

Visualization Library Documentation Guide: Matplotlib & Seaborn

Matplotlib

Matplotlib is a foundational plotting library in Python, providing control over every aspect of a figure. It is ideal for creating static, high-quality 2D plots.

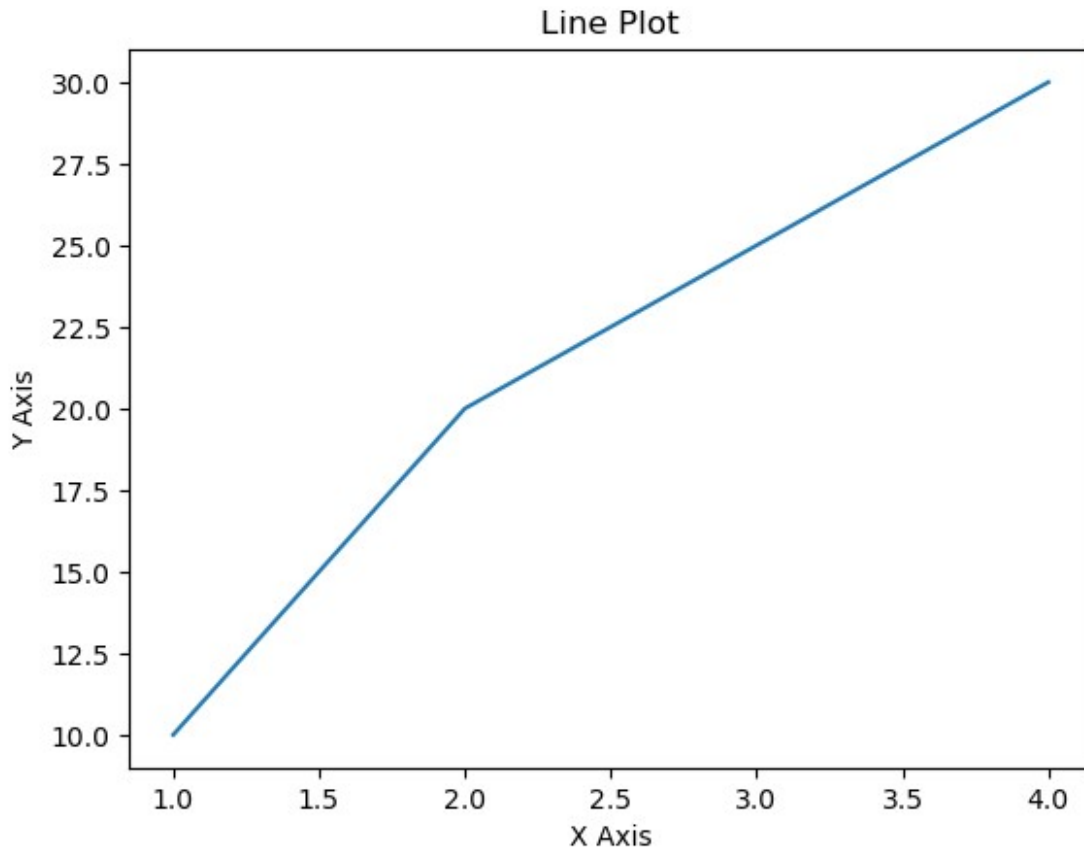
Suitable for publication-quality figures, detailed customization, and compatibility with many scientific libraries.

Line Plot

Use Case: Visualizing trends over time or ordered data.

```
## Line Plot

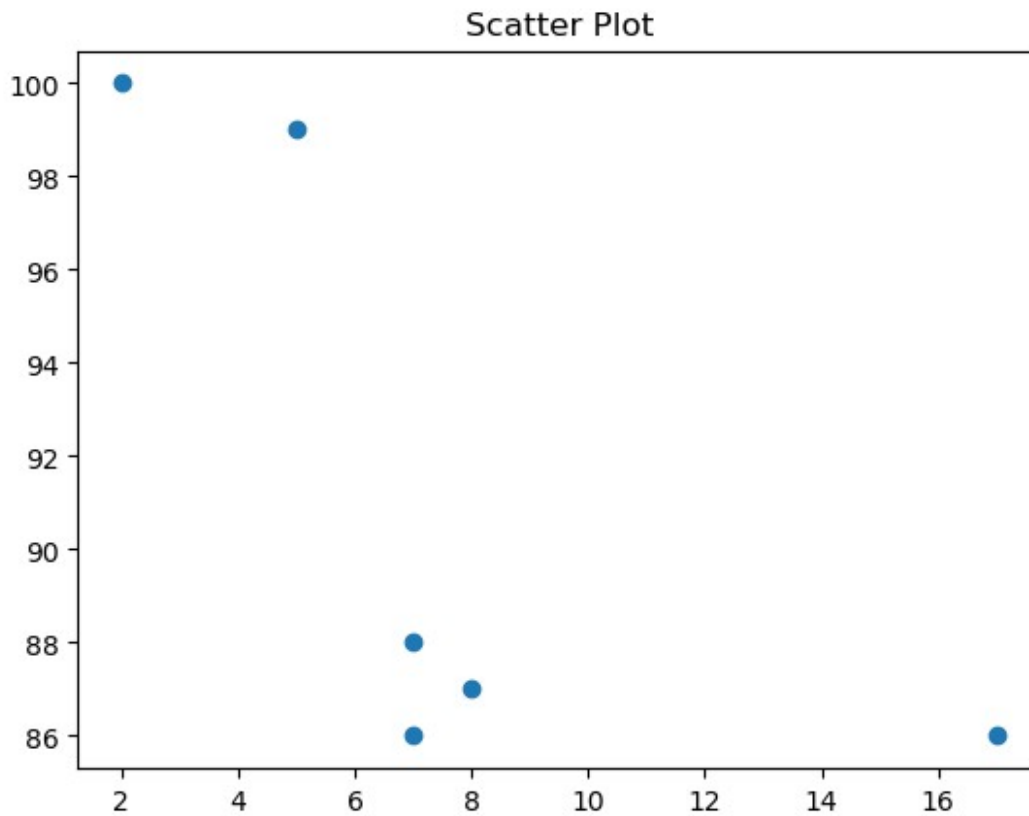
import matplotlib.pyplot as plt
x = [1, 2, 3, 4]
y = [10, 20, 25, 30]
plt.plot(x, y)
plt.title("Line Plot")
plt.xlabel("X Axis")
plt.ylabel("Y Axis")
plt.show()
```



Scatter Plot

Use Case: Showing relationships between two variables.

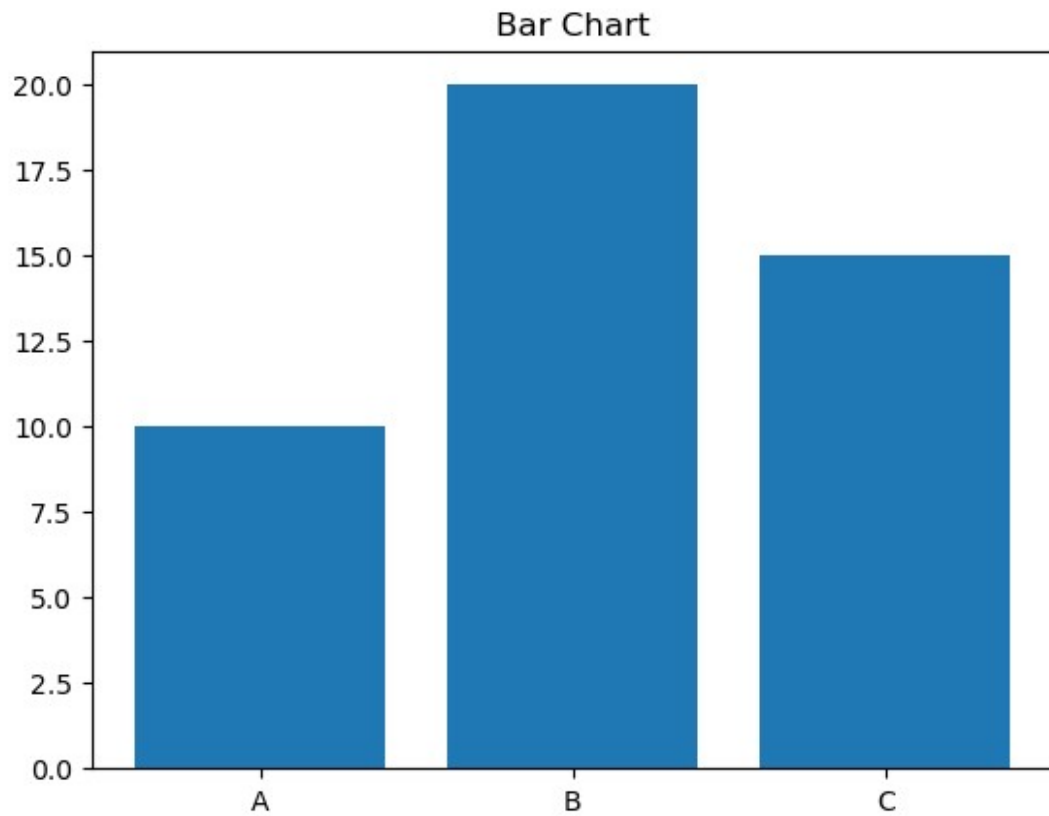
```
x = [5, 7, 8, 7, 2, 17]
y = [99, 86, 87, 88, 100, 86]
plt.scatter(x, y)
plt.title("Scatter Plot")
plt.show()
```



Bar Chart

Use Case: Comparing categories.

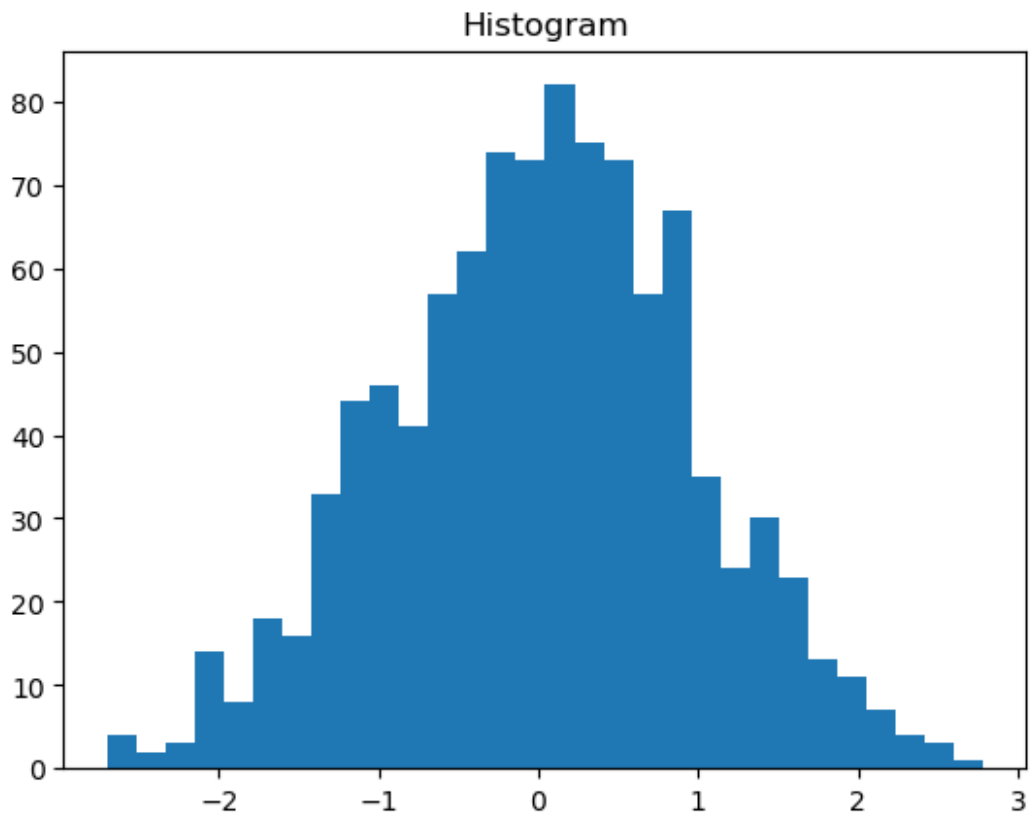
```
x = ['A', 'B', 'C']  
y = [10, 20, 15]  
plt.bar(x, y)  
plt.title("Bar Chart")  
plt.show()
```



Histogram

Use Case: Understanding distribution of a dataset.

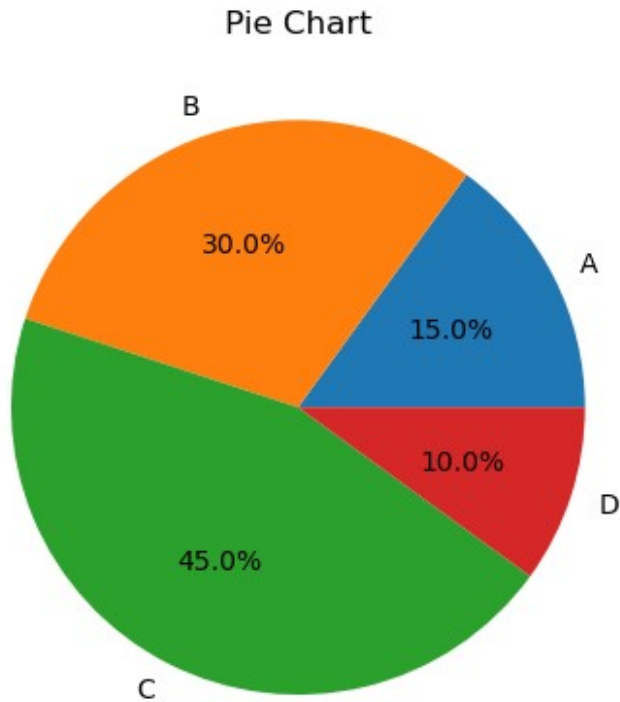
```
import numpy as np
data = np.random.randn(1000)
plt.hist(data, bins=30)
plt.title("Histogram")
plt.show()
```



Pie Chart

Use Case: Displaying proportions.

```
sizes = [15, 30, 45, 10]
labels = ['A', 'B', 'C', 'D']
plt.pie(sizes, labels=labels, autopct='%1.1f%%')
plt.title("Pie Chart")
plt.show()
```



Seaborn

Built on top of Matplotlib, Seaborn simplifies the creation of beautiful and informative statistical graphics.

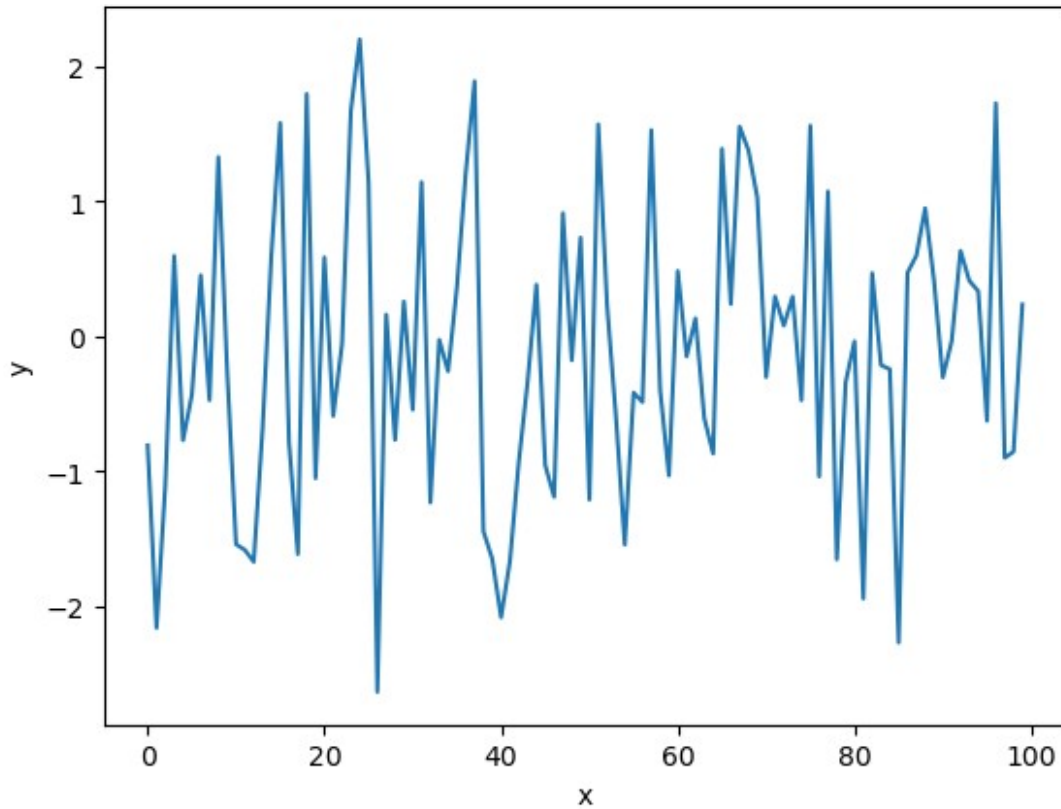
Great for statistical data visualization, integrated with Pandas DataFrames, and aesthetically pleasing defaults.

Line Plot

Use Case: Time series or sequential data with confidence intervals.

```
import seaborn as sns
import pandas as pd
import numpy as np
data = pd.DataFrame({'x': np.arange(100), 'y': np.random.randn(100)})
sns.lineplot(x='x', y='y', data=data)
```

<Axes: xlabel='x', ylabel='y'>

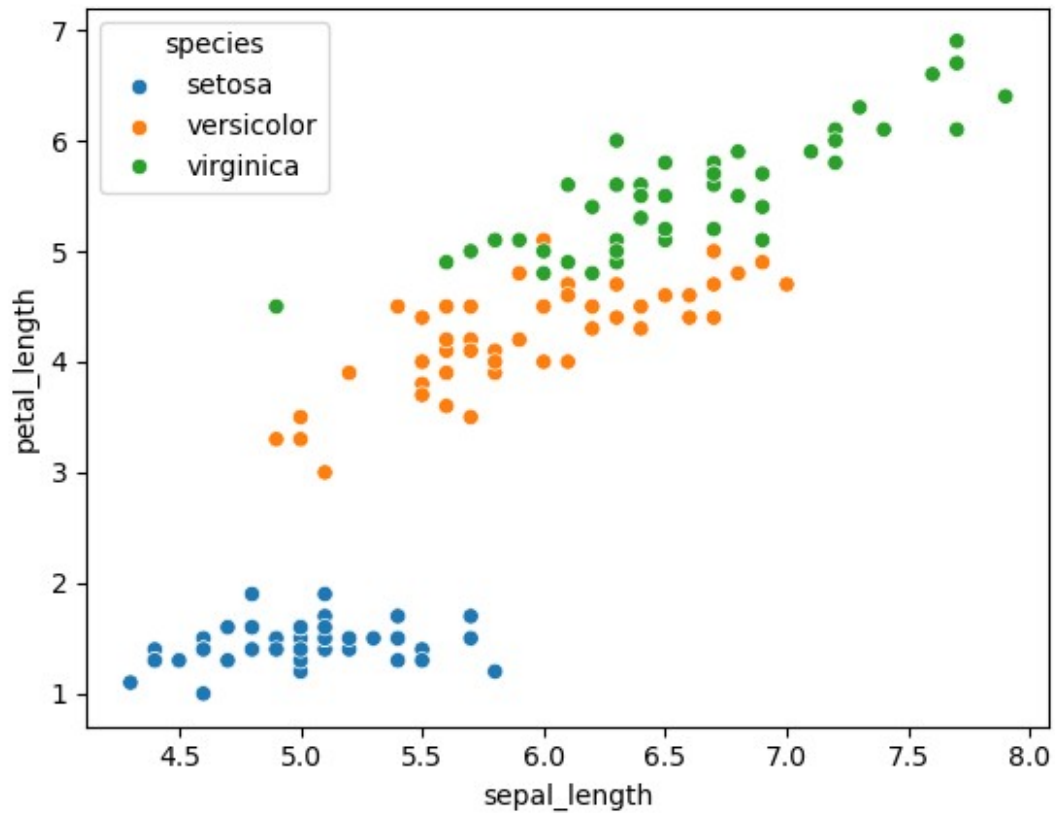


Scatter Plot

Use Case: Exploring relationships in statistical data.

```
iris = sns.load_dataset('iris')
sns.scatterplot(x='sepal_length', y='petal_length', hue='species',
data=iris)
```

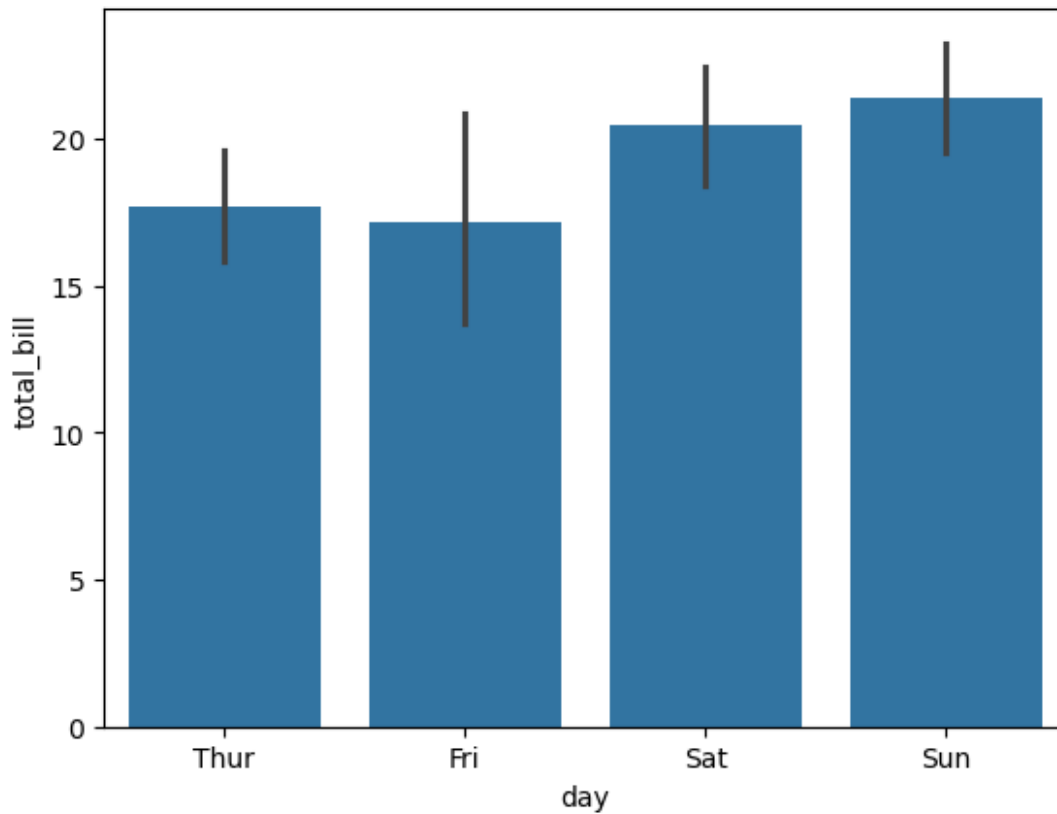
```
<Axes: xlabel='sepal_length', ylabel='petal_length'>
```



Bar Plot

Use Case: Comparing categorical values with error bars.

```
tips = sns.load_dataset('tips')
sns.barplot(x='day', y='total_bill', data=tips)
<Axes: xlabel='day', ylabel='total_bill'>
```

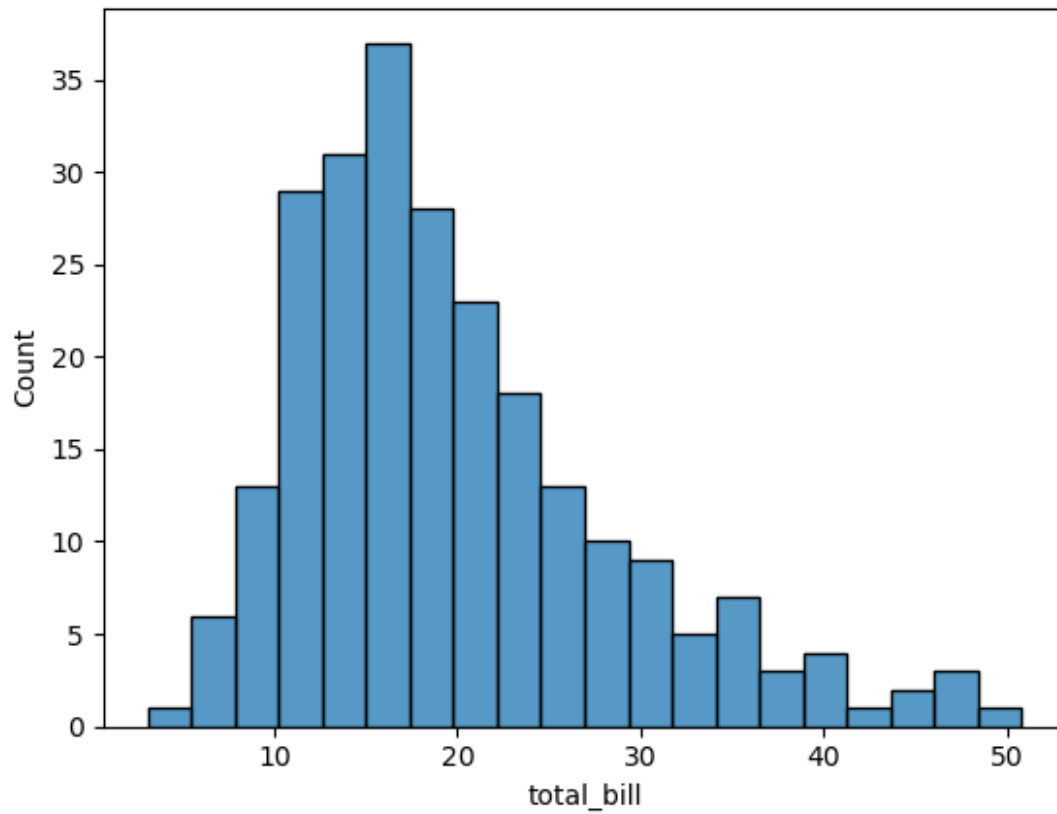



Histogram / Distribution Plot

Use Case: Viewing distribution of numeric data.

```
sns.histplot(data=tips['total_bill'], bins=20)
```

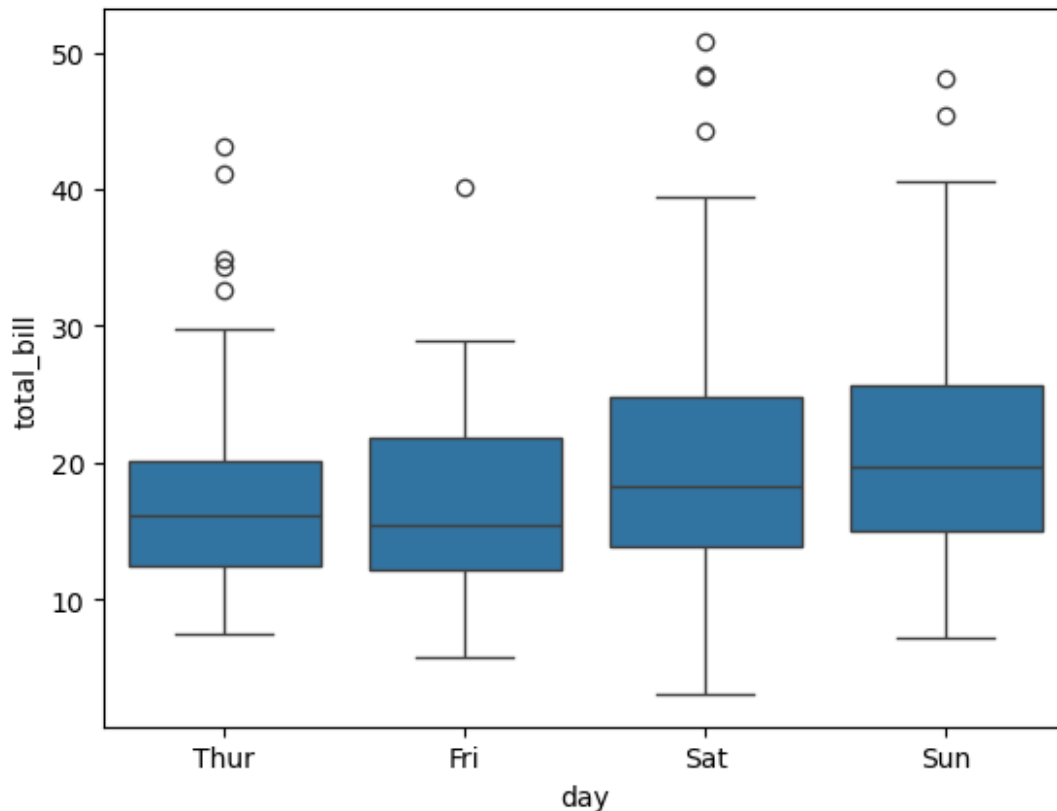
```
<Axes: xlabel='total_bill', ylabel='Count'>
```



Box Plot

Use Case: Visualizing spread and outliers in numerical data.

```
sns.boxplot(x='day', y='total_bill', data=tips)  
<Axes: xlabel='day', ylabel='total_bill'>
```



Plotly

Plotly is a versatile graphing library known for creating interactive and web-based visualizations with ease.

Ideal for dashboards, interactive reports, and presentations.

Line Plot

Use Case: Interactive trend analysis.

```
import plotly.express as px
df = px.data.gapminder().query("country=='India'")
fig = px.line(df, x='year', y='gdpPercap', title='GDP Per Capita')
fig.show()

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Scatter Plot

Use Case: Interactive relationships with hover info.

```
df = px.data.iris()
fig = px.scatter(df, x='sepal_width', y='sepal_length',
color='species')
fig.show()

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Bar Chart

Use Case: Category comparison with tooltips.

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fig.show()

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Histogram

Use Case: Visualizing frequency distribution interactively.

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fig = px.histogram(df, x='total_bill')
fig.show()

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Pie Chart

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```

Bokeh

Bokeh specializes in interactive, web-friendly plots that can be easily embedded in web apps.

Perfect for real-time data visualization and browser-based interactivity.

Line Plot

Use Case: Interactive line chart with zoom and pan.

```
from bokeh.plotting import figure, show
from bokeh.io import output_notebook
output_notebook()
p = figure(title='Line Plot')
p.line([1, 2, 3, 4], [4, 7, 1, 6])
show(p)

""

""
```

Scatter Plot

Use Case: Interactive point cloud.

```
p = figure(title="Scatter Plot")
p.circle([1, 2, 3, 4], [4, 7, 1, 6], size=10, color="navy", alpha=0.5)
show(p)
```

BokehDeprecationWarning: 'circle() method with size value' was deprecated in Bokeh 3.4.0 and will be removed, use 'scatter(size=...)' instead' instead.

""

Bar Chart

Use Case: Simple bar chart visualization.

```
from bokeh.transform import dodge
from bokeh.models import ColumnDataSource
source = ColumnDataSource(data=dict(fruits=['Apples', 'Oranges',
'Pears'], counts=[5, 3, 4]))
p = figure(x_range=source.data['fruits'], title="Bar Chart")
p.vbar(x='fruits', top='counts', width=0.5, source=source)
show(p)
```

""

Histogram

Use Case: Data distribution.

```
import numpy as np
hist, edges = np.histogram(np.random.normal(0, 1, 1000), bins=20)
p = figure(title="Histogram")
p.quad(top=hist, bottom=0, left=edges[:-1], right=edges[1:],
fill_color="navy")
show(p)
```

""

Pie Chart

Use Case: Bokeh doesn't natively support pie charts, but can be created using wedge() glyph.

```
from math import pi
from bokeh.palettes import Category20c
from bokeh.transform import cumsum
import pandas as pd
x = {'A': 10, 'B': 20, 'C': 30, 'D': 40}
data = pd.Series(x).reset_index(name='value').rename(columns={'index':
'category'})
data['angle'] = data['value']/data['value'].sum() * 2*pi
data['color'] = Category20c[len(x)]
p = figure()
p.wedge(x=0, y=1, radius=0.4,
start_angle=cumsum('angle', include_zero=True),
end_angle=cumsum('angle'), line_color='white',
```

```
fill_color='color', legend_field='category', source=data)
show(p)

"""
```

Comparison

Feature	Matplotlib	Seaborn	Plotly	Bokeh
Ease of Use	Medium	Easy	Easy	Moderate
Customization	High	Medium	High	High
Interactivity	Low	Low	High	High
Performance	High	High	Medium-High	High
Best Use	Publication plots	Statistical visualizations	Interactive dashboards	Web-based apps

Resources

Matplotlib:https://matplotlib.org/stable/users/explain/quick_start.html#quick-start

Seaborn-<https://seaborn.pydata.org/tutorial/introduction.html>

Plotly-<https://plotly.com/python/distplot/>

Bokeh:https://docs.bokeh.org/en/latest/docs/user_guide/basic.html