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Visualization with Python

Matplotlib, Seaborn, Plotly

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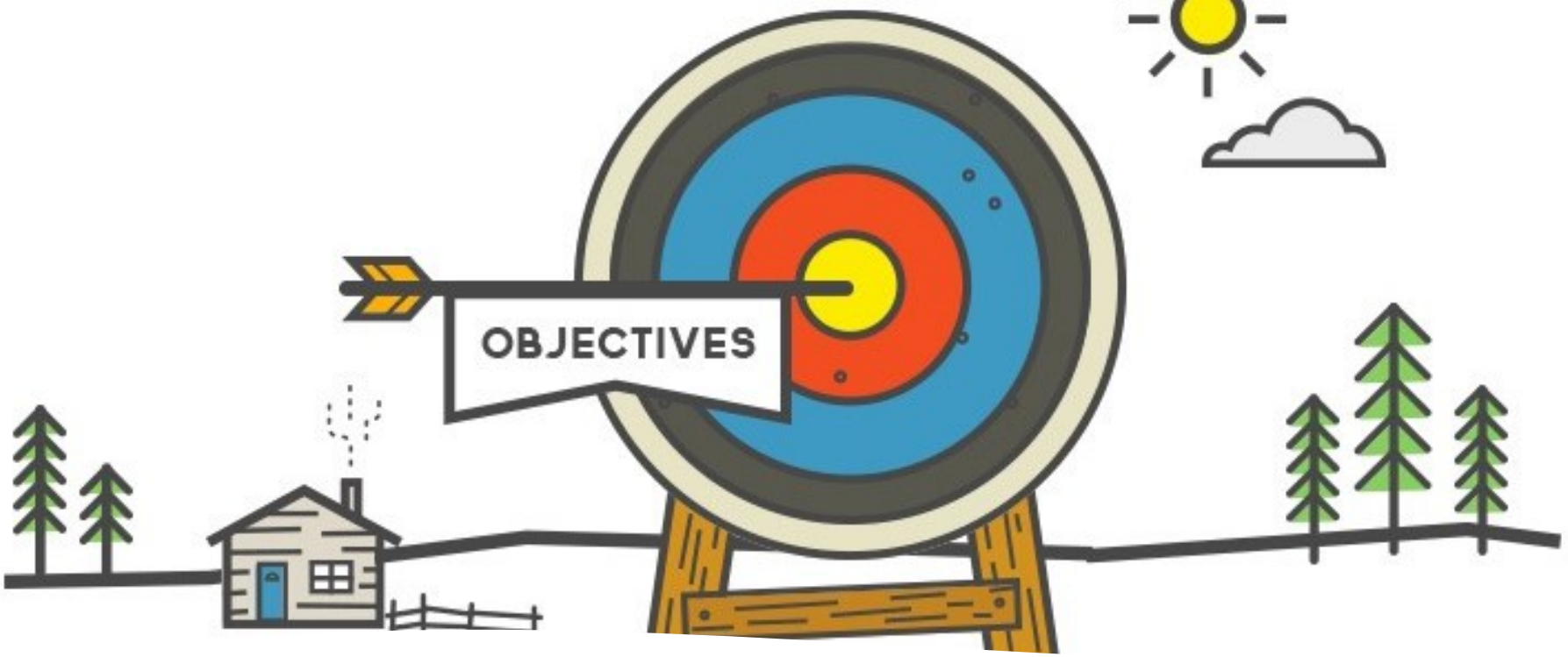
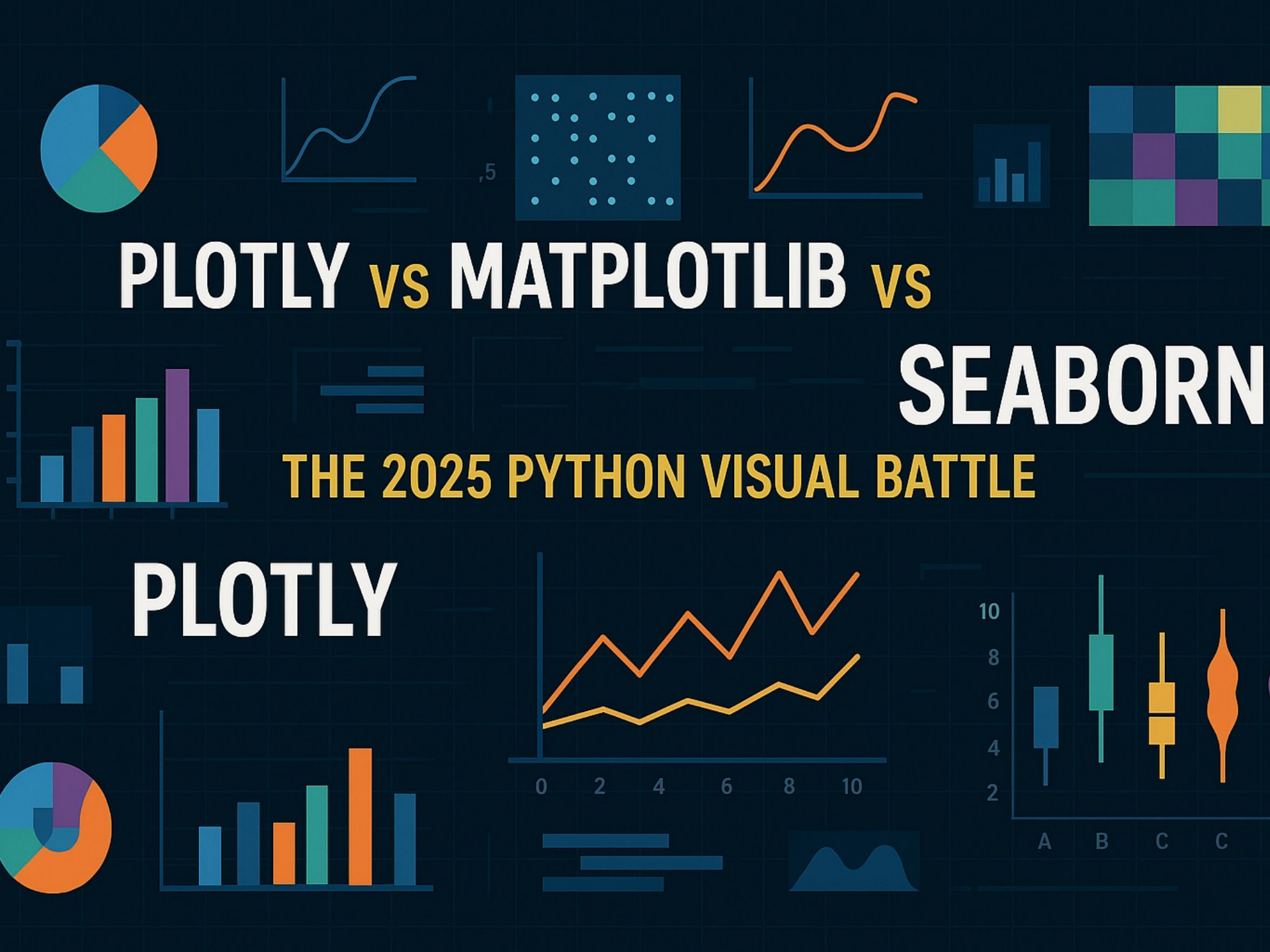


Learning Goals

By the end of this session, you will:

- Create clear, professional visualizations
- Choose the right tool: static vs interactive
- Prepare messy data for visualization
- Build interactive dashboards
- Analyze real-world datasets


PLOTLY vs MATPLOTLIB vs
SEABORN
THE 2025 PYTHON VISUAL BATTLE
PLOTLY
0 2 4 6 8 10
10 8 6 4 2
A B C C

Python Visualization Stack

- **Matplotlib** - low-level control
- **Seaborn** - statistical and beautiful
- **Plotly** - interactive dashboards

When to Use What

Feature	Matplotlib	Seaborn	Plotly
Default styling	⭐	⭐⭐⭐	⭐⭐⭐⭐
Ease of use	⭐⭐	⭐⭐⭐⭐	⭐⭐⭐
Interactivity	⭐	⭐	⭐⭐⭐⭐⭐
Customization	⭐⭐⭐⭐	⭐⭐	⭐⭐⭐
Dashboard-ready	❌	❌	✅

Tool	Best For
Matplotlib	Full customization
Seaborn	Quick statistical plots
Plotly	Interactive dashboards


matplotlib

Basic Plot

```
import matplotlib.pyplot as plt

x = [1,2,3,4]
y = [10,20,25,30]

plt.plot(x, y)
plt.title("Basic Line Plot")
plt.xlabel("X")
plt.ylabel("Y")
plt.show()
```

Customization

plt.plot(x, y, color='red', linestyle='--', marker='o’)

- Colors
- Markers
- Line styles

Multiple Plots

```
plt.plot(x, y)
plt.plot(x, [15,18,22,28])
plt.legend(["A", "B"])
```

Subplots

```
fig, ax = plt.subplots(1,2)

ax[0].plot(x,y)
ax[1].bar(x,y)
```

Exercise (5 min)

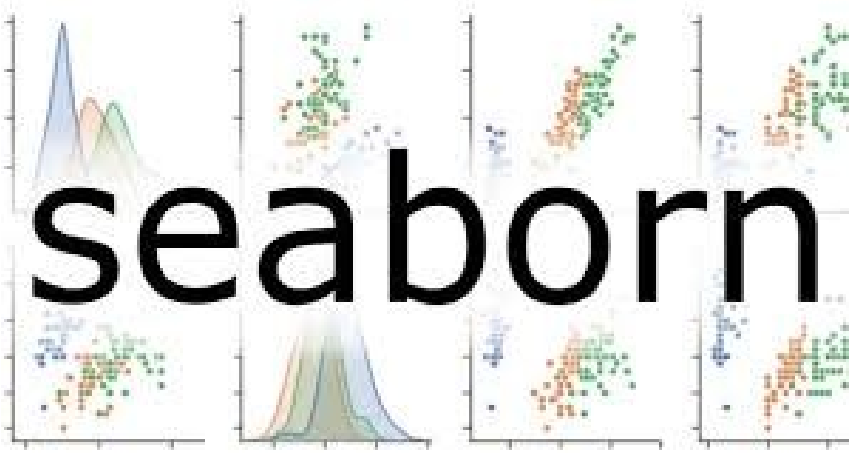
Create:

- Line chart
- Bar chart
- Add title and labels


seaborn

Why Seaborn

- Built on Matplotlib
- Better defaults
- Designed for data analysis

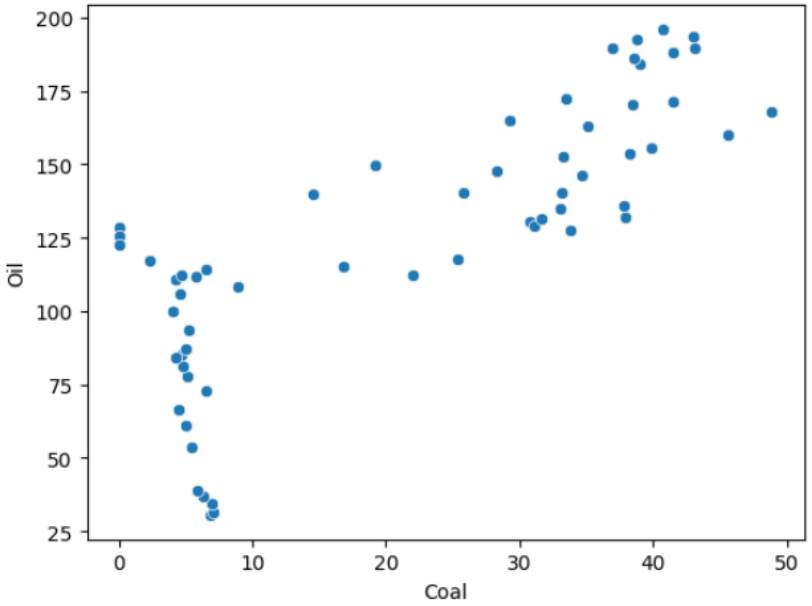


Load Dataset

```
import pandas as pd
import seaborn as sns
file="https://raw.githubusercontent.com/masterfloss/energyCountry/refs/heads/main/energy-consumption-by-source-and-country.csv"
df=pd.read_csv(file)
df.head()
```

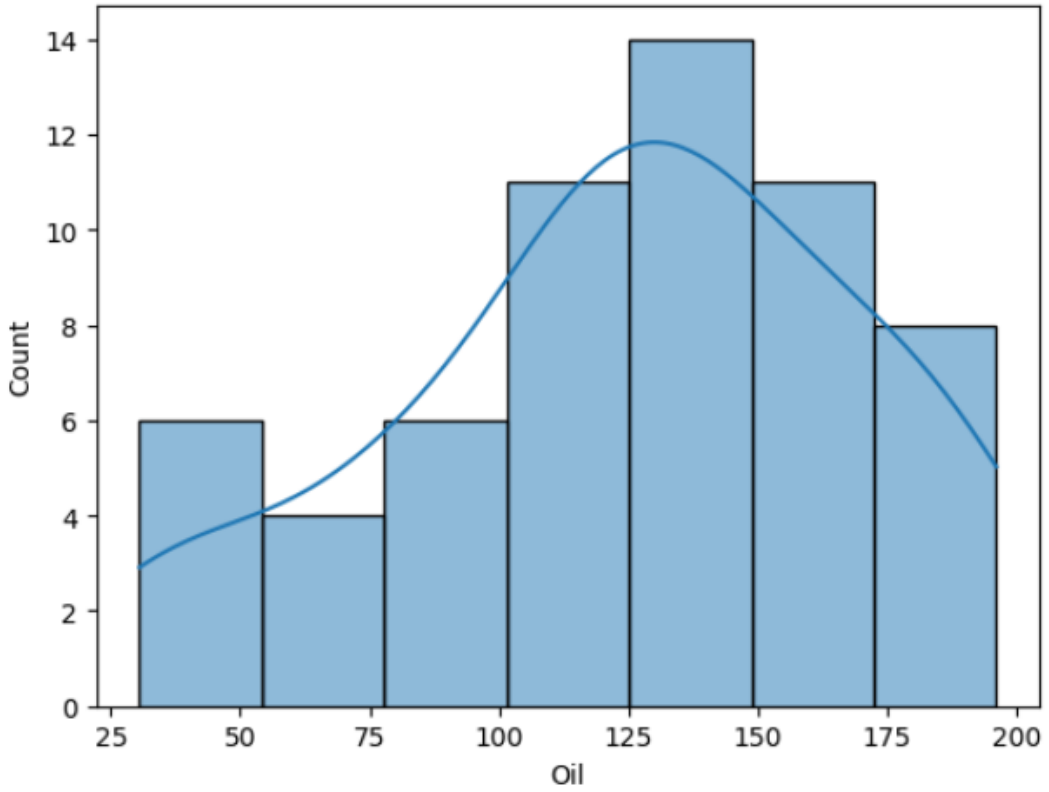
Scatter Plot

```
#Scatter Plot
dfP=df[df.Entity=="Portugal"]
sns.scatterplot(data=dfP, x="Coal", y="Oil")
```



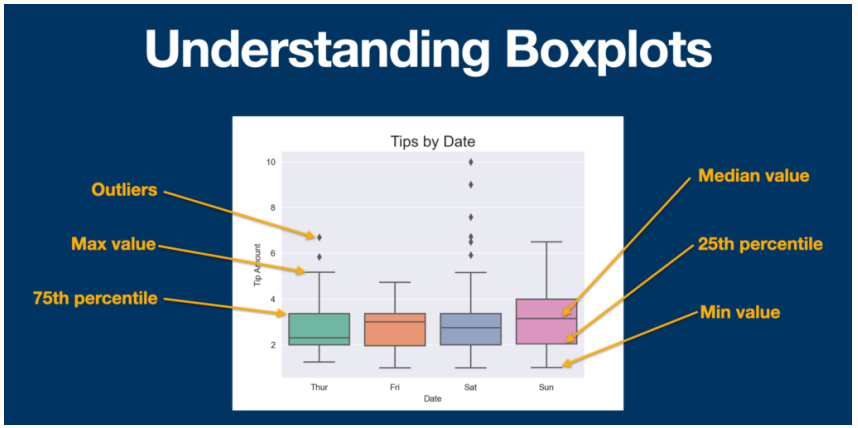
Distribution Plot

```
sns.histplot(dfP.dropna()["Oil"], kde=True)
```



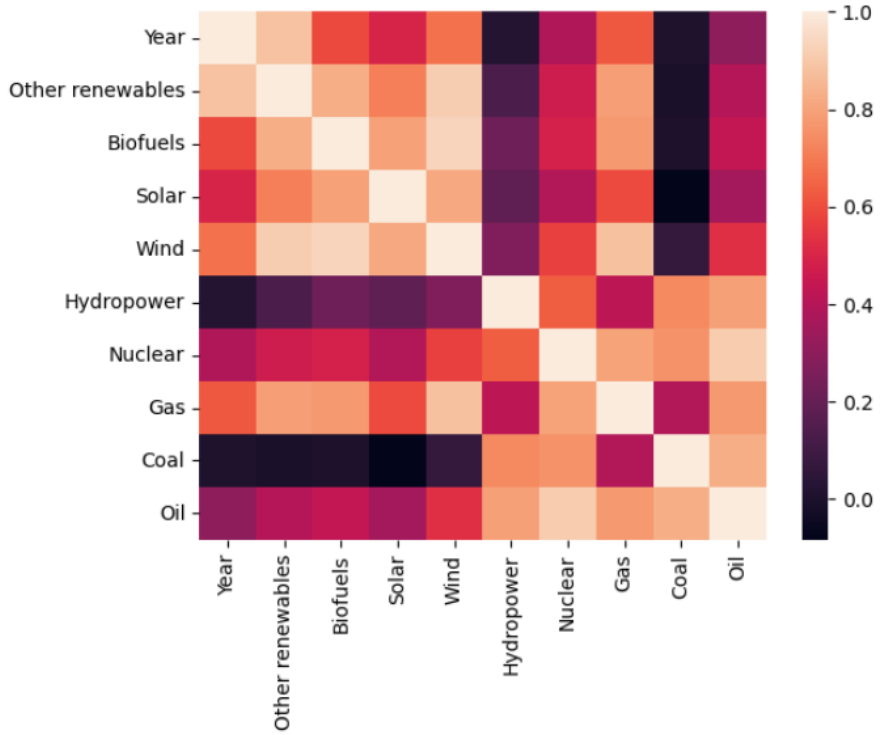
Boxplot

```
dfPS=df[(df.Entity=="Portugal") | (df.Entity=="Spain")]
sns.boxplot(data=dfPS, x="Entity", y="Oil")
```



Heatmap (Correlation)

```
Df_Nb=dfPS.select_dtypes(include='number’)
sns.heatmap(Df_Nb.corr())
```



Exercise (5 min)

- Using dataset:
- Create:
  - Histogram
  - Boxplot
  - Heatmap


plotly

Why Plotly

- Interactive charts
- Zoom, hover, filter
- Great for dashboards

Basic Plot

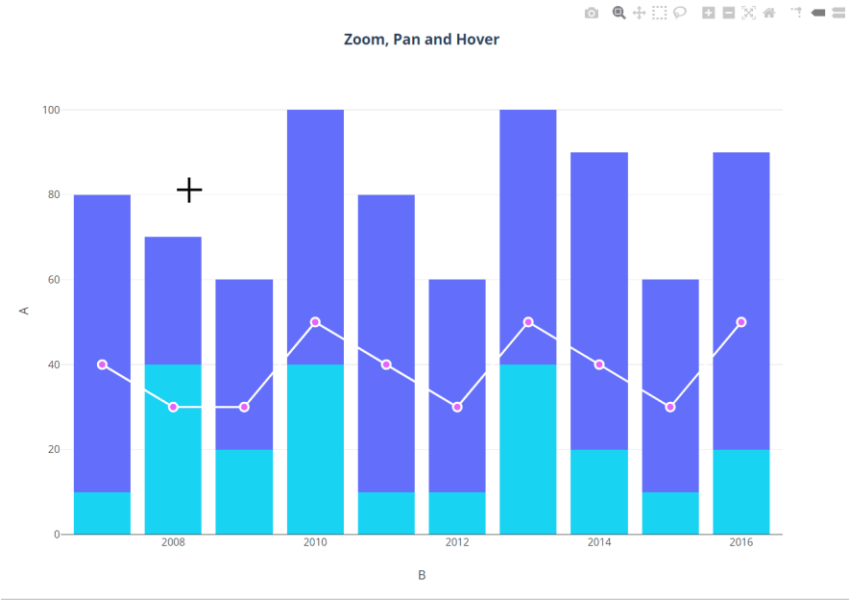
```
import plotly.express as px

fig = px.scatter(dfPS, x="Coal", y="Oil")
fig.show()
```

```
fig = px.scatter(dfPS, x="Coal", y="Oil", )
fig.show()
```

Interactive Features

- Hover info
- Zoom
- Dynamic filtering



Interactive Bar Chart

```
fig = px.bar(dfPS, x="Year", y="Solar", color="Entity")
fig.show()
```

Dashboard Style

```
fig = px.scatter(dfPS, x="Coal", y="Oil",
                 size="Solar", color="Entity")
fig.show()
```

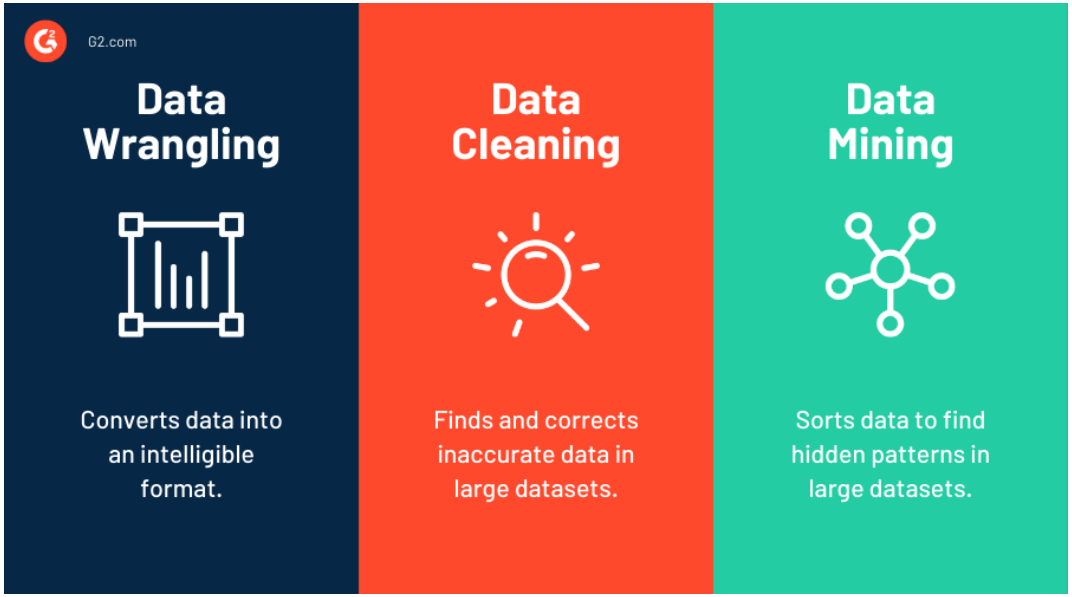
Exercise (5 min)

Create:

- Interactive scatter
- Add color + size dimensions

DATA WRANGLING

- **Why Data Prep Matters**
  - Bad data contribute to misleading charts



Common Tasks

- Handling missing values
- Filtering
- Grouping
- Aggregation

Example

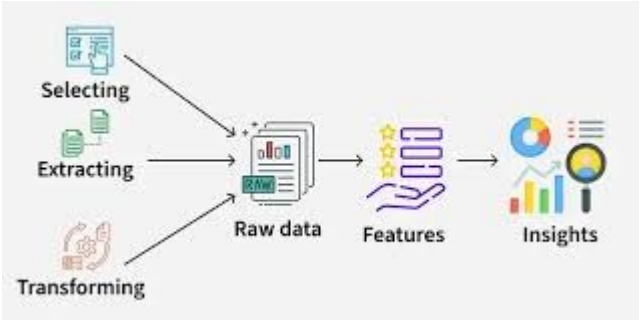
```
df.groupby("Entity")["Per capita energy consumption"].mean()
```

Cleaning Data

df.dropna()
df.fillna(0)

Feature Engineering

- Feature Selection
- Feature Transformation
- Feature Creation (Encoding, Binning)
- Feature Extraction (Automated in Deep Learning)



Feature Engineering

```
file1=https://raw.githubusercontent.com/masterfloss/energyCountry/refs/heads/main/energy-consumption-by-source-and-country.csv
file2=https://raw.githubusercontent.com/masterfloss/energyCountry/refs/heads/main/per-capita-energy-use.csv

df1 = pd.read_csv(file1)
df2 = pd.read_csv(file2)
df_merged = pd.merge(df1, df2, on=['Entity', 'Year'], how='inner')
df_merged.head()
```

Feature Engineering

```
listEnergies=['Other
renewables','Biofuels','Solar','Wind','Hydropower','Nuclear','Gas','Co
al','Oil']

total_energy = df_merged[listEnergies].sum(axis=1)


for i in listEnergies:
    df_merged[i+'_percentual'] = df_merged[i] / total_energy
```

Lab Task (20 min)

- Obtain Dataset
- Clean dataset
- Create:
  - Line plot
  - Boxplot
  - Heatmap
- Build:
  - Interactive Plotly chart

Extra

- Create a **mini dashboard**
- Combine:
  - Scatter
  - Bar
  - KPI metric

Key Takeaways

- Matplotlib - control
- Seaborn - simplicity and stats
- Plotly - interactivity
- Data prep is essential

Q&A / Discussion

"Any questions?"