📊 Matplotlib -(Starting To Basic Graphs)

1️⃣ What is Matplotlib? (Theory)

Matplotlib Python ki ek data visualization library hai jo numerical data ko graphs aur charts ke form me show karti hai.

Simple definition:

Matplotlib numbers ko visual form (graphs) me convert karta hai, jisse data easily samajh aata hai.

2️⃣ Why we use Matplotlib?

- **Data ko visualise karne ke liye**
- **Trend, comparison, distribution samajhne ke liye**
- **Data Science, AI, ML me use hota hai**
- **Pandas aur NumPy ke data ke sath kaam karta hai**

3️⃣ Matplotlib ka basic structure

- **import matplotlib.pyplot as plt**
- **matplotlib.pyplot → plotting module**
- **plt → short name (easy use)**

4️⃣ Line Graph (Most Important)

- **👉 Use:**
- **Growth**
- **Trend**

- **Time based data**

Example Code

- **import matplotlib.pyplot as plt**
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- **x = [1, 2, 3, 4, 5]**
- **y = [10, 20, 30, 40, 50]**
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- **plt.plot(x, y)**
- **plt.title("Line Graph Example")**
- **plt.show()**

Explanation

- **x → X-axis values**
- **y → Y-axis values**
- **plt.plot(x, y) → line graph draw karta hai**
- **plt.title() → graph ka title**
- **plt.show() → graph display karta hai**

Output

Straight increasing line

X badhne par Y bhi badhta hai
➡ Positive trend

5️⃣ Bar Chart

👉 Use:

Comparison ke liye

Categories ke beech difference

Example Code

```
import matplotlib.pyplot as plt


students = ["A", "B", "C", "D"]
marks = [70, 85, 60, 90]


plt.bar(students, marks)
plt.title("Bar Chart Example")
plt.show()
```

Explanation

plt.bar() → bar chart banata hai

Har student ke marks alag bar me dikhte hain

Comparison easy hota hai

Output

Vertical bars

Height = value (marks)

6️⃣ Scatter Plot

👉 **Use:**

Relationship dekhne ke liye

Pattern analysis

Example Code

```
import matplotlib.pyplot as plt


x = [1, 2, 3, 4, 5]

y = [5, 10, 15, 20, 25]


plt.scatter(x, y)

plt.title("Scatter Plot Example")

plt.show()
```

Explanation

- `plt.scatter()` → dots ka graph
- Har point independent hota hai
- Relationship show karta hai

Output

- Dots form me graph
- Linear relationship dikhegi

7️⃣ Histogram

☞ Use:

- **Data distribution**
- **Frequency count**

Example Code

```
import matplotlib.pyplot as plt

data = [10, 20, 20, 30, 30, 30, 40, 50]

plt.hist(data)
plt.title("Histogram Example")
plt.show()
```

Explanation

- `plt.hist()` → **histogram banata hai**
- **Values ko groups (bins) me divide karta hai**
- **Batata hai kaunsi value kitni baar aayi**

Output

- **Bars showing frequency**
- **Distribution clearly dikhta hai**

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8 Pie Chart

☞ Use:

- **Percentage show karne ke liye**
- **Parts of whole**

Example Code

```
import matplotlib.pyplot as plt

languages = ["Python", "Java", "C++"]
usage = [50, 30, 20]

plt.pie(usage, labels=languages)
plt.title("Pie Chart Example")
plt.show()
```

Explanation

- plt.pie() → **pie chart banata hai**
- **Circle ka har part ek category dikhata hai**
- **Percentage representation**

Output

- **Circular graph**
- **Har slice ka size value ke according**

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9 Important Functions (Quick Revision Table)

Function	Use
plt.plot()	Line graph
plt.bar()	Bar chart
plt.scatter()	Scatter plot
plt.hist()	Histogram
plt.pie()	Pie chart
plt.title()	Graph title

Function	Use
plt.show()	Graph display