Clean your time series data

VISUALIZING TIME SERIES DATA IN PYTHON

Thomas Vincent

Head of Data Science, Getty Images

datacamp

The CO2 level time series

A snippet of the weekly measurements of CO2 levels at the Mauna Loa Observatory, Hawaii.

```
datastamp    co2
1958-03-29  316.1
1958-04-05  317.3
1958-04-12  317.6
...
...
2001-12-15  371.2
2001-12-22  371.3
2001-12-29  371.5
```

Finding missing values in a DataFrame

```
print(df.isnull())
```

```
datestamp   co2
1958-03-29  False
1958-04-05  False
1958-04-12  False
```

```
print(df.notnull())
```

```
datestamp    co2
1958-03-29   True
1958-04-05   True
1958-04-12   True
...
```

Counting missing values in a DataFrame

```
print(df.isnull().sum())
```

```
datestamp     0
co2          59
dtype: int64
```

Replacing missing values in a DataFrame

```
print(df)
```

```
...
5  1958-05-03  316.9
6  1958-05-10    NaN
7  1958-05-17  317.5
...
```

```
df = df.fillna(method='bfill')
print(df)
```

```
...
5  1958-05-03  316.9
6  1958-05-10  317.5
7  1958-05-17  317.5
...
```

Let's practice!

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Plot aggregates of your data

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Moving averages

- In the field of time series analysis, a moving average can be used for many different purposes:
  - smoothing out short-term fluctuations
  - removing outliers
  - highlighting long-term trends or cycles.

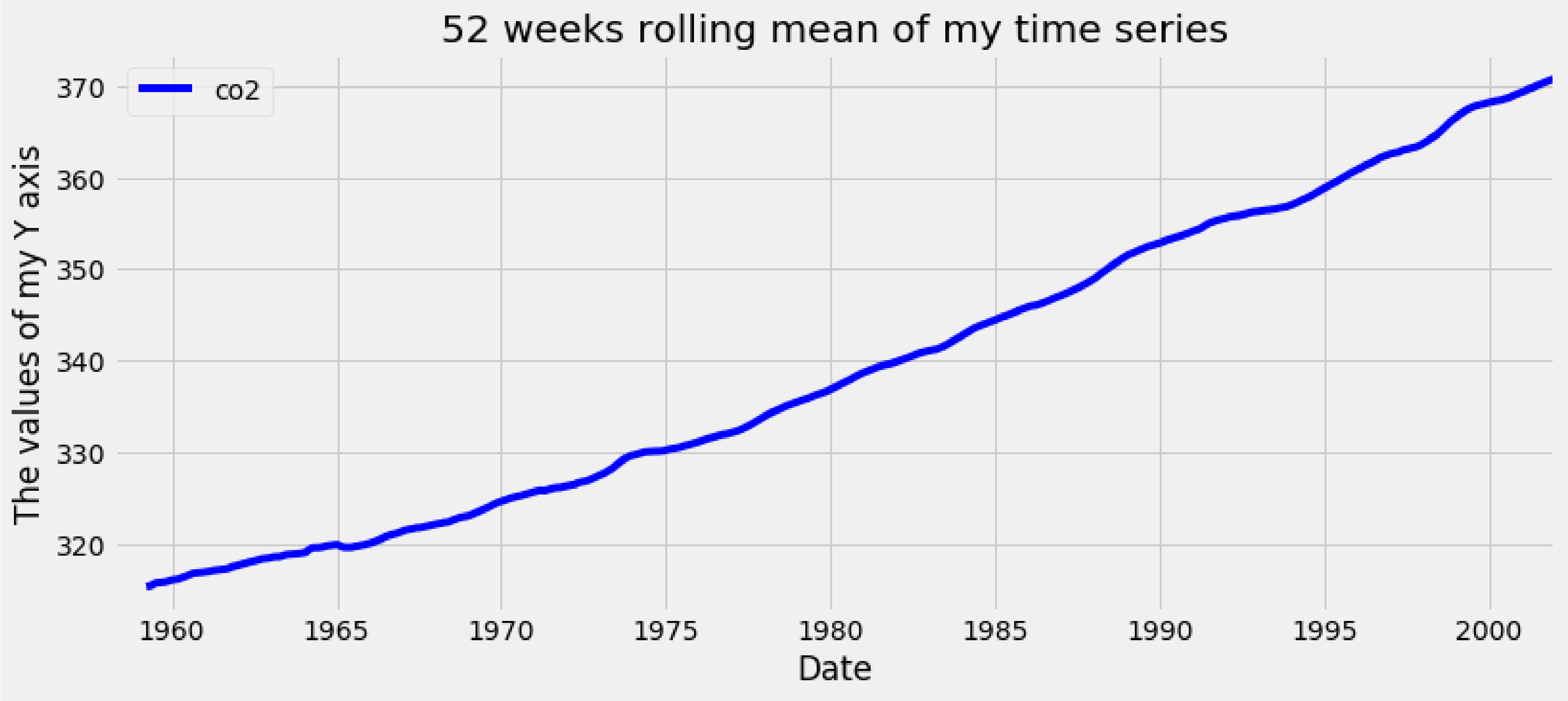
The moving average model

```
co2_levels_mean = co2_levels.rolling(window=52).mean()

ax = co2_levels_mean.plot()
ax.set_xlabel("Date")
ax.set_ylabel("The values of my Y axis")
ax.set_title("52 weeks rolling mean of my time series")

plt.show()
```

A plot of the moving average for the CO2 data



Computing aggregate values of your time series

```
co2_levels.index
```

```
DatetimeIndex(['1958-03-29', '1958-04-05',...],
              dtype='datetime64[ns]', name='datestamp',
              length=2284, freq=None)
```

```
print(co2_levels.index.month)
```

```
array([ 3,  4,  4, ..., 12, 12, 12], dtype=int32)
```

```
print(co2_levels.index.year)
```

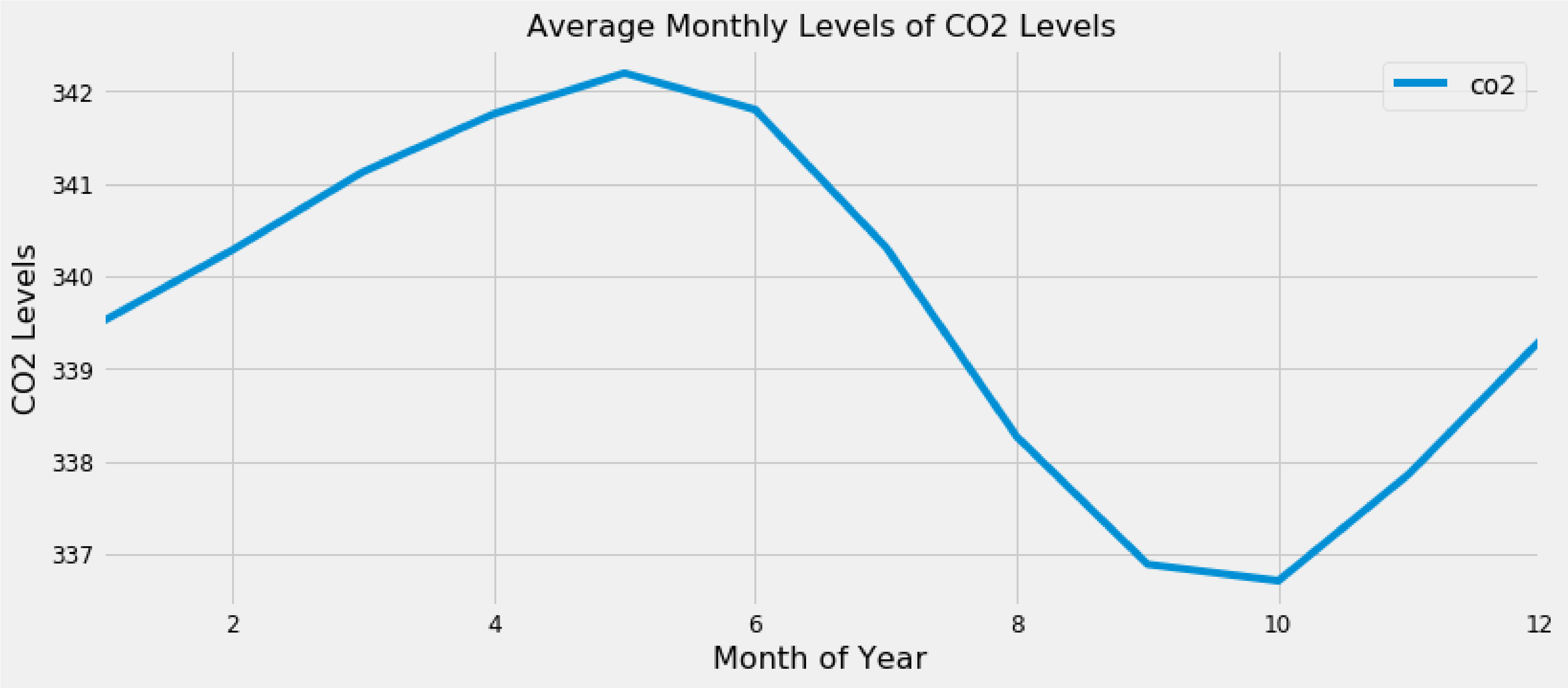
```
array([1958, 1958, 1958, ..., 2001,
      2001, 2001], dtype=int32)
```

Plotting aggregate values of your time series

```
index_month = co2_levels.index.month
co2_levels_by_month = co2_levels.groupby(index_month).mean()
co2_levels_by_month.plot()

plt.show()
```

Plotting aggregate values of your time series



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Summarizing the values in your time series data

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Obtaining numerical summaries of your data

- What is the average value of this data?
- What is the maximum value observed in this time series?

The `.describe()` method automatically computes key statistics of all numeric columns in your DataFrame

```
print(df.describe())
```

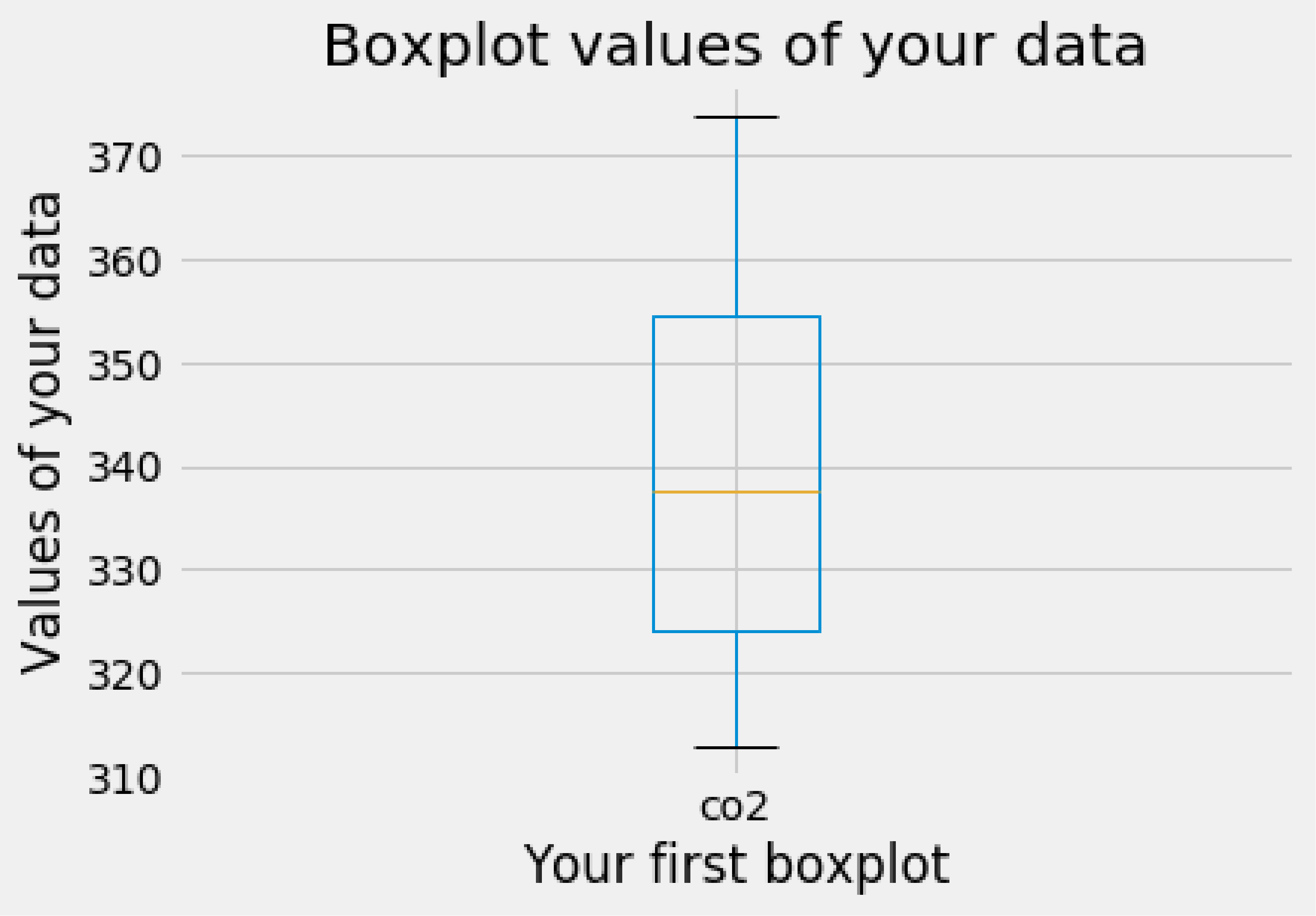
```
               co2
count  2284.000000
mean    339.657750
std      17.100899
min     313.000000
25%     323.975000
50%     337.700000
75%     354.500000
max     373.900000
```

Summarizing your data with boxplots

```
ax1 = df.boxplot()
ax1.set_xlabel('Your first boxplot')
ax1.set_ylabel('Values of your data')
ax1.set_title('Boxplot values of your data')

plt.show()
```

A boxplot of the values in the CO2 data

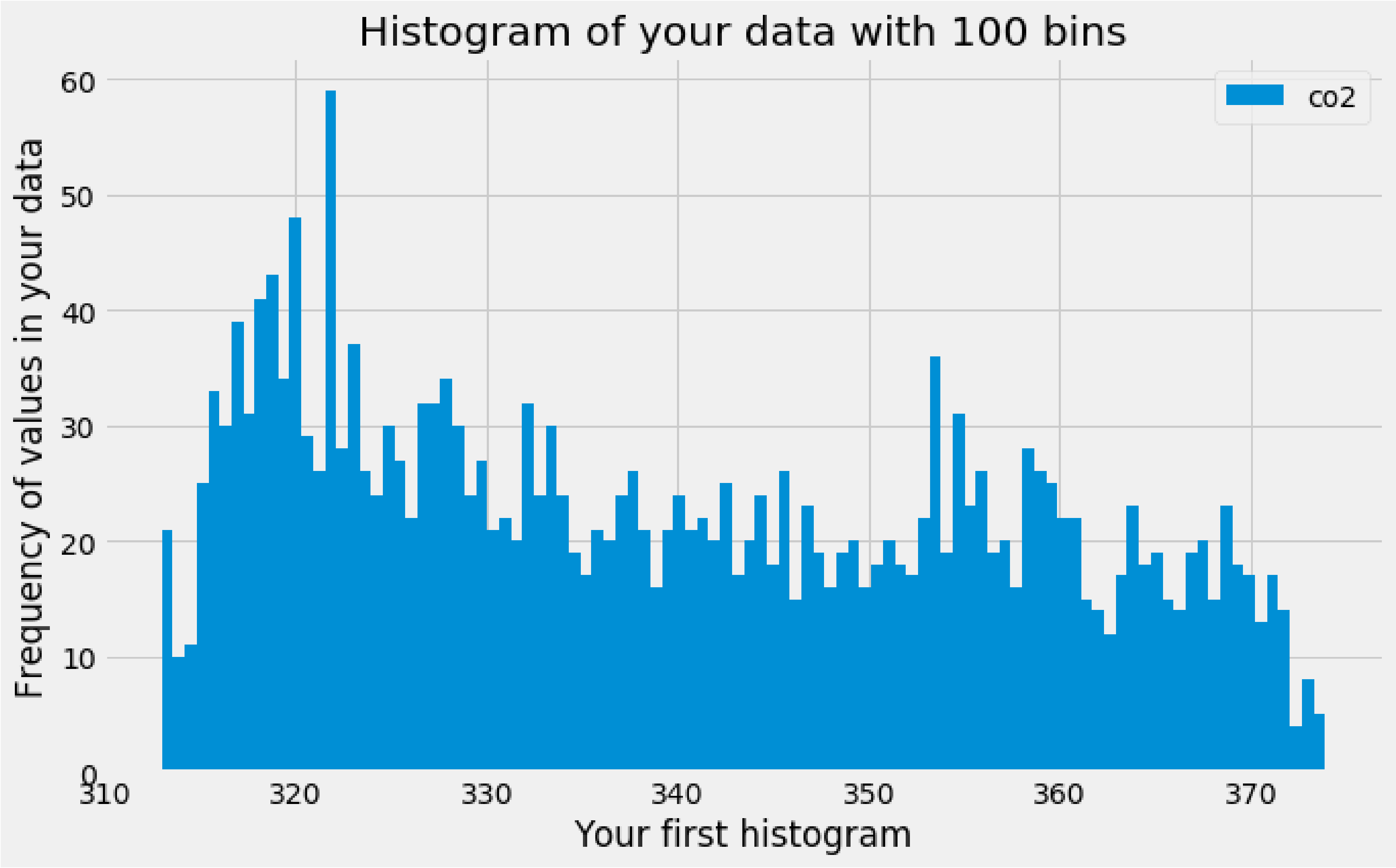


Summarizing your data with histograms

```
ax2 = df.plot(kind='hist', bins=100)
ax2.set_xlabel('Your first histogram')
ax2.set_ylabel('Frequency of values in your data')
ax2.set_title('Histogram of your data with 100 bins')

plt.show()
```

A histogram plot of the values in the CO2 data

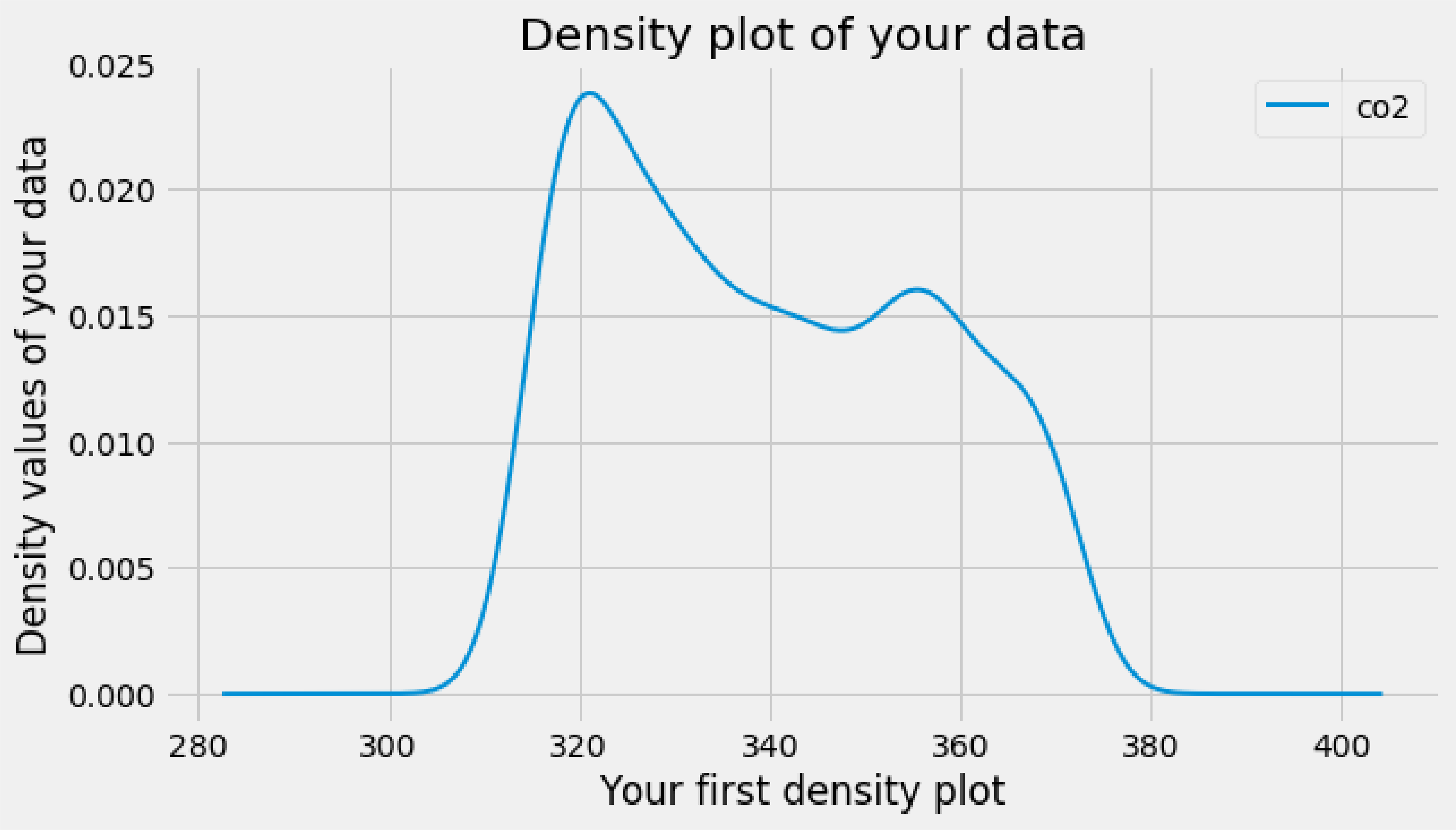


Summarizing your data with density plots

```
ax3 = df.plot(kind='density', linewidth=2)
ax3.set_xlabel('Your first density plot')
ax3.set_ylabel('Density values of your data')
ax3.set_title('Density plot of your data')

plt.show()
```

A density plot of the values in the CO2 data



Let's practice!

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