Creating plots with MatPlotLib

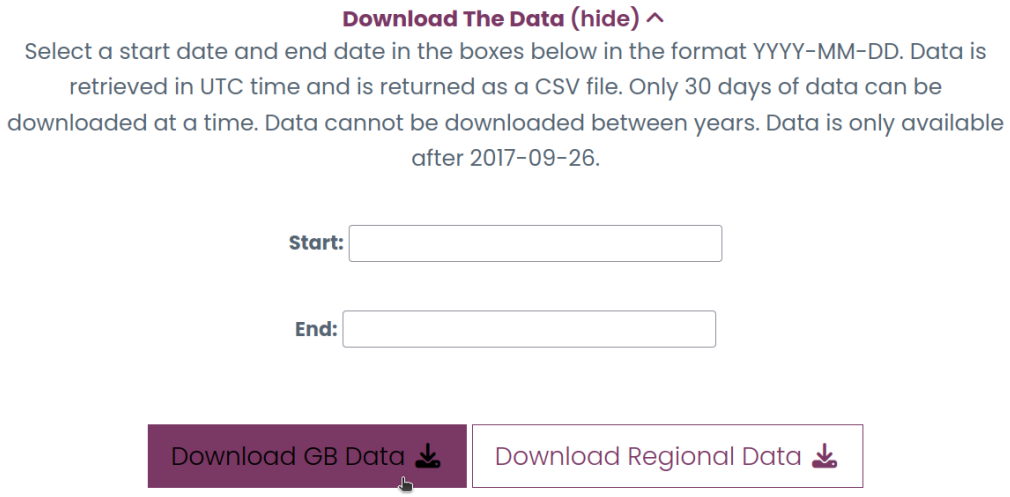
MatPlotLib is a library for creating plots. There are a variety of plots available within `matplotlib.pyplot`, including:

- Line plot (e.g. plotting a function): `plot`;
- Histogram: `hist`;
- Scatter plot: `scatter`;
- Bar chart: `bar`;
- Pie chart: `pie` (though note that when representing data, a pie chart is almost never the right chart);
- 3D plot: `plot_surface`.

Exercise: Plotting carbon from energy

We'll download some data in a CSV file and plot this.

First, go to Carbon Intensity and scroll down to find 'Download The Data', click to expand it and it should look like this.



Enter the start date as a week ago and the end date as today, and click Download GB Data.

Save this file in the same folder as you create a new Python file.

We start by loading some modules we are going to use. We will use `csv` to import the data, `datetime` to process the dates/times and `matplotlib.pyplot` to plot the data.

```
import matplotlib.pyplot as plt
import csv
from datetime import datetime
```

Import CSV data

First, let's import the data from the CSV file.

We enter the filename and use `file()` to open the file.

```
# update to match your downloaded file
f = open("Carbon_Intensity_Data.csv", "r")
```

Now we start a `csv.reader()` to process the data from the file.

```
csvfile = csv.reader(f)
```

We can get the first row (headings) and store this as a list `fields`. If we print `fields`, we can see what headings there are in our file.

```
fields = next(csvfile)
print(fields)
```

You should see something like this

```
['Datetime (UTC)', 'Actual Carbon Intensity (gCO2/kWh)', 'Forecast Carbon Inte
```

This tells us that the first column (column 0) is the datetime and the second (column 1) is "Actual Carbon Intensity (gCO2/kWh)". Let's get these ready to plot.

First we start two new list in which we will store our data.

```
dates = []
actual_carbon = []
```

Now we loop through the rows of the CSV file, storing the entry in column 0 in `dates` and the entry in column 1 in `actual_carbon`. We use a command from `datetime` to process the entry in column 0 into a date that `matplotlib` will understand.

```
for row in csvfile:
    dates.append(datetime.strptime(row[0], '%Y-%m-%dT%H:%MZ'))
    actual_carbon.append(int(row[1]))
```

Since we are finished using it, we close the file.

```
f.close()
```

Now we have our data in two lists, `dates` and `actual_carbon`, we can plot these.

```
plt.plot(dates, actual_carbon)
plt.show()
```

We label the axes using `plt.xlabel` for the x-axis and `plt.ylabel` for the y-axis. Put these commands after `plt.plot()` and before `plt.show()`.

```
plt.xlabel('Date/time')
plt.ylabel('Actual Carbon')
```

We can add a title to the plot

```
plt.title('Carbon Intensity Data')
```

Finally, we'll rotate the dates on the x axis so they don't overlap so easily, and `plt.tight_layout()` just helps deal with overlaps. Again, put these commands before `plt.show()`.

```
plt.xticks(rotation=45)
plt.tight_layout()
```

When finished, you should be looking at a plot that is something like this.