

## LAB-2

### Moving\_averages

```
In [1]: import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
```

- Global mean surface air temperature anomaly and global co2 concentration

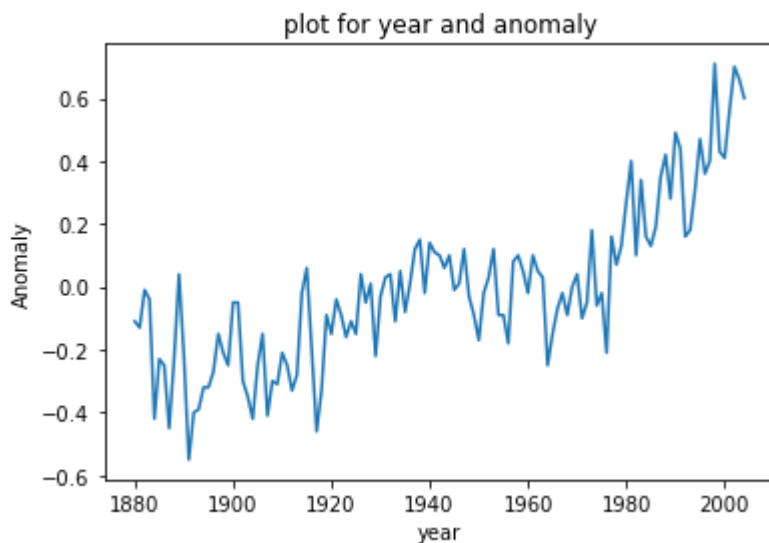
```
In [2]: df=pd.read_csv("C:\\Users\\Lenovo\\OneDrive\\Desktop\\Timeseries_lab\\lab2\\An
df
```

Out[2]:

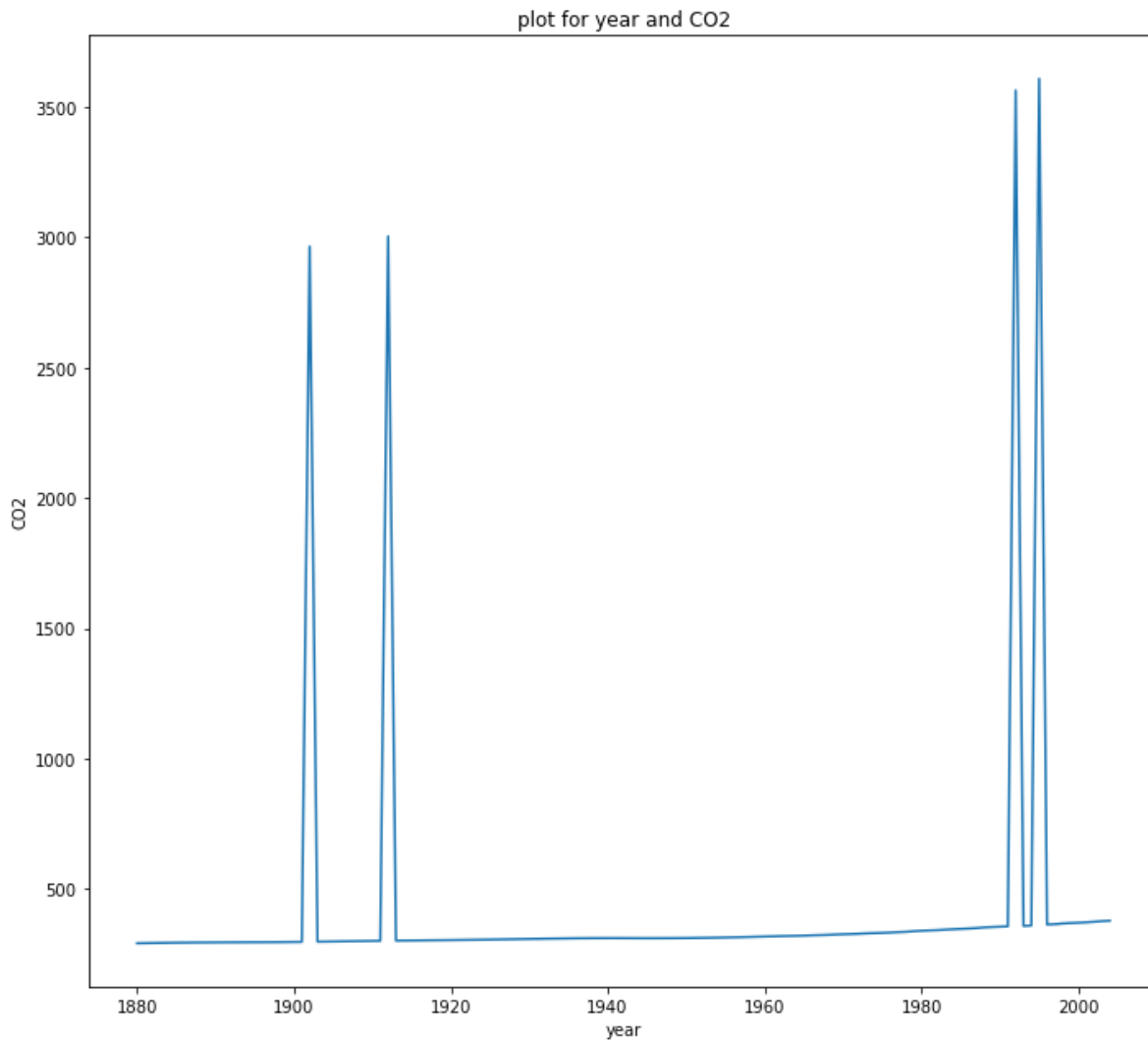
	Year	Anomaly	CO2
0	1880	-0.11	290.7
1	1881	-0.13	291.2
2	1882	-0.01	291.7
3	1883	-0.04	292.1
4	1884	-0.42	292.6
...	...	...	...
120	2000	0.41	369.5
121	2001	0.56	371.0
122	2002	0.70	373.1
123	2003	0.66	375.6
124	2004	0.60	377.4

125 rows × 3 columns

```
In [3]: plt.plot(df.Year,df.Anomaly)
plt.rcParams["figure.figsize"] = [10,9]
plt.rcParams["figure.autolayout"] = True
plt.xlabel("year")
plt.ylabel("Anomaly")
plt.title("plot for year and anomaly")
plt.show()
```



```
In [4]: plt.plot(df.Year,df.CO2)
plt.rcParams["figure.figsize"] = [20,9]
plt.rcParams["figure.autolayout"] = True
plt.xlabel("year")
plt.ylabel("CO2")
plt.title("plot for year and CO2")
plt.show()
```



- Moving average

In [5]: `import numpy as np`

`window_size = 3`

`i = 0`

`moving_averages_3 = []`

`while i < len(df['Anomaly']) - window_size + 1:`

`window_average = round(np.sum(df['Anomaly'][i:i+window_size]) / window_size,`

`moving_averages_3.append(window_average)`

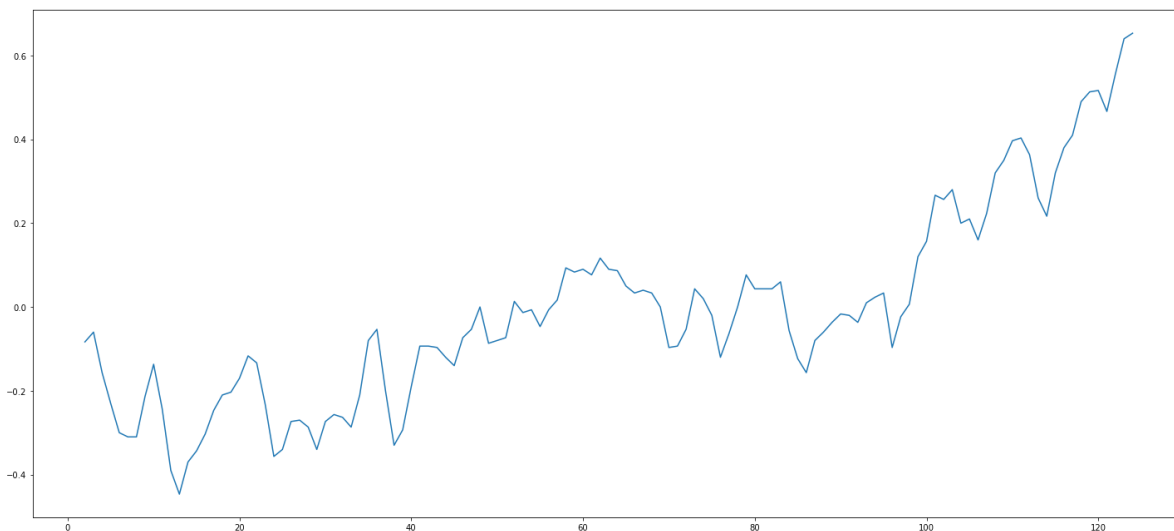
`i += 1`

`print("Moving average for three years",moving_averages_3)`

Moving average for three years [-0.08, -0.06, -0.16, -0.23, -0.3, -0.31, -0.31, -0.21, -0.14, -0.24, -0.39, -0.45, -0.37, -0.34, -0.3, -0.25, -0.21, -0.2, -0.17, -0.12, -0.13, -0.23, -0.36, -0.34, -0.27, -0.27, -0.29, -0.34, -0.27, -0.26, -0.26, -0.29, -0.21, -0.08, -0.05, -0.2, -0.33, -0.29, -0.19, -0.09, -0.09, -0.1, -0.12, -0.14, -0.07, -0.05, -0.0, -0.09, -0.08, -0.07, 0.01, -0.01, -0.01, -0.05, -0.01, 0.02, 0.09, 0.08, 0.09, 0.08, 0.12, 0.09, 0.09, 0.05, 0.03, 0.04, 0.03, 0.0, -0.1, -0.09, -0.05, 0.04, 0.02, -0.02, -0.12, -0.06, 0.0, 0.08, 0.04, 0.04, 0.04, 0.06, -0.06, -0.12, -0.16, -0.08, -0.06, -0.04, -0.02, -0.02, -0.04, 0.01, 0.02, 0.03, -0.1, -0.02, 0.01, 0.12, 0.16, 0.27, 0.26, 0.28, 0.2, 0.21, 0.16, 0.22, 0.32, 0.35, 0.4, 0.4, 0.36, 0.26, 0.22, 0.32, 0.38, 0.41, 0.49, 0.51, 0.52, 0.47, 0.56, 0.64, 0.65]

In [6]: `df['Anomaly'].rolling(window=3).mean().plot()`

Out[6]: `<AxesSubplot:>`



```
In [7]: window_size = 5

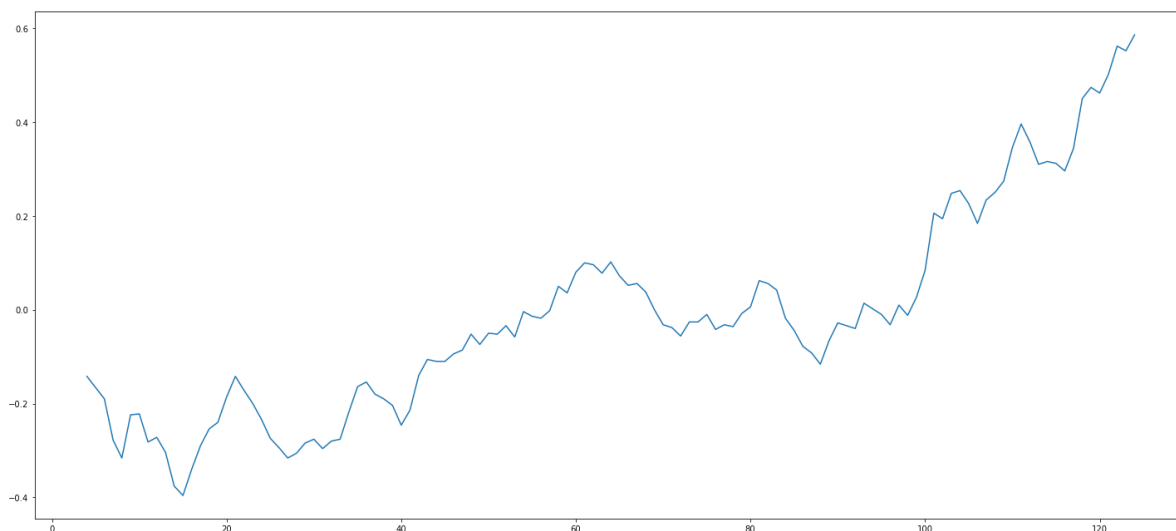
i = 0
moving_averages = []
while i < len(df['Anomaly']) - window_size + 1:
    window_average = round(np.sum(df['Anomaly'][i:i+window_size]) / window_size)
    moving_averages.append(window_average)
    i += 1

print(moving_averages)
```

```
[-0.14, -0.17, -0.19, -0.28, -0.32, -0.22, -0.22, -0.28, -0.27, -0.3, -0.38,
-0.4, -0.34, -0.29, -0.25, -0.24, -0.19, -0.14, -0.17, -0.2, -0.23, -0.27, -
0.29, -0.32, -0.31, -0.28, -0.28, -0.3, -0.28, -0.28, -0.22, -0.16, -0.15, -
0.18, -0.19, -0.2, -0.25, -0.21, -0.14, -0.11, -0.11, -0.11, -0.09, -0.09, -
0.05, -0.07, -0.05, -0.05, -0.03, -0.06, -0.0, -0.01, -0.02, -0.0, 0.05, 0.0
4, 0.08, 0.1, 0.1, 0.08, 0.1, 0.07, 0.05, 0.06, 0.04, 0.0, -0.03, -0.04, -0.0
6, -0.03, -0.03, -0.01, -0.04, -0.03, -0.04, -0.01, 0.01, 0.06, 0.06, 0.04, -
0.02, -0.04, -0.08, -0.09, -0.12, -0.07, -0.03, -0.03, -0.04, 0.01, 0.0, -0.0
1, -0.03, 0.01, -0.01, 0.03, 0.08, 0.21, 0.19, 0.25, 0.25, 0.23, 0.18, 0.23,
0.25, 0.27, 0.35, 0.4, 0.36, 0.31, 0.32, 0.31, 0.3, 0.34, 0.45, 0.47, 0.46,
0.5, 0.56, 0.55, 0.59]
```

```
In [8]: df['Anomaly'].rolling(window=5).mean().plot()
```

```
Out[8]: <AxesSubplot:>
```



```
In [9]: window_size = 7

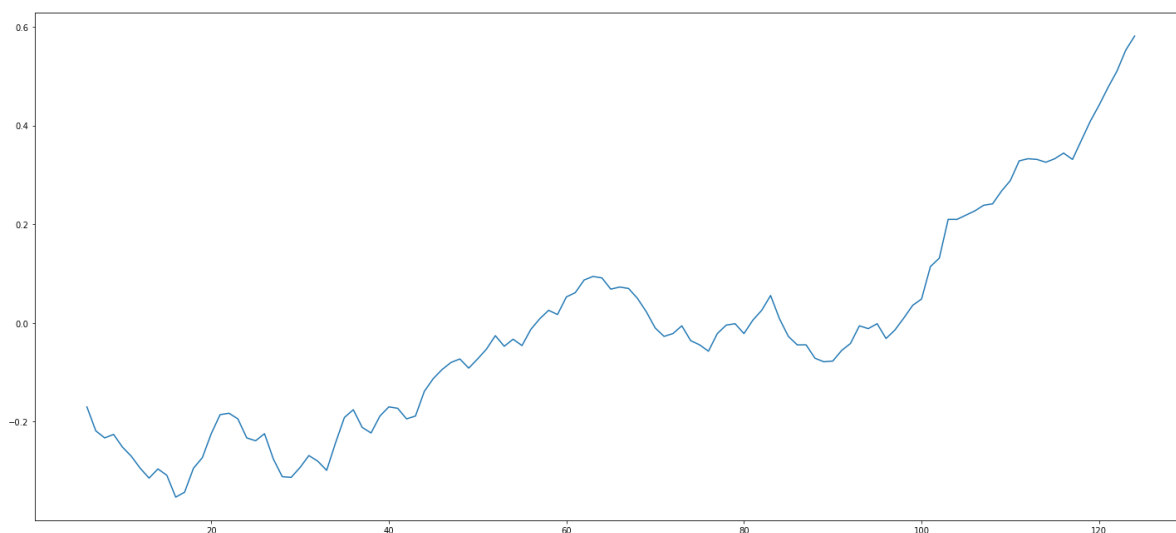
i = 0
moving_averages = []
while i < len(df['Anomaly']) - window_size + 1:
    window_average = round(np.sum(df['Anomaly'][i:i+window_size]) / window_size)
    moving_averages.append(window_average)
    i += 1

print(moving_averages)
```

```
[-0.17, -0.22, -0.23, -0.23, -0.25, -0.27, -0.29, -0.31, -0.3, -0.31, -0.35,
-0.34, -0.29, -0.27, -0.22, -0.19, -0.18, -0.19, -0.23, -0.24, -0.22, -0.28,
-0.31, -0.31, -0.29, -0.27, -0.28, -0.3, -0.24, -0.19, -0.18, -0.21, -0.22, -
0.19, -0.17, -0.17, -0.19, -0.19, -0.14, -0.11, -0.09, -0.08, -0.07, -0.09, -
0.07, -0.05, -0.03, -0.05, -0.03, -0.05, -0.01, 0.01, 0.03, 0.02, 0.05, 0.06,
0.09, 0.09, 0.09, 0.07, 0.07, 0.07, 0.05, 0.02, -0.01, -0.03, -0.02, -0.01, -
0.04, -0.04, -0.06, -0.02, -0.0, -0.0, -0.02, 0.01, 0.03, 0.06, 0.01, -0.03,
-0.04, -0.04, -0.07, -0.08, -0.08, -0.06, -0.04, -0.01, -0.01, -0.0, -0.03, -
0.01, 0.01, 0.04, 0.05, 0.11, 0.13, 0.21, 0.21, 0.22, 0.23, 0.24, 0.24, 0.27,
0.29, 0.33, 0.33, 0.33, 0.33, 0.33, 0.34, 0.33, 0.37, 0.41, 0.44, 0.48, 0.51,
```

```
In [10]: df['Anomaly'].rolling(window=7).mean().plot()
```

```
Out[10]: <AxesSubplot:>
```



```
In [11]: window_size = 3
```

```
i = 0
```

```
moving_averages = []
```

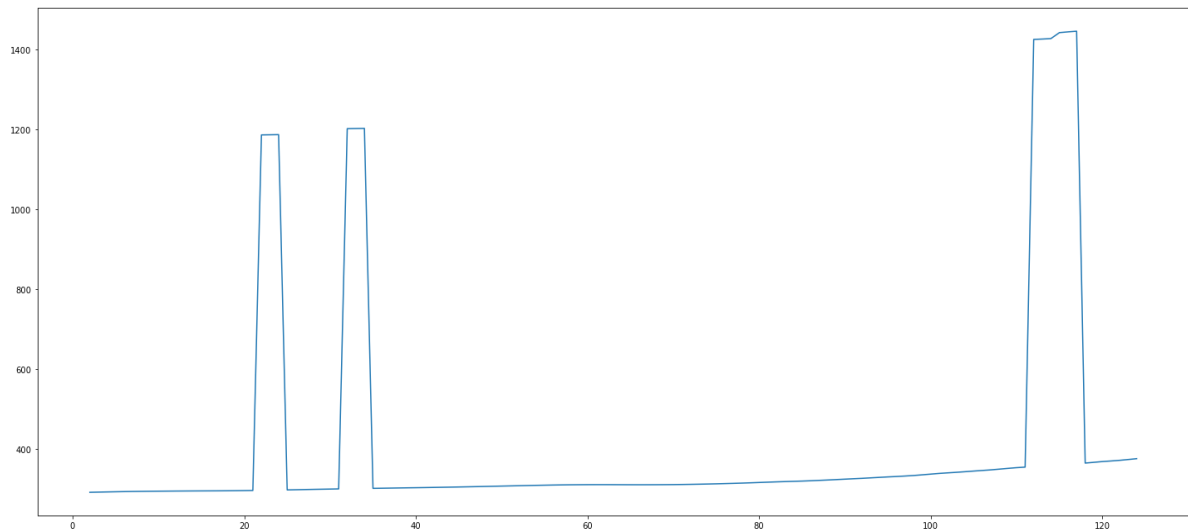
```
while i < len(df['CO2']) - window_size + 1:
    window_average = round(np.sum(df['CO2'][i:i+window_size]) / window_size, 2)
    moving_averages.append(window_average)
    i += 1
```

```
print(moving_averages)
```

```
[291.2, 291.67, 292.13, 292.57, 292.97, 293.3, 293.57, 293.8, 294.0, 294.17,
294.33, 294.47, 294.6, 294.7, 294.8, 294.9, 295.03, 295.23, 295.5, 295.8, 118
5.63, 1185.97, 1186.33, 297.2, 297.63, 298.07, 298.5, 298.9, 299.3, 299.7, 12
01.27, 1201.63, 1201.97, 301.1, 301.4, 301.73, 302.07, 302.4, 302.7, 303.03,
303.4, 303.77, 304.13, 304.53, 304.97, 305.4, 305.83, 306.3, 306.77, 307.23,
307.7, 308.17, 308.6, 309.0, 309.4, 309.73, 310.0, 310.17, 310.3, 310.37, 31
0.37, 310.3, 310.2, 310.13, 310.1, 310.13, 310.2, 310.33, 310.5, 310.77, 311.
1, 311.5, 311.93, 312.43, 313.0, 313.6, 314.23, 314.97, 315.77, 316.57, 317.3
3, 318.03, 318.67, 319.3, 320.1, 321.03, 322.0, 323.03, 324.1, 325.17, 326.1
7, 327.37, 328.57, 329.73, 330.73, 331.93, 333.23, 334.93, 336.73, 338.5, 33
9.9, 341.27, 342.77, 344.37, 345.83, 347.33, 349.2, 351.1, 352.87, 354.23, 14
24.6, 1425.53, 1426.63, 1441.63, 1443.5, 1445.13, 364.33, 366.23, 368.13, 36
9.6, 371.2, 373.23, 375.37]
```

In [12]: `df['CO2'].rolling(window=3).mean().plot()`

Out[12]: <AxesSubplot:>



In [13]: `window_size = 5`

`i = 0`

`moving_averages = []`

`while i < len(df['CO2']) - window_size + 1:`

`# Calculate the average of current window`

`window_average = round(np.sum(df['CO2'][i:i+window_size]) / window_size, 2)`

`moving_averages.append(window_average)`

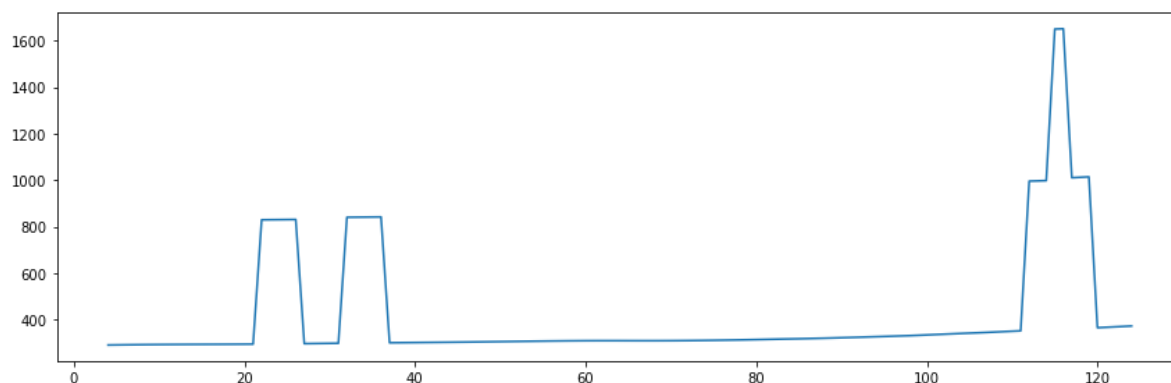
`i += 1`

`print(moving_averages)`

```
[291.66, 292.12, 292.54, 292.92, 293.26, 293.54, 293.78, 293.98, 294.16, 294.32, 294.46, 294.58, 294.7, 294.8, 294.92, 295.08, 295.28, 295.52, 829.52, 829.84, 830.18, 830.54, 830.94, 297.64, 298.06, 298.48, 298.9, 299.3, 840.4, 840.78, 841.14, 841.48, 841.8, 301.42, 301.74, 302.06, 302.38, 302.72, 303.06, 303.4, 303.76, 304.16, 304.56, 304.96, 305.4, 305.86, 306.3, 306.76, 307.24, 307.7, 308.14, 308.58, 309.0, 309.36, 309.68, 309.94, 310.14, 310.26, 310.32, 310.32, 310.28, 310.22, 310.16, 310.14, 310.16, 310.24, 310.36, 310.56, 310.82, 311.14, 311.52, 311.98, 312.48, 313.02, 313.62, 314.3, 315.02, 315.76, 316.54, 317.3, 317.98, 318.66, 319.42, 320.2, 321.04, 322.04, 323.08, 324.08, 325.12, 326.3, 327.4, 328.5, 329.64, 330.86, 332.02, 333.46, 335.06, 336.68, 338.24, 339.88, 341.38, 342.82, 344.28, 345.84, 347.58, 349.28, 350.94, 352.62, 995.64, 996.74, 997.94, 1648.9, 1650.3, 1010.26, 1012.18, 1014.06, 366.16, 367.84, 369.7, 371.5, 373.32]
```

```
In [14]: plt.figure(figsize=(12,4))
df['CO2'].rolling(window=5).mean().plot()
```

Out[14]: <AxesSubplot:>



```
In [15]: window_size = 7

i = 0

moving_averages = []

while i < len(df['CO2']) - window_size + 1:

    window_average = round(np.sum(df['CO2'][i:i+window_size]) / window_size, 2)
    moving_averages.append(window_average)
    i += 1

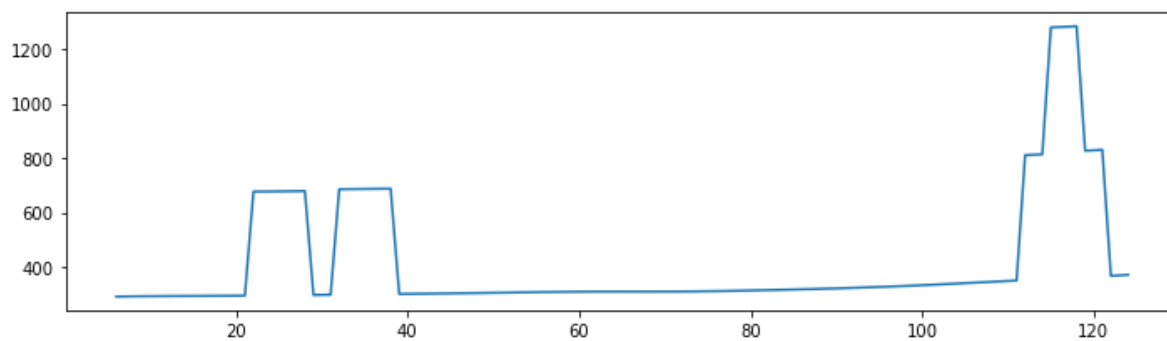
print(moving_averages)
```

```
[292.09, 292.5, 292.87, 293.2, 293.5, 293.74, 293.96, 294.14, 294.3, 294.44,
294.57, 294.69, 294.81, 294.96, 295.13, 295.33, 676.79, 677.06, 677.37, 677.7
1, 678.09, 678.47, 678.87, 298.06, 298.47, 298.89, 685.51, 685.9, 686.27, 68
6.63, 686.97, 687.31, 687.64, 301.74, 302.06, 302.39, 302.73, 303.07, 303.41,
303.79, 304.17, 304.57, 304.99, 305.41, 305.86, 306.31, 306.77, 307.23, 307.6
9, 308.13, 308.56, 308.96, 309.31, 309.61, 309.87, 310.07, 310.2, 310.26, 31
0.27, 310.26, 310.23, 310.2, 310.19, 310.21, 310.29, 310.43, 310.63, 310.89,
311.2, 311.59, 312.03, 312.53, 313.07, 313.69, 314.36, 315.06, 315.79, 316.5
1, 317.23, 317.96, 318.71, 319.49, 320.29, 321.16, 322.09, 323.07, 324.1, 32
5.2, 326.3, 327.41, 328.5, 329.66, 330.87, 332.26, 333.67, 335.13, 336.61, 33
8.19, 339.77, 341.39, 342.86, 344.31, 345.97, 347.66, 349.29, 350.89, 810.61,
812.01, 813.44, 1278.8, 1280.19, 1281.56, 1283.13, 826.6, 828.39, 830.11, 36
7.84, 369.7, 371.64]
```



```
In [16]: plt.figure(figsize=(10,3))  
df['CO2'].rolling(window=7).mean().plot()
```

Out[16]: <AxesSubplot:>



In [ ]: