

Data Visualization Guide: Matplotlib & Seaborn

Prerequisites

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Enable inline plotting for Jupyter
%matplotlib inline

# Set a Seaborn style
sns.set(style='whitegrid')
```

Matplotlib Basics

Line Plot

```
x = np.linspace(0, 10, 100)
y = np.sin(x)

plt.figure(figsize=(8, 4))
plt.plot(x, y, label='sin(x)', color='blue', linewidth=2)
plt.title('Line Plot')
plt.xlabel('x')
plt.ylabel('sin(x)')
plt.legend()
plt.grid(True)
plt.show()
```

Bar Plot

```
categories = ['A', 'B', 'C']
values = [10, 24, 36]

plt.bar(categories, values, color='purple')
plt.title('Bar Plot')
plt.show()
```

Histogram

```
data = np.random.randn(1000)

plt.hist(data, bins=30, color='skyblue', edgecolor='black')
plt.title('Histogram')
plt.show()
```

Scatter Plot

```
x = np.random.rand(50)
y = np.random.rand(50)

plt.scatter(x, y, color='green')
plt.title('Scatter Plot')
plt.xlabel('x')
plt.ylabel('y')
plt.show()
```

Seaborn Basics

Distribution Plot

```
data = np.random.randn(1000)
sns.histplot(data, kde=True, bins=30, color='coral')
plt.title('Distribution Plot')
plt.show()
```

Box Plot

```
tips = sns.load_dataset("tips")
sns.boxplot(x='day', y='total_bill', data=tips)
plt.title('Box Plot by Day')
plt.show()
```

Violin Plot

```
sns.violinplot(x='day', y='total_bill', data=tips, palette='Set2')
plt.title('Violin Plot')
plt.show()
```

Pair Plot

```
sns.pairplot(tips, hue='sex')
plt.show()
```

Heatmap (Correlation Matrix)

```
corr = tips.corr(numeric_only=True)
sns.heatmap(corr, annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Correlation Heatmap')
plt.show()
```

Advanced Seaborn Usage

Facet Grid

```
g = sns.FacetGrid(tips, col='sex', row='time')
g.map(sns.histplot, 'total_bill')
plt.show()
```

Custom Themes

```
sns.set_context("talk") # paper, notebook, talk, poster  
sns.set_style("darkgrid") # white, dark, ticks, whitegrid
```

Tips & Tricks

- Use `plt.tight_layout()` to avoid overlap.
- For high-quality export: `plt.savefig("plot.png", dpi=300)`
- Combine Seaborn for aesthetics + Matplotlib for customization.