Data Visualization with Matplotlib

Matplotlib is used to create **charts and graphs** like line graphs, bar charts, pie charts, and more.

🧰 What is Matplotlib?

Matplotlib is a library that allows you to create **visual representations** of your data. It's especially useful when working with data in Pandas or NumPy.

🔧 Installing Matplotlib

```
pip install matplotlib
```

📈 Basic Line Plot

```
import matplotlib.pyplot as plt

# Sample data
x = [1, 2, 3, 4, 5]
y = [10, 20, 25, 30, 40]

# Create a line plot
plt.plot(x, y)
plt.title("Simple Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.show()
```

📊 Bar Chart Example

```
# Sample data
names = ['Alice', 'Bob', 'Charlie']
scores = [85, 90, 78]

plt.bar(names, scores, color='skyblue')
plt.title("Student Scores")
plt.xlabel("Students")
plt.ylabel("Scores")
plt.show()
```

🥧 Pie Chart Example

```
# Sample data
activities = ['Sleeping', 'Eating', 'Coding', 'Gaming']
hours = [8, 2, 8, 6]

plt.pie(hours, labels=activities, autopct='%1.1f%%')
plt.title("Daily Activities")
plt.show()
```

📏 Histogram Example

```
# Example: showing frequency of values
ages = [22, 21, 20, 23, 24, 22, 20, 21, 22, 25, 23]

plt.hist(ages, bins=5, color='purple')
plt.title("Age Distribution")
plt.xlabel("Age")
plt.ylabel("Frequency")
plt.show()
```

💡 Combine with Pandas Example

```
import pandas as pd

# Create a DataFrame
data = {
    'Year': [2021, 2022, 2023],
    'Users': [1500, 3000, 5000]
}

df = pd.DataFrame(data)

# Plot using pandas + matplotlib
plt.plot(df['Year'], df['Users'], marker='o')
plt.title("User Growth Over Time")
plt.xlabel("Year")
plt.ylabel("Users")
plt.grid(True)
plt.show()
```

🧪 Practice Tasks

1. Create a **bar chart** showing 5 different countries and their population.
2. Create a **pie chart** showing how a student spends 24 hours of their day.
3. Make a **line chart** that shows temperature changes during the day (morning, noon, evening, night).