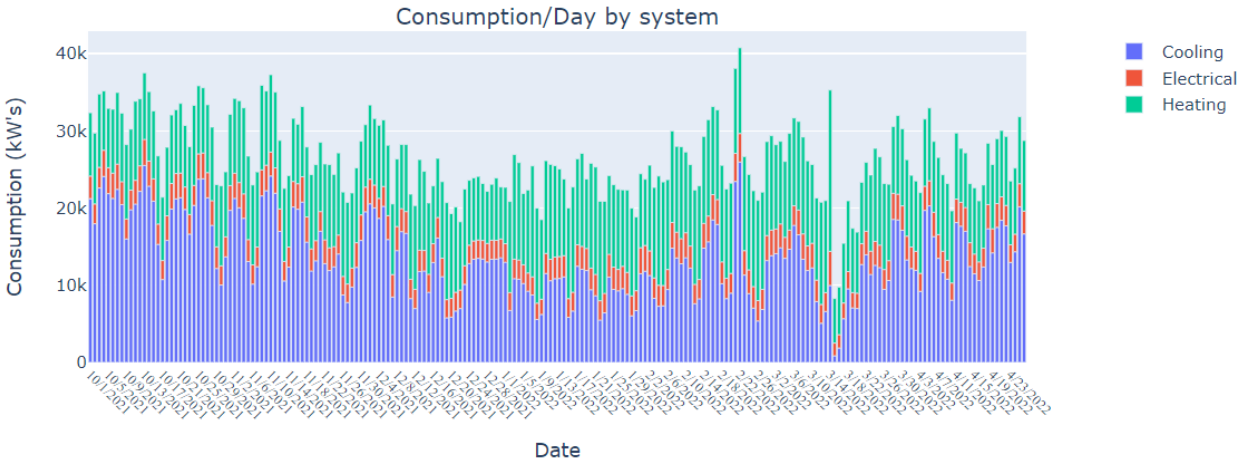
Dashboard Page

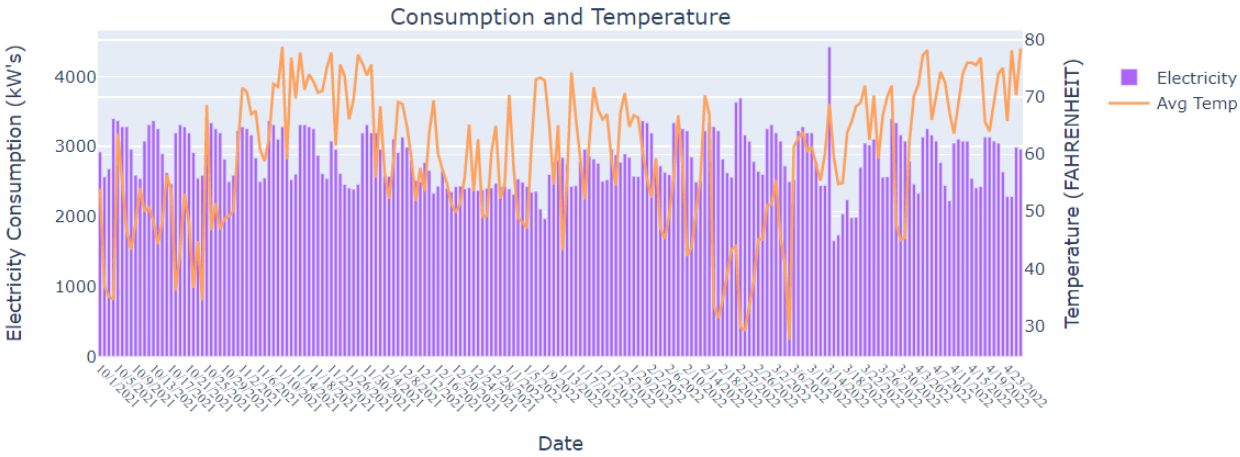


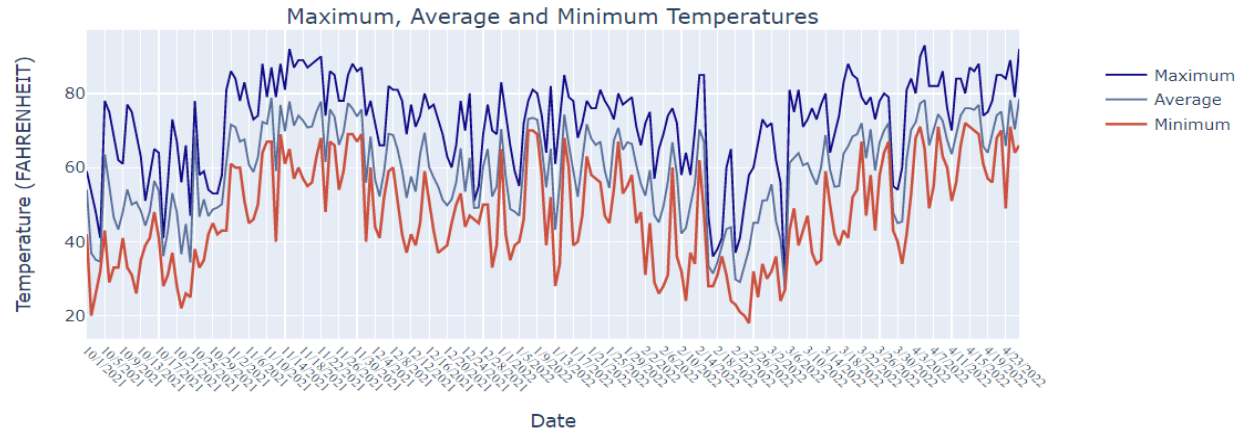


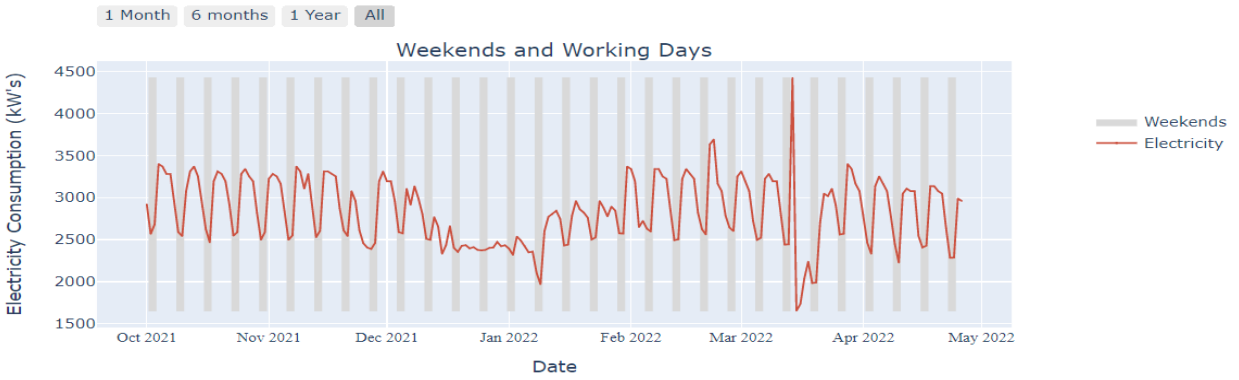
All Graphs in the Dashboard Page



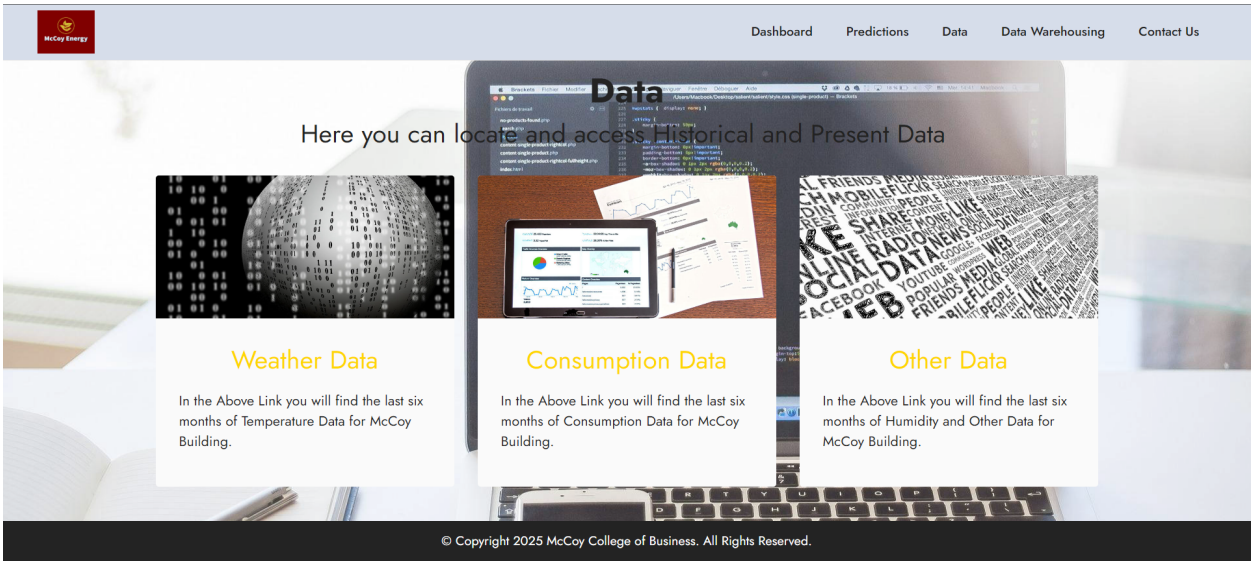





Maximum, Average and Minimum Temperatures
Temperature (FAHRENHEIT)
80
60
40
20
Maximum
Average
Minimum
Date


1 Month
6 months
1 Year
All
Weekends and Working Days
Electricity Consumption (kW's)
4500
4000
3500
3000
2500
2000
1500
Oct 2021
Nov 2021
Dec 2021
Jan 2022
Feb 2022
Mar 2022
Apr 2022
May 2022
Date
Weekends
Electricity

Data Page


Dashboard
Predictions
Data
Data Warehousing
Contact Us
Data
Here you can locate and access Historical and Present Data
Weather Data
In the Above Link you will find the last six months of Temperature Data for McCoy Building.
Consumption Data
In the Above Link you will find the last six months of Consumption Data for McCoy Building.
Other Data
In the Above Link you will find the last six months of Humidity and Other Data for McCoy Building.
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Contact Us Page