Data Visualization

Agenda

We want to **plot** points & lines on a graph with 2 axis.

Lecture outline:

- **Matplotlib** (1h10)
- Seaborn (20m)

Matplotlib

Quoting the documentation:

> Python 2D plotting library which produces publication quality figures of hardcopy formats and **interactive environments**.
>
> Matplotlib can be used in **Python scripts**, the IPython shells, the **Jupyter notebook**, web application servers, etc.

👉 Gallery (https://matplotlib.org/gallery/index.html) & Repo (https://github.com/matplotlib/matplotlib)

Canonical import

```
import matplotlib.pyplot as plt
```

Dataset

In the upcoming slides, we will use data from the US Carbon emissions from electricity production (https://www.kaggle.com/txtrouble/carbon-emissions) dataset.

Python script

Matplotlib can be used in a regular `.py` python script:

```
mkdir dataviz-101 && cd $_
touch carbon.py
```

In our favorite text editor we can code:

```
# carbon.py
import matplotlib.pyplot as plt

years_x = [1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015]
total_y = [1243, 1543, 1619, 1831, 1960, 2310, 2415, 2270, 1918]

plt.plot(years_x, total_y)
plt.show() # Will open a graph window.
           # Wait for it to be closed to continue script execution
```

Back to the terminal we can run:

```
python carbon.py
```

💾 Saving to disk with `matplotlib.pyplot.savefig` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.savefig.html)

```
# [...]
plt.savefig('carbon.png')
plt.show()
```

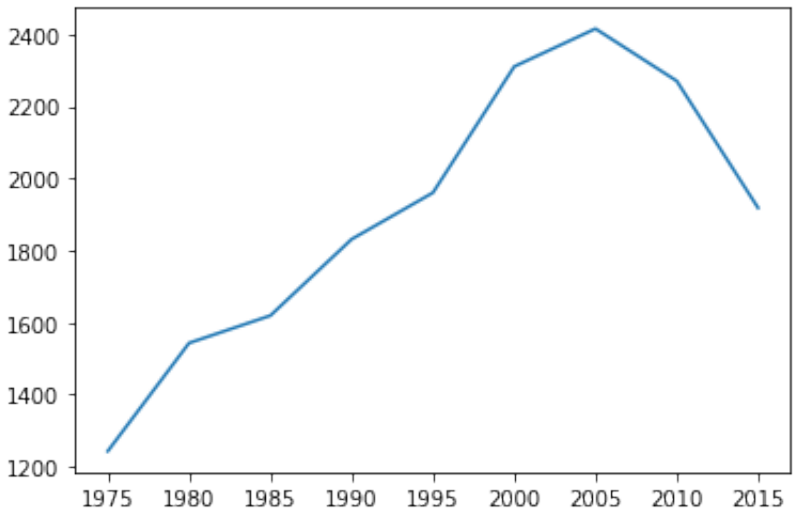
Notebook

Matplotlib can also be used in a Jupyter Notebook.
Start a `jupyter notebook` and create a `Carbon` notebook.
Start with the following cell (after a good title):

In [ ]:
```
from matplotlib import pyplot as plt
```

In [ ]:
```
years_x = [1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015]
total_y = [1243, 1543, 1619, 1831, 1960, 2310, 2415, 2270, 1918]
```

In [ ]:
```
plt.plot(years_x, total_y)
plt.show()
```



Notebook Tips

- You can use `ipywidgets` for interactive graphs

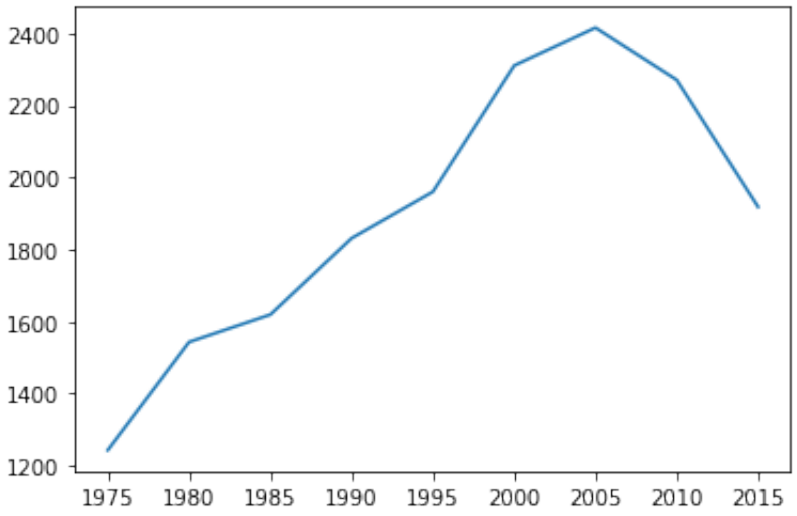
```
!pip install ipywidgets
```

```
%matplotlib widget # enable interactivity in your notebook
%matplotlib inline # get back to normal mode
```

❗ Warning: with widgets, you might encounter compatibility issues. We recommend you to use it only when needed.

- You don't need to type `plt.show()` in a notebook context.
  - Make sure to use `;` at the final line to avoid printing its output

In [ ]:
```
plt.plot(years_x, total_y);
```



Matplotlib Basics

Methods to call *before* `plt.show()` to **enrich** the plot.

Let's stick in `carbon.py` for now and run the code with

```
python carbon.py
```

Title

👉 `matplotlib.pyplot.title` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.title.html)

```
plt.title("USA - CO2 emissions from electricity production")
```

Axis labels

👉 `matplotlib.pyplot.xlabel` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.xlabel.html) and `matplotlib.pyplot.ylabel` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.ylabel.html)

```
plt.xlabel("Year")
plt.ylabel("CO2 - M of tons")
```

Axis ticks

👉 `matplotlib.pyplot.xticks` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.xticks.html) & `matplotlib.pyplot.yticks` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.yticks.html)

For example:

```
plt.xticks([1975, 1995, 2015], ['start', 1995, 'end'])
plt.yticks([0, 5000])
```

💡 2 more useful methods for axis: `matplotlib.pyplot.xlim` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.xlim.html) & `matplotlib.pyplot.ylim` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.ylim.html)

Let's add two more lines for **Coal** and **Natural gas** production:

```
coal_y = [823, 1136, 1367, 1547, 1660, 1927, 1983, 1827, 1352]
gas_y = [171, 200, 166, 175, 228, 280, 319, 399, 529]
```

And plot them:

```
plt.plot(years_x, coal_y)
plt.plot(years_x, gas_y)
```

Legend

👉 `matplotlib.pyplot.legend` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.legend.html)

First you need to add **labels** to each plot:

```
plt.plot(years_x, total_y, label="Total")
plt.plot(years_x, coal_y, label="Coal")
plt.plot(years_x, gas_y, label="Natural Gas")
```

Then call:

```
plt.legend(loc="best")
```

Grid

👉 `matplotlib.pyplot.grid` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.grid.html)

Example:

```
plt.grid(axis="y", linewidth=0.5)
```

Styles

Matplotlib comes with many **style sheets** (https://matplotlib.org/gallery/style_sheets/style_sheets_reference.html) to customize the look & feel of your graph.

In [ ]:
```
print(plt.style.available)
```

```
['Solarize_Light2', '_classic_test_patch', 'bmh', 'classic', 'dark_b
ackground', 'fast', 'fivethirtyeight', 'ggplot', 'grayscale', 'seabo
rn', 'seaborn-bright', 'seaborn-colorblind', 'seaborn-dark', 'seabor
n-dark-palette', 'seaborn-darkgrid', 'seaborn-deep', 'seaborn-mute
d', 'seaborn-notebook', 'seaborn-paper', 'seaborn-pastel', 'seaborn-
poster', 'seaborn-talk', 'seaborn-ticks', 'seaborn-white', 'seaborn-
whitegrid', 'tableau-colorblind10']
```

👉 `lib/matplotlib/mpl-data/stylelib` (https://github.com/matplotlib/matplotlib/tree/master/lib/matplotlib/mpl-data/stylelib) folder on GitHub

Using a style

In a Python script:

```
# After `matplotlib` import:
plt.style.use('seaborn')
```

In a Notebook, isolate the configuration to *one* plot to not pollute the whole context:

In [ ]:
```
with plt.style.context('seaborn'):
    # [...]
    plt.show()
```

Lines

You have total control over the `matplotlib.lines.Line2D` (https://matplotlib.org/api/_as_gen/matplotlib.lines.Line2D.html):

- `color` (https://matplotlib.org/api/colors_api.html) (cycled, see `plt.rcParams['axes.prop_cycle']`)
- `marker` (https://matplotlib.org/gallery/lines_bars_and_markers/marker_reference.html) (default: `None`)
- `linestyle` (https://matplotlib.org/gallery/lines_bars_and_markers/line_styles_reference.html) (default: `"-"`)
- `linewidth` (default: `1.5`)

For example:

```
plt.plot(years_x, total_y, color="#999999", linestyle=':', marker='s')
plt.plot(years_x, coal_y, linewidth=3)
```

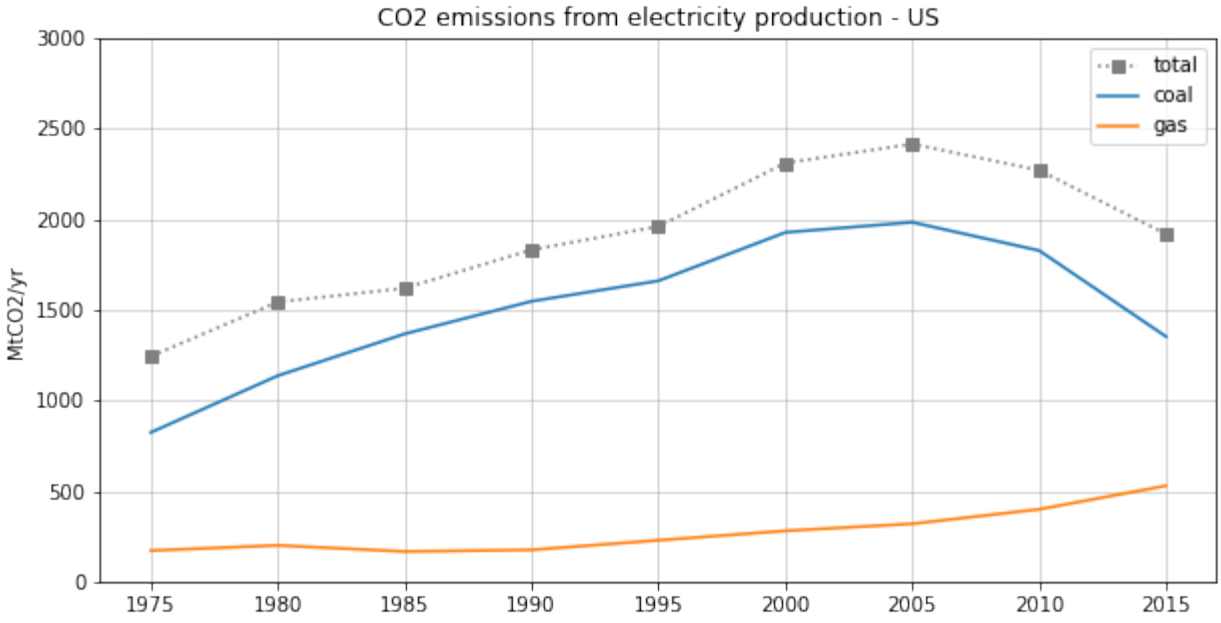
Figure Size

```
plt.figure(figsize=(10,5))
```

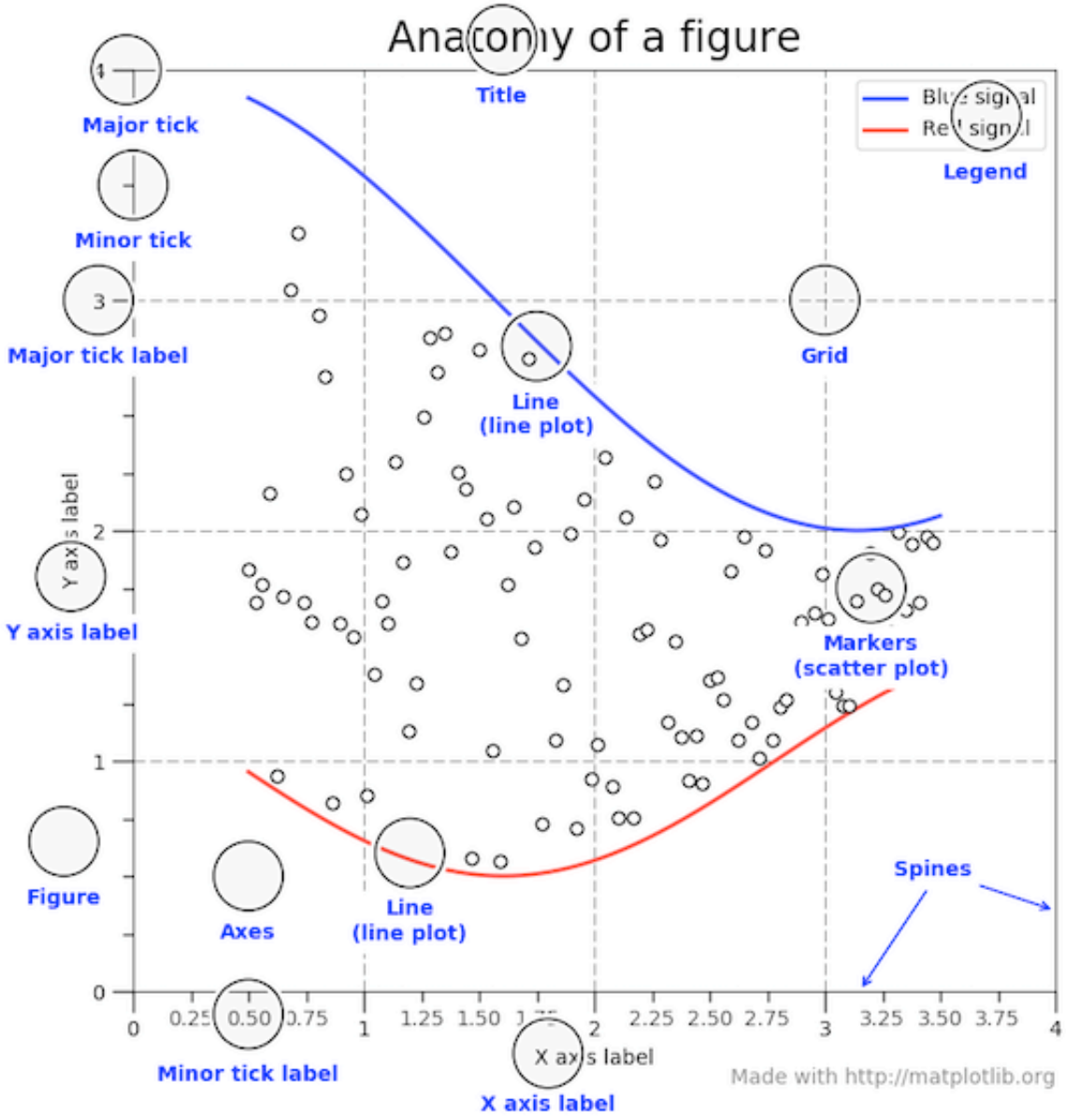
In [ ]:
```
plt.figure(figsize=(10,5))

# 3 lines plot
plt.plot(years_x, total_y, label='total', c="grey", ls=':', marker='
s')
plt.plot(years_x, coal_y, label='coal')
plt.plot(years_x, gas_y, label='gas')
# Decoration
plt.legend()
plt.title('CO2 emissions from electricity production - US')
plt.ylim((0,3000))
plt.ylabel('MtCO2/yr')
plt.grid(lw=0.5)

plt.show()
```



Matplotlib Advanced



Axes vs Axis

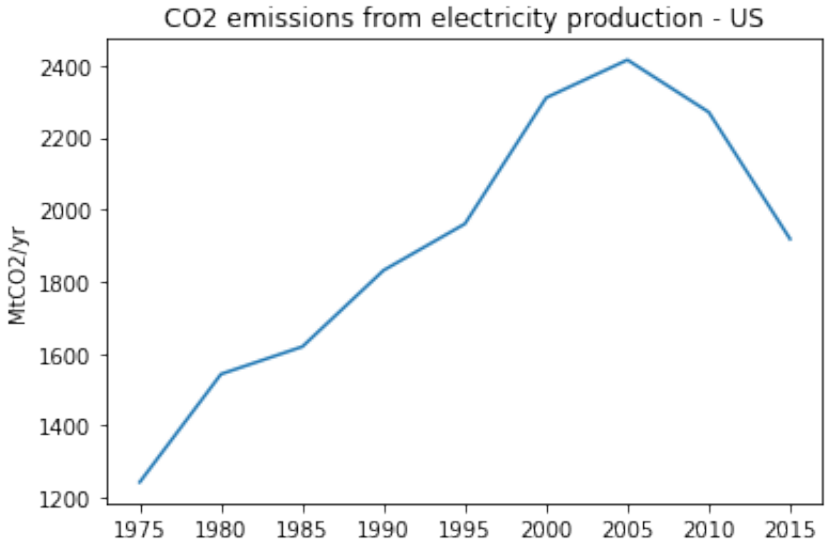
- Axis is the axis of the plot, the thing that gets ticks and tick labels.
- The axes is the area your plot appears in.

👉 `matplotlib.axes` (https://matplotlib.org/api/axes_api.html)

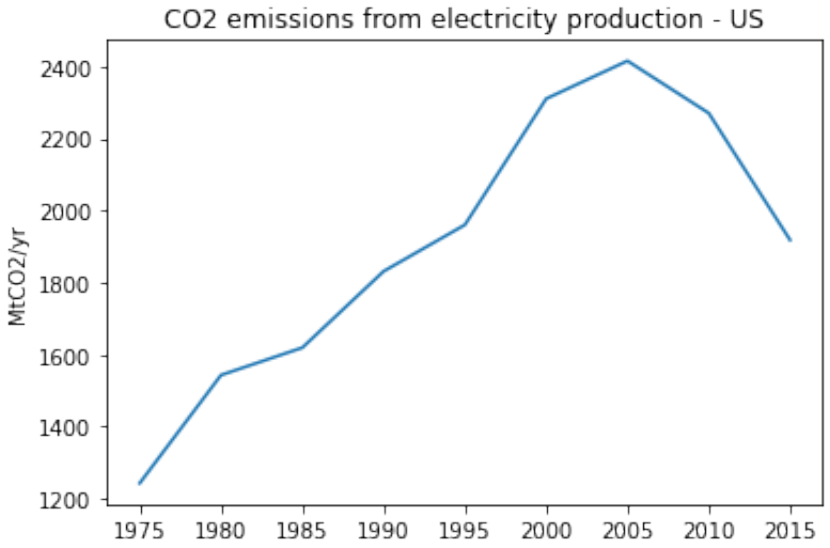
You can access the current `Axes` instance with `matplotlib.pyplot.gca` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.gca.html)

```
ax = plt.gca()
```

In [ ]:
```
# Let's take this simple example
plt.plot(years_x, total_y)
plt.ylabel('MtCO2/yr')
plt.title('CO2 emissions from electricity production - US')
plt.show()
```



In [ ]:
```
# And compare it with this one
plt.plot(years_x, total_y)
# Access the ax first
ax = plt.gca()
# then change its properties
ax.set_title('CO2 emissions from electricity production - US')
ax.set_ylabel('MtCO2/yr')
plt.show()
```



⚠️ Notice the difference:

- `matplotlib.pyplot.title` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.title.html)
- `matplotlib.axes.Axes.set_title` (https://matplotlib.org/api/_as_gen/matplotlib.axes.Axes.set_title.html)

🤔 Why would we want to access the `ax` ?

- For finetuning / customizing
- When creating multiple subplots
- For integration with other libraries (Pandas etc...)

Finetune axes' Spines

In [ ]:
```
ax.spines
```

Out[ ]:
```
OrderedDict([('left', <matplotlib.spines.Spine at 0x116e400d0>),
             ('right', <matplotlib.spines.Spine at 0x116e401c0>),
             ('bottom', <matplotlib.spines.Spine at 0x116e402b0>),
             ('top', <matplotlib.spines.Spine at 0x116e403a0>)])
```

You can remove a spine (or set a specific color!) with `Spine.set_color` (https://matplotlib.org/api/spines_api.html#matplotlib.spines.Spine.set_color):

```
ax.spines['right'].set_color(None)
```

You can also `Spine.set_position` (https://matplotlib.org/api/spines_api.html#matplotlib.spines.Spine.set_position):

```
ax.spines['bottom'].set_position(('axes', 0.5)) # half of y-axis
# or
ax.spines['bottom'].set_position(('data', 750)) # 750 on y-axis
```

💡 Useful in a Math context (https://scipy-lectures.org/intro/matplotlib/auto_examples/exercises/plot_exercise_7.html)

Figures, Subplots and Axes

A **figure** in matplotlib means the whole window in the UI.
Within this figure there can be several **subplots**
Subplots are arranged and numberd in a (nrow, ncol) grid as below

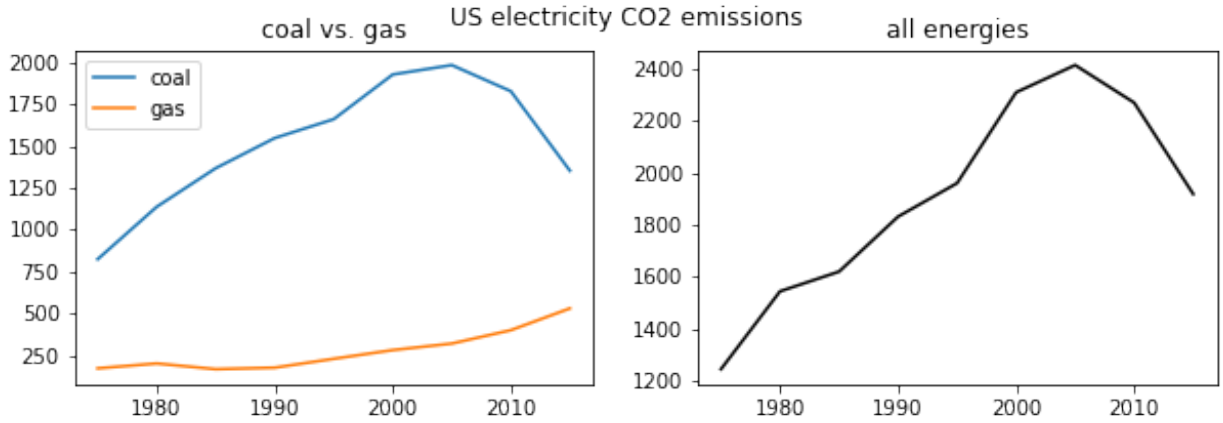
Subplots are instances of the **Axes** class

You can also create an axes without a subplot grid, by placing it in absolute position within a figure. 👉 stack overflow on axes vs. subplot (https://stackoverflow.com/a/43330553/7849552)

Multiple subplots on the same figure

State-based interface

In [ ]:
```
# Start a figure
plt.figure(figsize=(10,3))
# First subplot
plt.subplot(1,2,1)
plt.plot(years_x, coal_y, label="coal")
plt.plot(years_x, gas_y, label = "gas")
plt.title('coal vs. gas')
plt.legend()
# Second subplot
plt.subplot(1,2,2)
plt.plot(years_x, total_y, label="total", c='black')
plt.title("all energies")
# Global figure methods
plt.suptitle('US electricity CO2 emissions')
plt.show()
```



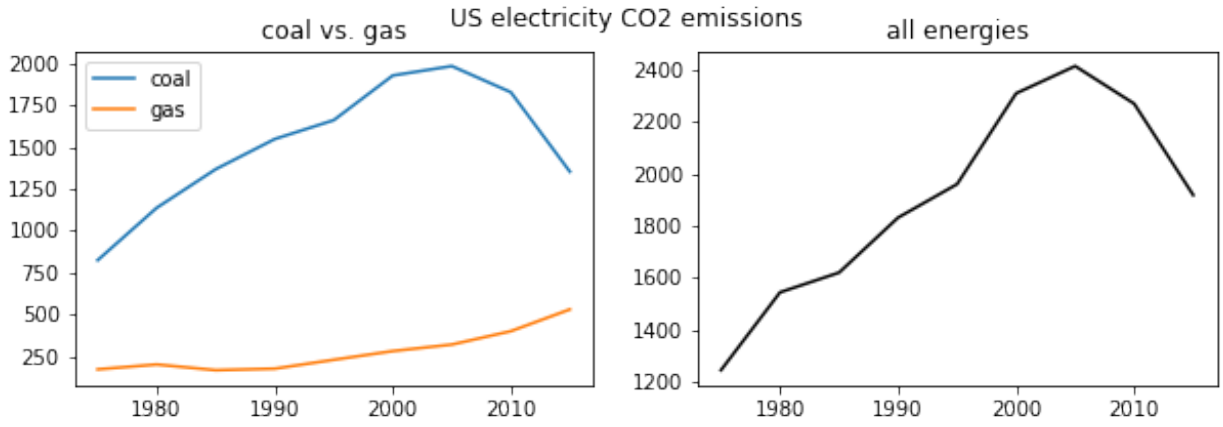
Object-oriented interface

In [ ]:
```
fig = plt.figure(figsize=(10,3))

# First subplot
ax1 = fig.add_subplot(1,2,1)
ax1.plot(years_x, coal_y, label="coal")
ax1.plot(years_x, gas_y, label = "gas")
ax1.set_title('coal vs. gas')
ax1.legend()

# Second subplot
ax2 = fig.add_subplot(1,2,2)
ax2.plot(years_x, total_y, c='black')
ax2.set_title('all energies')

# Global figure methods
fig.suptitle('US electricity CO2 emissions')
plt.show()
```



Instead of

```
fig = plt.figure()
ax1 = fig.add_subplot(1,2,1)
ax2 = fig.add_subplot(1,2,2)
```

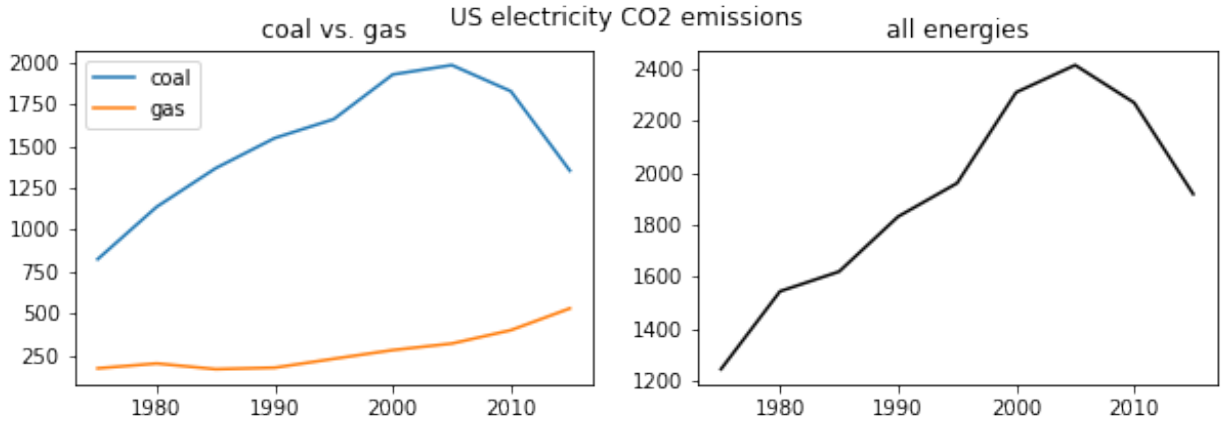
You will often find in the offical docs the shortcut

```
fig, (ax1, ax2) = plt.subplots(nrows=1, ncols=2)
```

It's called a **Destructuring assignment**

In [ ]:
```
# Destructuring initialization
fig, axs = plt.subplots(1, 2, figsize=(10,3)) # axs is a (1,2) nd-arra
y

# First subplot
axs[0].plot(years_x, coal_y, label="coal")
axs[0].plot(years_x, gas_y, label = "gas")
axs[0].set_title('coal vs. gas')
axs[0].legend()
# Second subplot
axs[1].plot(years_x, total_y, c='black')
axs[1].set_title('all energies')
# Global figure methods
plt.suptitle('US electricity CO2 emissions')
plt.show()
```



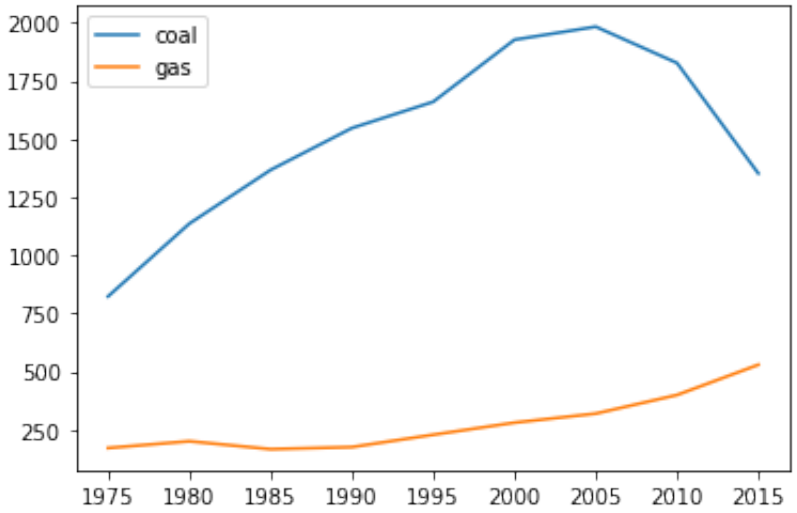
What about Pandas?

In [ ]:
```
import pandas as pd
df = pd.DataFrame({ 'coal': coal_y, 'gas': gas_y }, index=years_x)
df
```

Out[ ]:

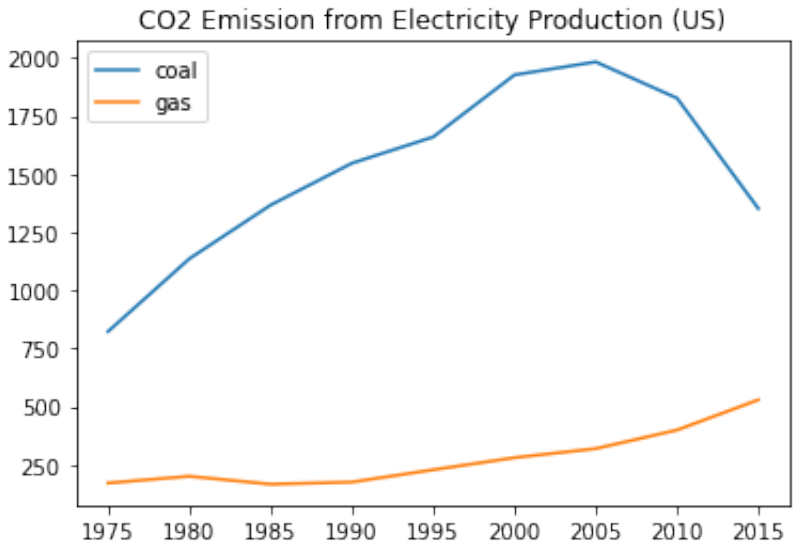
	coal	gas
1975	823	171
1980	1136	200
1985	1367	166
1990	1547	175
1995	1660	228
2000	1927	280
2005	1983	319
2010	1827	399
2015	1352	529

In [ ]:
```
df.plot();
```



In [ ]:
```
import pandas as pd
ax = df.plot()
ax.set_title('CO2 Emission from Electricity Production (US)')
ax
```

Out[ ]:
```
<AxesSubplot:title={'center':'CO2 Emission from Electricity Producti
on (US)'}>
```



In [ ]:
```
type(ax)
```

Out[ ]:
```
matplotlib.axes._subplots.AxesSubplot
```

In [ ]:
```
type(ax).__bases__
```

Out[ ]:
```
(matplotlib.axes._subplots.SubplotBase, matplotlib.axes._axes.Axes)
```

⚠️ **beware of the two `plot` methods**:

`pandas.DataFrame.plot`

```
df.plot() # plot all columns against the index
ax = df.plot() # this is an Axes, thanks to pandas
```

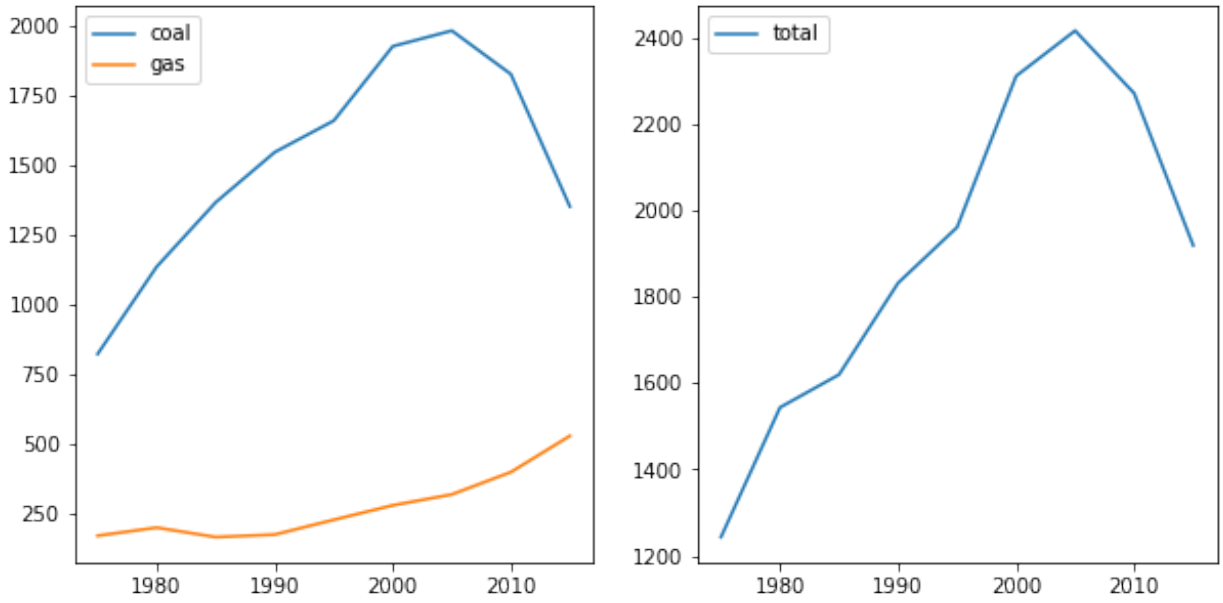
`matplotlib.pyplot.plot`

```
plt.plot(df) # not an Axes (matplotlib.lines.Line2D in our case)
ax = plt.gca() # get_current_axes method required to access it
```

2 plots with pandas

In [ ]:
```
df1 = pd.DataFrame({ 'coal': coal_y, 'gas': gas_y }, index=years_x)
df2 = pd.DataFrame({ 'total': total_y }, index=years_x)
fig, (ax1, ax2) = plt.subplots(1,2, figsize=(10,5))
df1.plot(ax=ax1)
df2.plot(ax=ax2)
```

Out[ ]: <AxesSubplot:>



Plot types

Let's explore other plot types than line charts that we can quickly draw with `matplotlib`

Scatter Plot

Type of plot using Cartesian coordinates `(x, y)` to display values one (or multiple) set(s) of data.

👉 `matplotlib.pyplot.scatter` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.scatter.html)

Let's plot the relationship between Views & Likes of Trending Youtube Videos (https://www.kaggle.com/datasnaek/youtube-new) of 2019

📚 raw csv (https://gist.githubusercontent.com/ssaunier/8044d6a7267223787ed143d0973e3ec6/raw/youtube.csv)

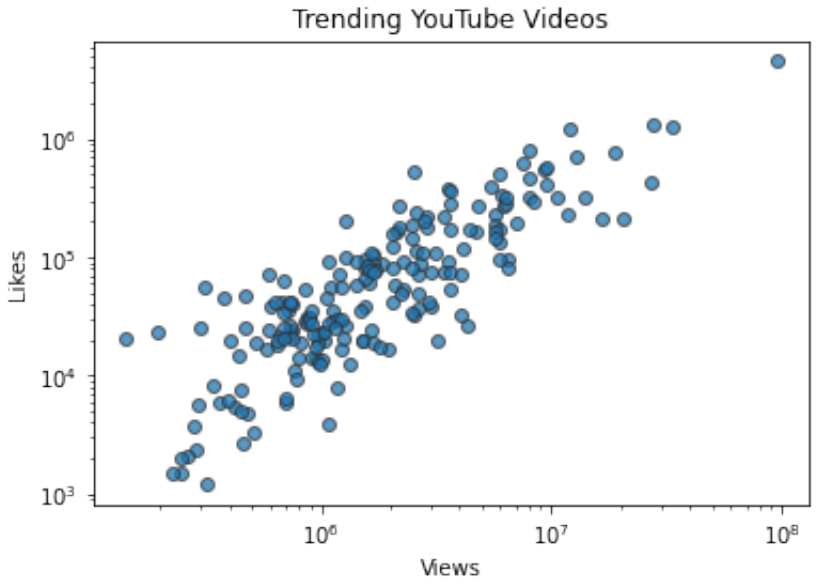
In [ ]:
```
data = pd.read_csv('https://gist.githubusercontent.com/ssaunier/8044d6a7267223787ed143d0973e3ec6/raw/youtube.csv')

plt.scatter(data['views'], data['likes'], edgecolor='#333333', alpha=0.75)

plt.xscale('log')
plt.yscale('log')

plt.title('Trending YouTube Videos')
plt.xlabel('Views')
plt.ylabel('Likes')
```

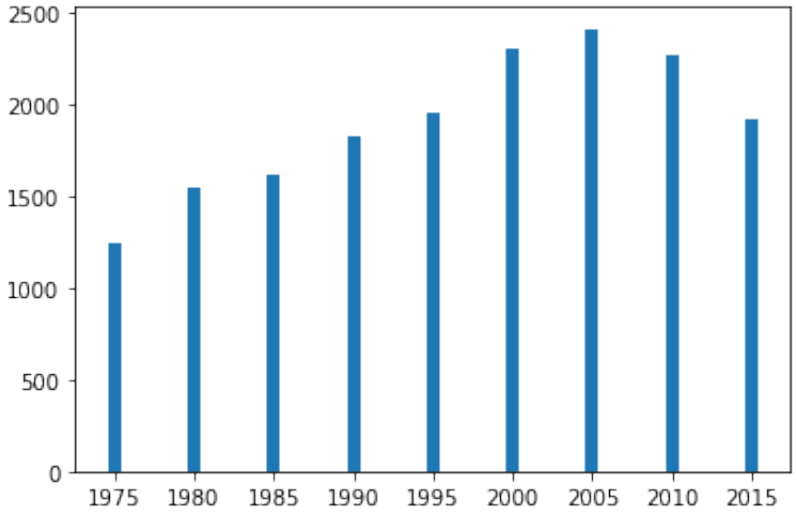
Out[ ]:
```
Text(0, 0.5, 'Likes')
```



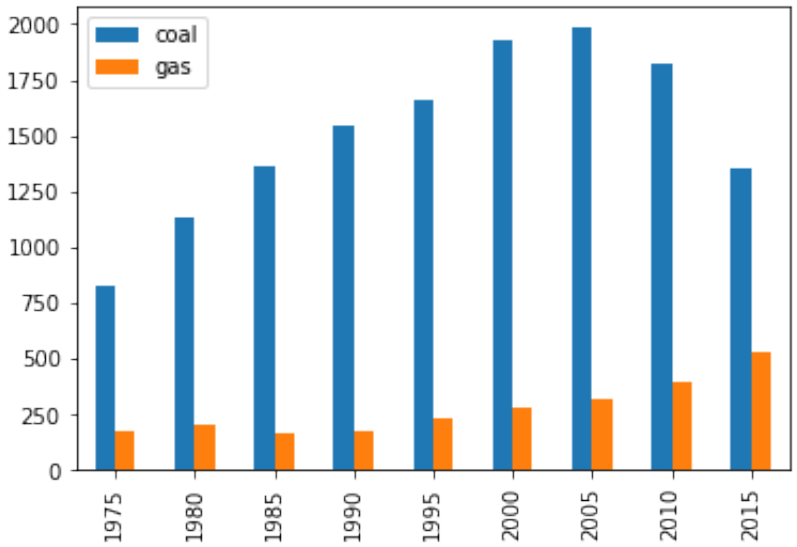
Bar Plot

👉 `matplotlib.pyplot.bar` (https://matplotlib.org/api/_as_gen/matplotlib.pyplot.bar.html)

In [ ]:
```
plt.bar(years_x, total_y);
```



In [ ]:
```
# with pandas
df.plot(kind='bar');
```

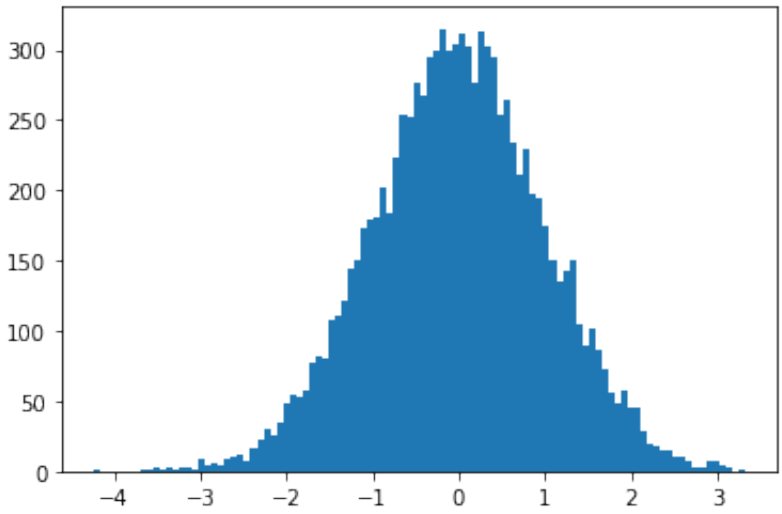


Histogram

A histogram is an accurate representation of the **distribution** of numerical data. We can use the `matplotlib.pyplot.hist` (https://matplotlib.org/3.1.1/api/_as_gen/matplotlib.pyplot.hist.html) function

In [ ]:
```
import numpy as np

x = np.random.normal(size=10_000) # Randomly pick 10_000 numbers
plt.hist(x, bins=100); # Vertical axis shows the frequencies of each b
in.
```



Seaborn

A Python data visualization library **built on top of `matplotlib`** . It provides a **high-level interface** for drawing attractive and informative statistical graphics.

Official page: seaborn.pydata.org (https://seaborn.pydata.org/)

👉 Gallery (https://seaborn.pydata.org/examples/index.html)

Install

In [ ]:
```
!pip install --quiet seaborn
```

Canonical import

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

Loading the `tips` dataset

You can preview it on GitHub here: mwaskom/seaborn-data (https://github.com/mwaskom/seaborn-data)

There are two ways to load the **same** `DataFrame` :

In [ ]:
```
tips_df = sns.load_dataset('tips')
# tips_df = pd.read_csv("https://raw.githubusercontent.com/mwaskom/seaborn-data/master/tips.csv")
tips_df.shape
```

Out[ ]:
```
(244, 7)
```

In [ ]:
```
tips_df.head(5)
```

Out[ ]:

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

One numeric variable (univariate)

We can use one of:

- Histogram
- Density plot

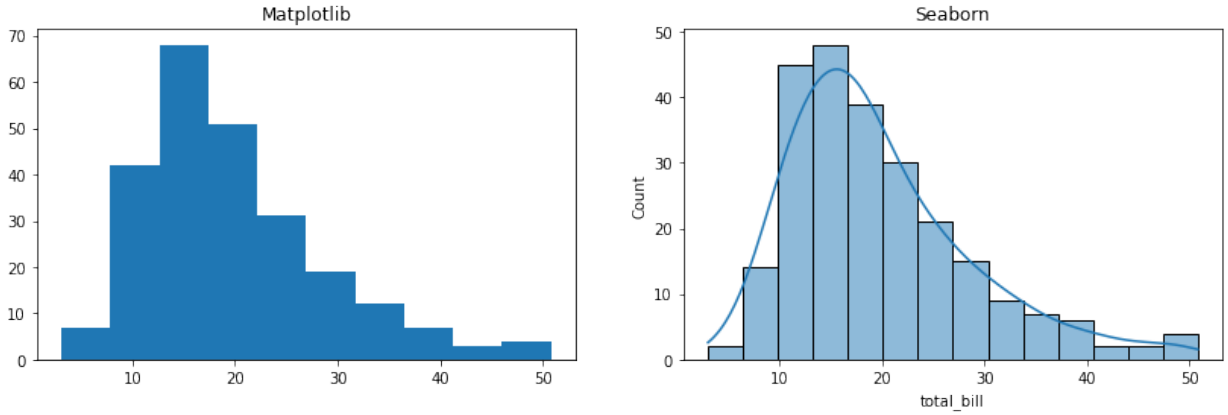
In Seaborn, we use **`histplot`** (http://seaborn.pydata.org/generated/seaborn.histplot.html)

🤔 Can you plot the distribution of the numeric variable `total_bill` ?

In [ ]:
```
plt.figure(figsize=(14, 4))

plt.subplot(1, 2, 1)
plt.title('Matplotlib')
plt.hist(tips_df['total_bill'])

plt.subplot(1, 2, 2)
plt.title('Seaborn')
sns.histplot(tips_df['total_bill'], kde=True);
```



One categorical variable

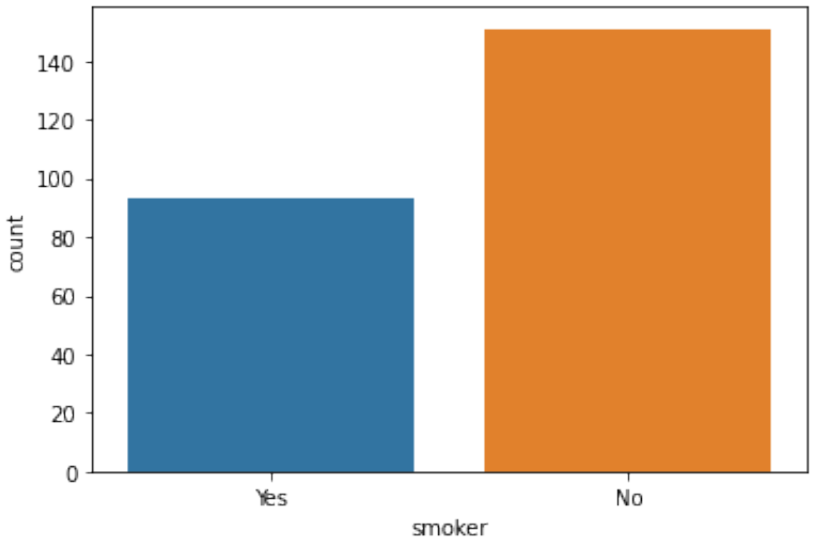
We can use one of:

- Barplot
- Pie/Doughnut charts (👎)

In Seaborn, we use **`countplot`** (https://seaborn.pydata.org/generated/seaborn.countplot.html)

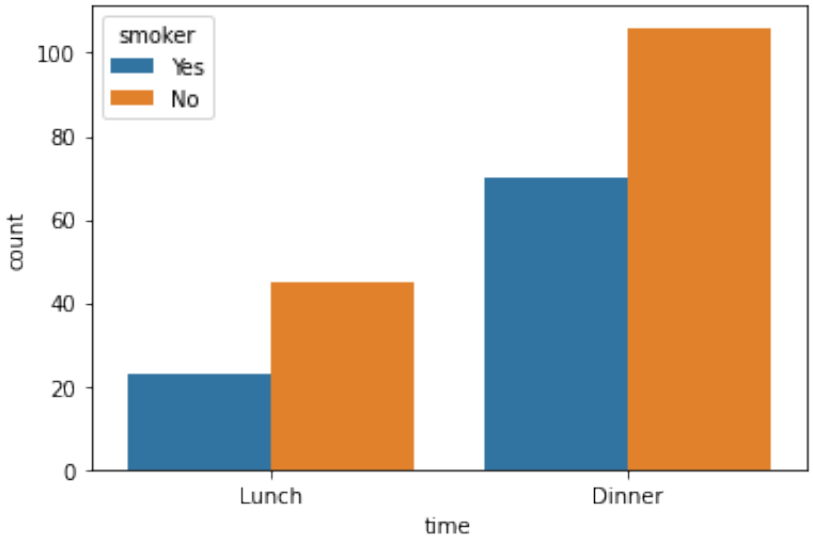
🤔 Are there more smokers than non-smokers in this restaurant clientele?

In [ ]:
```
sns.countplot(x="smoker", data=tips_df);
```



🤔 Are there more smokers at Lunch?

In [ ]:
```
sns.countplot(x="time", hue="smoker", data=tips_df);
```



One Numeric + One Categorical

We can use one of:

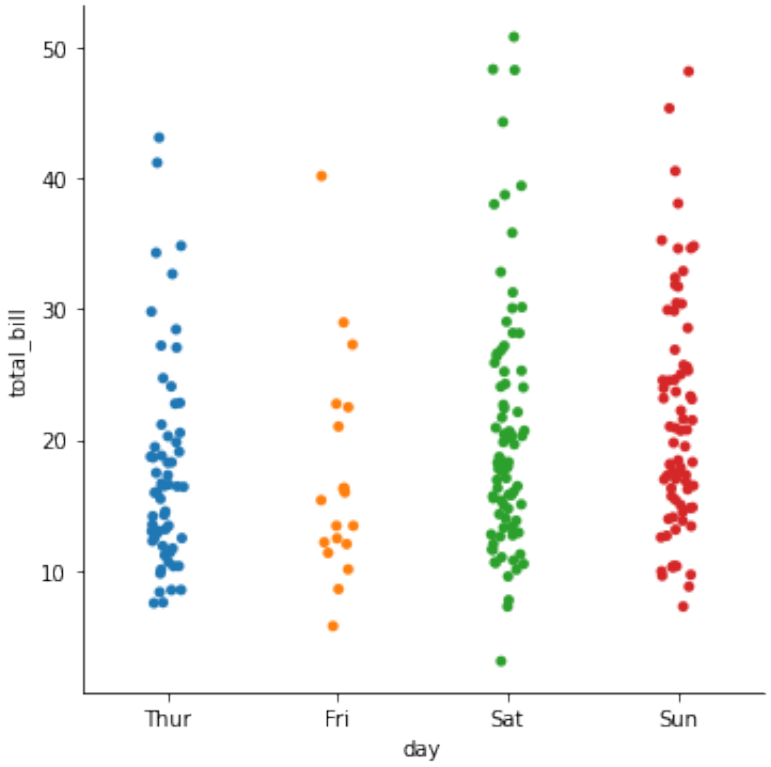
- Scatter plots
- Distribution plots (box, violin, etc.)

In Seaborn, we will use the unified API of `seaborn.catplot` (https://seaborn.pydata.org/generated/seaborn.catplot.html)

Categorical Scatter plot

```
In [ ]: sns.catplot(x='day', y='total_bill', data=tips_df)
```

```
Out[ ]: <seaborn.axisgrid.FacetGrid at 0x116f8eaf0>
```

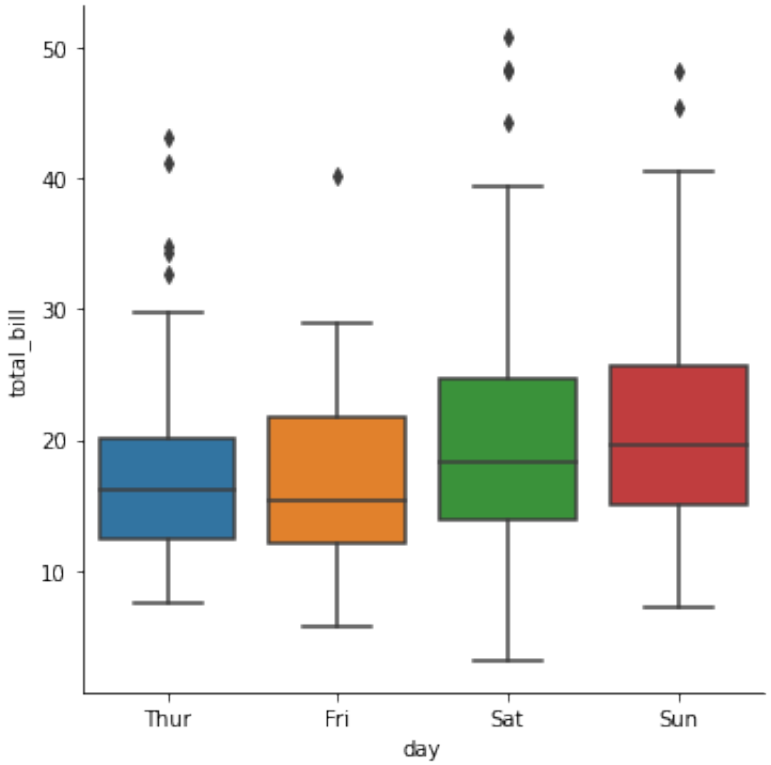


Categorical distribution plots

🤔 **What day** do people spend the most money in average at this restaurant?

Try using a `seaborn.catplot` (https://seaborn.pydata.org/generated/seaborn.catplot.html) with `kind` : `bar` , `box` , `violin` or `boxen`

In [ ]:
```
sns.catplot(x='day', y='total_bill', data=tips_df, kind="box");
```



Two numeric variables (bivariate)

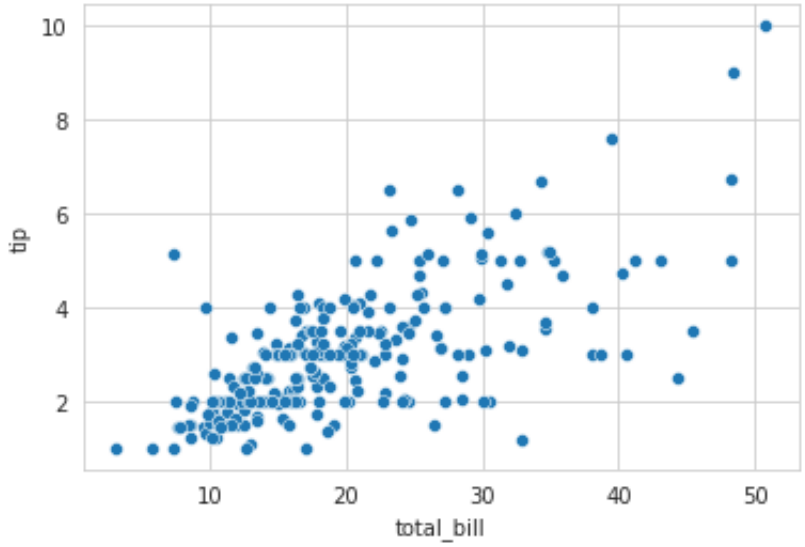
One can be `x` , the other can be `y` allowing to visualize **statistical relationship**.

Scatterplot

🤔 What is the relationship between the `tip` and the `total_bill` ?

Let's use `seaborn.scatterplot` (https://seaborn.pydata.org/generated/seaborn.scatterplot.html)

In [ ]:
```
with sns.axes_style('whitegrid'):
    # sns.set(style="whitegrid") for global change
    sns.scatterplot(x="total_bill", y="tip", data=tips_df);
```

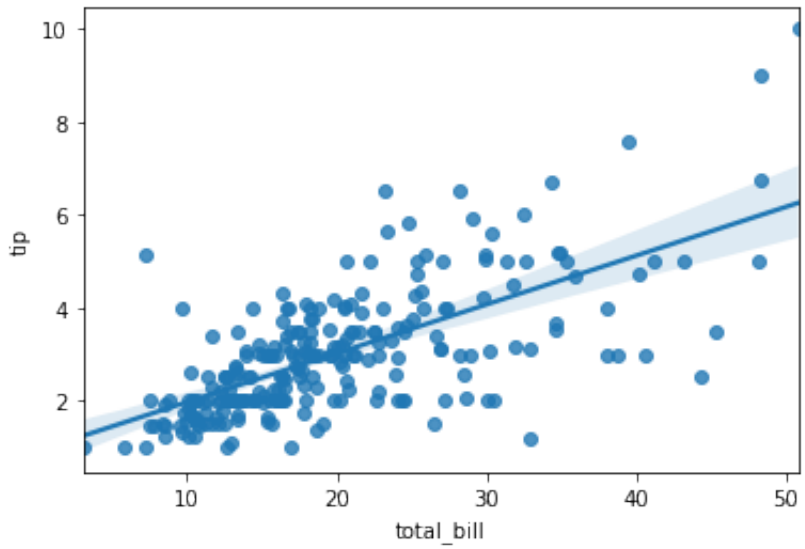


Regression

You can use `seaborn.regplot` (https://seaborn.pydata.org/generated/seaborn.regplot.html)

In [ ]:
```
sns.regplot(x='total_bill', y='tip', data=tips_df)
```

Out[ ]:
```
<AxesSubplot:xlabel='total_bill', ylabel='tip'>
```

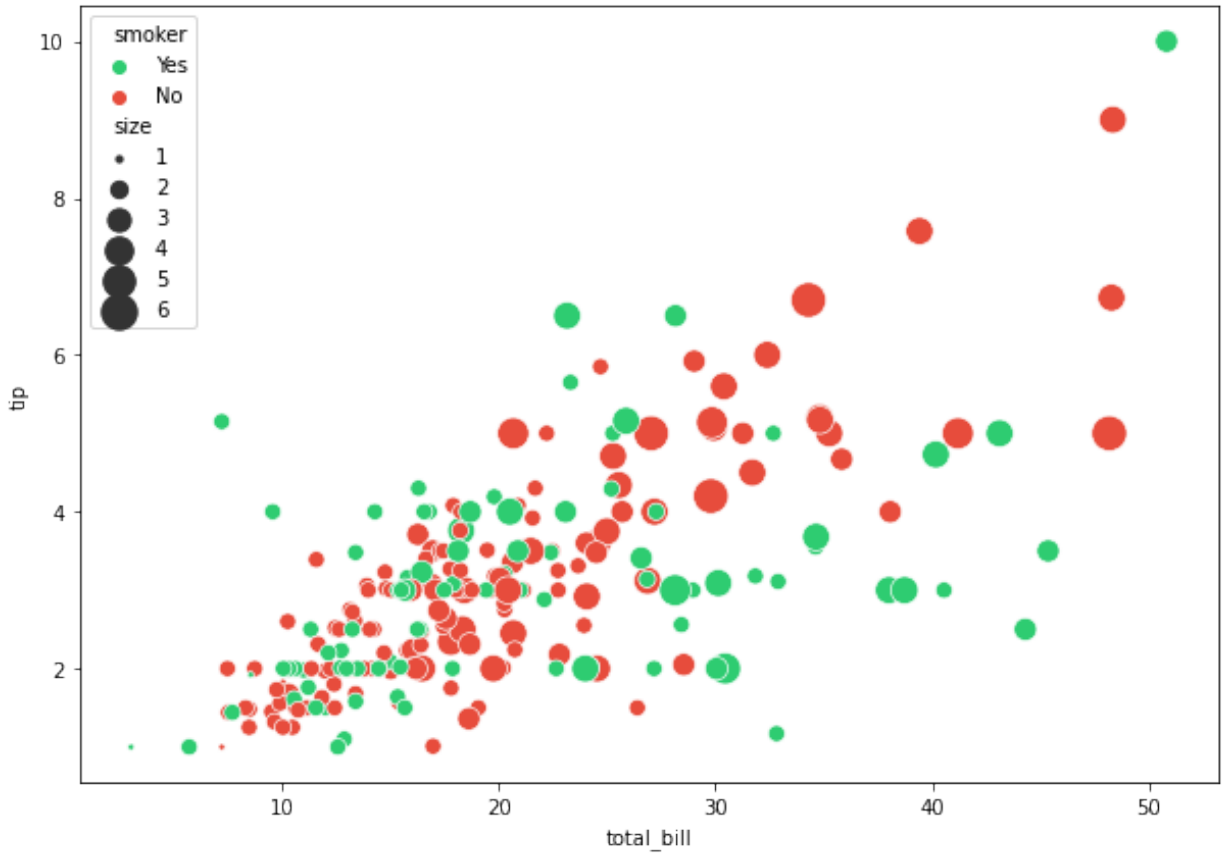


👉 Read more about visualizing linear relationships (https://seaborn.pydata.org/tutorial/regression.html) in Seaborn's documentation

💪 (3 numerical + 1 categorical) variables in 1 graph ??

In [ ]:
```
plt.figure(figsize=(10, 7))
sns.scatterplot(x="total_bill", y="tip", hue='smoker', size="size",
                palette=sns.color_palette(["#2ecc71", "#e74c3c"]),
                sizes=(10, 300), data=tips_df)
```

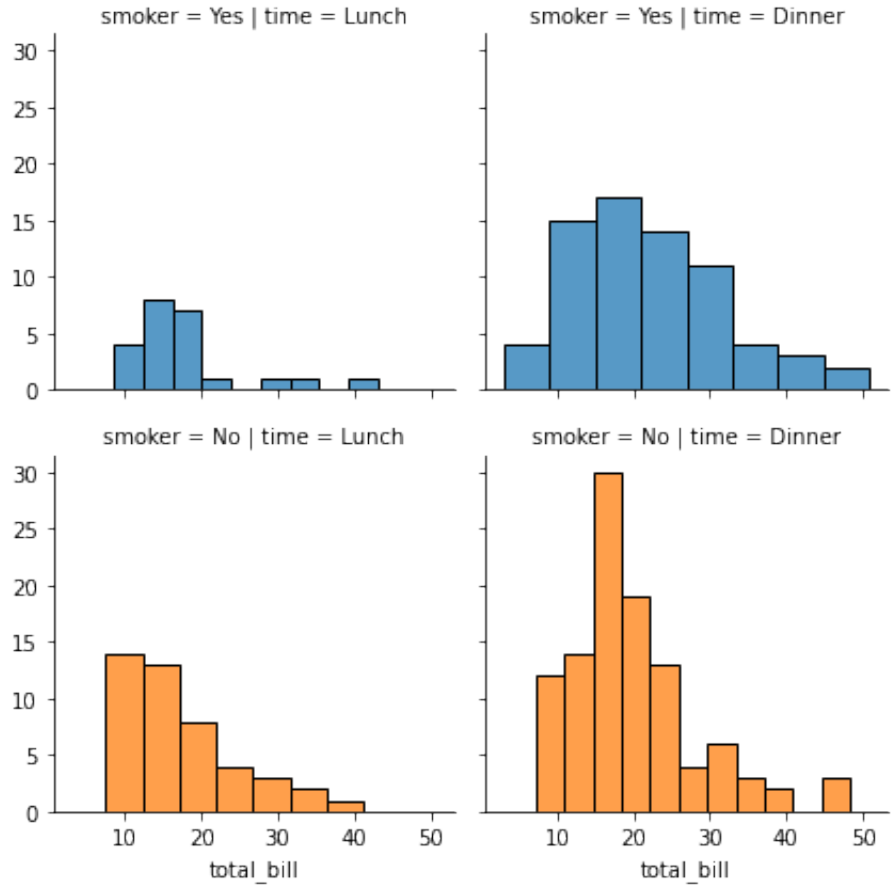
Out[ ]: <AxesSubplot:xlabel='total_bill', ylabel='tip'>



Facet grid - lets you plot the graph of your choice by groups

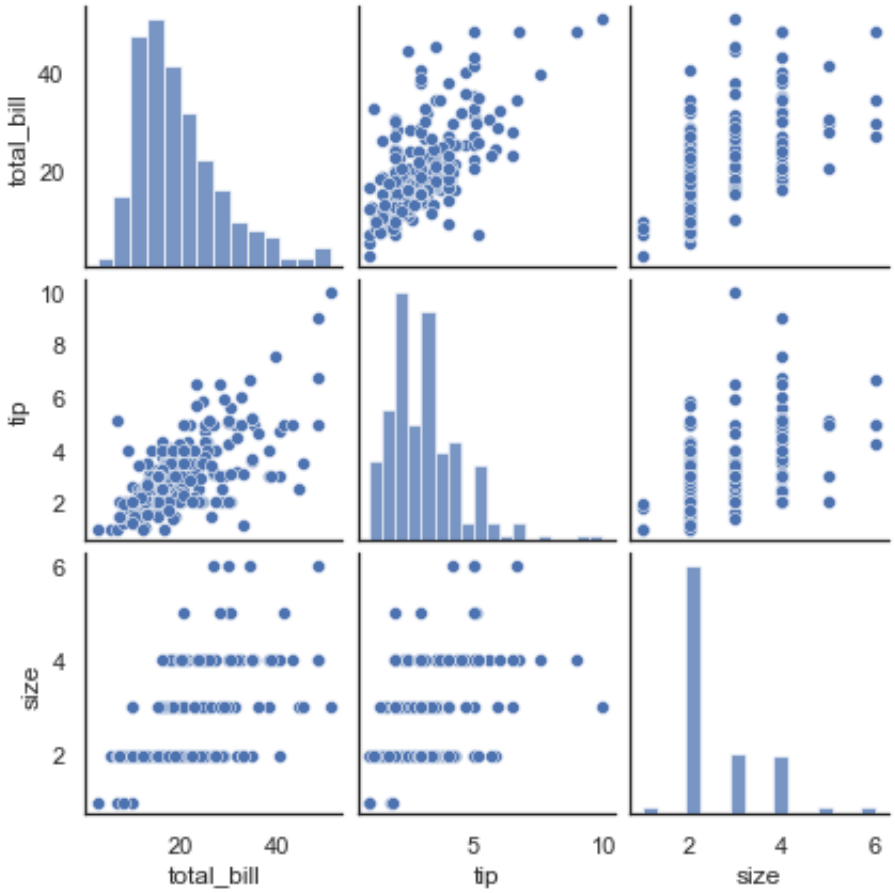
In [ ]:
```
# Create a grid
g = sns.FacetGrid(tips_df, col="time", row="smoker", hue="smoker")

# Plot a graph in each grid element
g.map(sns.histplot, "total_bill");
```



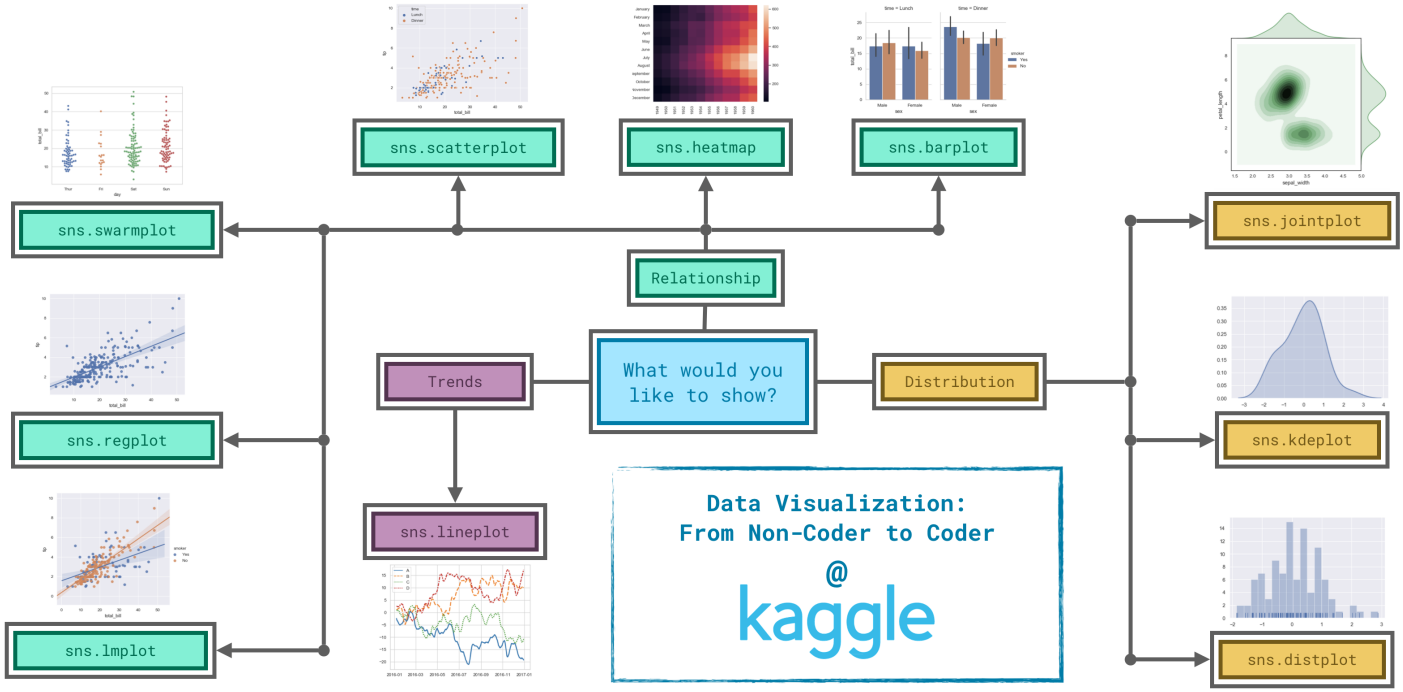
[Pair plots (https://seaborn.pydata.org/generated/seaborn.pairplot.html)](https://seaborn.pydata.org/generated/seaborn.pairplot.html) to automatically identify all *correlations* in a DataFrame

In [ ]:
```
sns.set(style='white')
sns.pairplot(tips_df, height=2)
plt.show()
```



Seaborn - Cheat sheets

cheatsheet (https://s3.amazonaws.com/assets.datacamp.com/blog_assets/Python_Seaborn_Cheat_Sheet.pdf)


sns.scatterplot
sns.heatmap
sns.barplot
sns.swarmplot
sns.jointplot
Relationship
What would you like to show?
Trends
Distribution
sns.regplot
sns.kdeplot
sns.lineplot
Data Visualization:
From Non-Coder to Coder
@
kaggle
sns.lmplot
sns.distplot

Le Wagon - Cheat Sheet

```
# LINE PLOTS
plt.plot(x=df.col1, y=df.col2, c='red', ls='--', lw='0.5')
sns.lineplot(data=df, x='col1', y='col2', hue='col3', size='col4')
# DISTRIBUTIONS
plt.hist()
sns.histplot()
sns.kdeplot()
sns.jointplot()
# SCATTER PLOTS
plt.scatter()
sns.scatterplot()
sns.regplot()
# COUNT PLOTS
sns.countplot()
# CAT PLOTS
plt.bar() # eg. plt.plot(kind='bar')
sns.barplot() # eg. catplot(kind="bar")
sns.violinplot() # eg. catplot(kind="violin")
sns.boxplot() # eg. catplot(kind="box")



# FACET GRID
g = sns.FacetGrid(data=df, col='col1')
g.map(plt.hist, 'col2')
# DATAFRAME-LEVEL MULTI CORRELATIONS
sns.heatmap(df.corr())
sns.pairplot(hue='')
## 2D HISTOGRAMS
plt.hist2d()
plt.colorbar()
sns.jointplot(x,y, kind='kde', data=df)
## 2D PROJECTION
plt.contour(X,Y,Z) # iso lines
plt.contourf(X,Y,Z=f(X,Y)) # area colors
```

Bonus: Plotly

Building **interactive** graphs (JavaScript!)

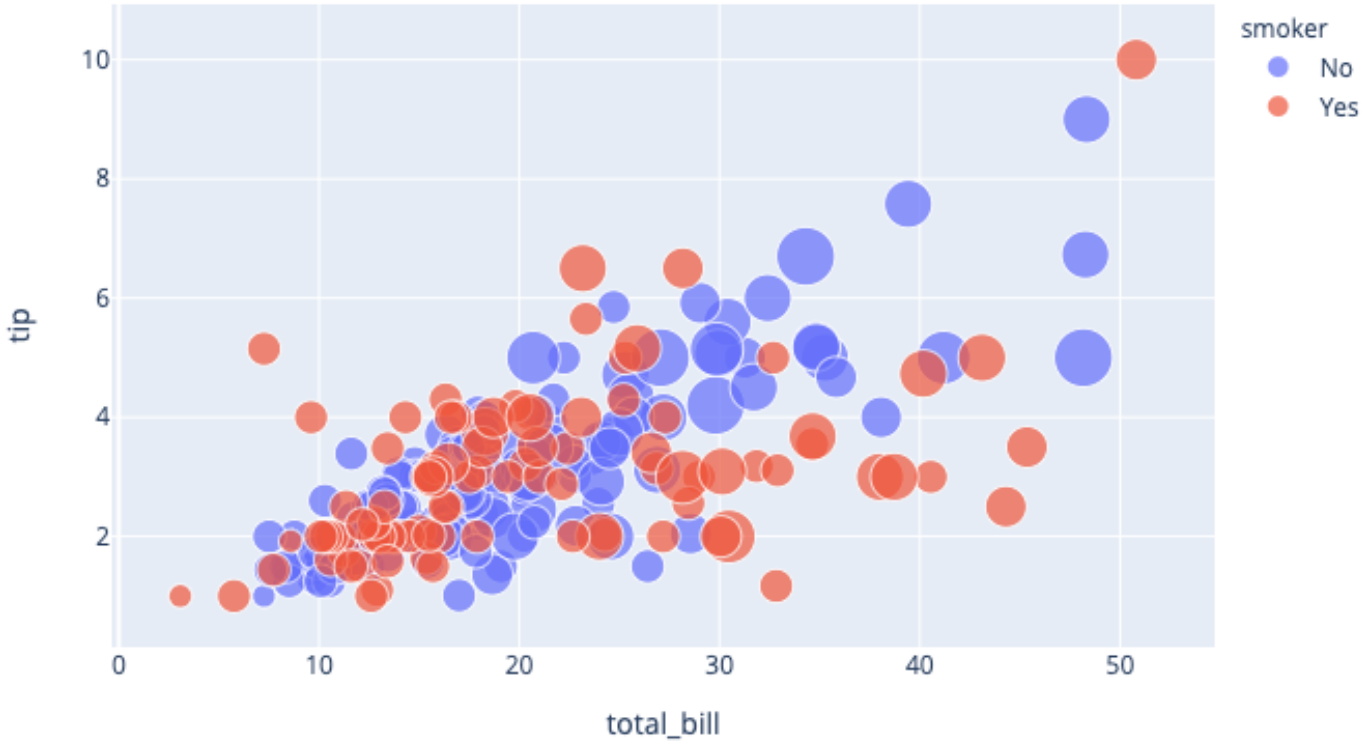
👉 Plot.ly Gallery (https://plot.ly/python/)

In [ ]:
```
!pip install --quiet plotly
```

In [ ]:
```
# Canonical import
import plotly.express as px
```

Scatter Plot

In [ ]:
```
tips = px.data.tips()
fig = px.scatter(tips, x="total_bill", y="tip", size="size", color="smoker")
fig.show()
```



Bibliography

- 📊 Matplotlib cheatsheet (https://matplotlib.org/cheatsheets/cheatsheets.pdf)
- 📊 Seaborn cheatsheet (https://s3.amazonaws.com/assets.datacamp.com/blog_assets/Python_Seaborn_Cheat_Sheet.pdf)
- 📚 Claus O. Wilke, Fundamentals of Data Visualization (https://clauswilke.com/dataviz/) (online book)
- 📚 Yan Holtz, From data to Viz (https://www.data-to-viz.com/) (website)
  - Decision Tree (https://www.data-to-viz.com/#explore)
  - Caveats (https://www.data-to-viz.com/caveats.html)
- 📄 How to tell a great story with Data Viz (https://www.kdnuggets.com/2021/02/telling-great-data-story-visualization-decision-tree.html)
- 📄 The many ways to call axes in Matplotlib (https://medium.com/towards-data-science/the-many-ways-to-call-axes-in-matplotlib-2667a7b06e06)

Your turn!