# Minor in AI – Batch 04
# 03 March 2025

## Title: Mastering Data Visualization with Matplotlib: From Basics to Stunning Plots

Topics:

- Customize axes, titles, and labels to enhance readability
- Work with Different Plot Types
- Create bar charts (plt.bar()), scatter plots (plt.scatter()), and histograms (plt.hist()).
- Differentiate between various chart types and their appropriate use cases.

**Note:**
Below are codes that we types together. For others, refer to the collab link.

Why that is for daily_steps CSV file, a line plot not a good idea?

```
import pandas as pd
import matplotlib.pyplot as plt

# Read CSV file
df = pd.read_csv("daily_steps.csv")

# Create the line plot
plt.plot(df['Person_ID'], df['Daily_Steps'])

# Add labels and title
plt.xlabel("Person ID")
plt.ylabel("Daily Steps")
plt.title("Daily Steps of Person")

# Display the plot
plt.show()
```

Instead we can go for a histogram.

```
import pandas as pd
import matplotlib.pyplot as plt

# Read CSV file
df = pd.read_csv("daily_steps.csv")
```

```
# Plot histogram
plt.hist(df["Daily_Steps"], bins=10, edgecolor="black")
plt.xlabel("Daily Steps")
plt.ylabel("Frequency")
plt.title("Distribution of Daily Steps Among People")
plt.show()
```

Understanding the customizations

```
import matplotlib.pyplot as plt

# Sample data
x = [1, 2, 3, 4, 5]
y1 = [2, 4, 6, 8, 10]  # Line 1
y2 = [1, 3, 5, 7, 9]   # Line 2

# Set figure size
plt.figure(figsize=(8, 5))

# Plot with different styles
plt.plot(x, y1, color="blue", marker="o", markersize=8,
linestyle="--", linewidth=2, label="Dashed Blue")
plt.plot(x, y2, color="red", marker="s", markersize=10,
linestyle="-.", linewidth=2, label="Dash-dot Red")

# Labels and title
plt.xlabel("X-axis Label", fontsize=12, color="darkblue")
plt.ylabel("Y-axis Label", fontsize=12, color="darkred")
plt.title("Matplotlib Customization Demo", fontsize=14,
fontweight="bold")

# Grid and legend
plt.grid(True, linestyle="--", alpha=0.5)
plt.legend()

# Show plot
plt.show()
```

Scatter Plots:

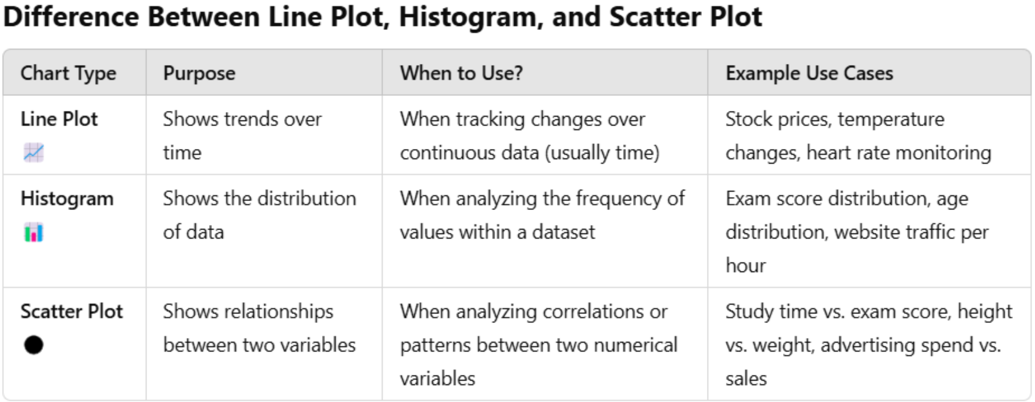
```
import pandas as pd
import matplotlib.pyplot as plt

# Sample Data
df = pd.read_csv("daily_steps.csv")
```

```
df["Calories_Burned"] = df["Daily_Steps"] * 0.04  # Assuming
0.04 calories per step

# Scatter Plot
plt.scatter(df["Daily_Steps"], df["Calories_Burned"])
plt.xlabel("Daily Steps")
plt.ylabel("Calories Burned")
plt.title("Daily Steps vs. Calories Burned")
plt.show()
```

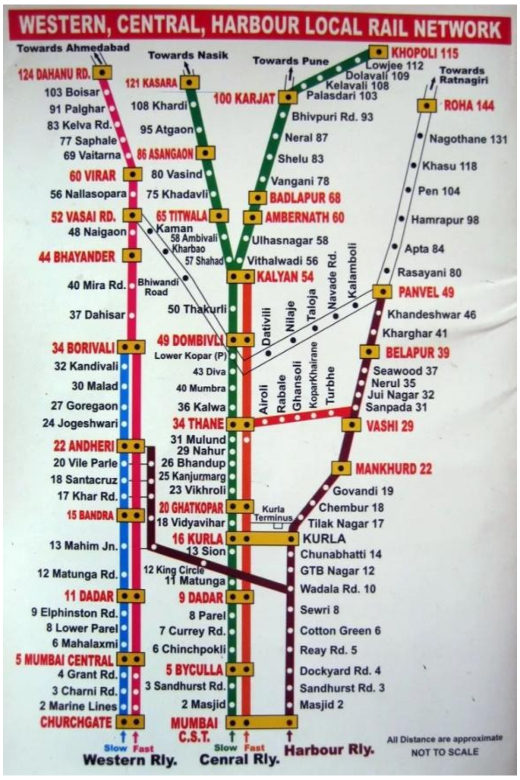
Difference Table: (Source: ChatGPT)



### Difference Between Line Plot, Histogram, and Scatter Plot

| Chart Type | Purpose | When to Use? | Example Use Cases |
|---|---|---|---|
| Line Plot<br>📈 | Shows trends over time | When tracking changes over continuous data (usually time) | Stock prices, temperature changes, heart rate monitoring |
| Histogram<br>📊 | Shows the distribution of data | When analyzing the frequency of values within a dataset | Exam score distribution, age distribution, website traffic per hour |
| Scatter Plot<br>● | Shows relationships between two variables | When analyzing correlations or patterns between two numerical variables | Study time vs. exam score, height vs. weight, advertising spend vs. sales |

Other Case Study used: (Interpreting the Mumbai local train lines)


WESTERN, CENTRAL, HARBOUR LOCAL RAIL NETWORK
Towards Ahmedabad
Towards Nasik
Towards Pune
Towards Ratnagiri
124 DAHANU RD.
103 Boisar
91 Palghar
83 Kelva Rd.
77 Saphale
69 Vaitarna
60 VIRAR
56 Nallasopara
52 VASAI RD.
48 Naigaon
44 BHAYANDER
40 Mira Rd.
37 Dahisar
34 BORIVALI
32 Kandivali
30 Malad
27 Goregaon
24 Jogeshwari
22 ANDHERI
20 Vile Parle
18 Santacruz
17 Khar Rd.
15 BANDRA
13 Mahim Jn.
12 Matunga Rd.
11 DADAR
9 Elphinston Rd.
8 Lower Parel
6 Mahalaxmi
5 MUMBAI CENTRAL
4 Grant Rd.
3 Charni Rd.
2 Marine Lines
CHURCHGATE
121 KASARA
108 Khardi
95 Atgaon
86 ASANGAON
80 Vasind
75 Khadavli
65 TITWALA
Kaman
58 Ambivali
Kharbao
57 Shahad
Bhiwandi Road
50 Thakurli
49 DOMBIVLI
Lower Kopar (P)
43 Diva
40 Mumbra
36 Kalwa
34 THANE
31 Mulund
29 Nahur
26 Bhandup
25 Kanjurmarg
23 Vikhroli
20 GHATKOPAR
18 Vidyavihar
16 KURLA
13 Sion
12 King Circle
11 Matunga
9 DADAR
8 Parel
7 Currey Rd.
6 Chinchpokli
5 BYCULLA
3 Sandhurst Rd.
2 Masjid
MUMBAI C.S.T.
KHOPOLI 115
Lowjee 112
Dolavali 109
Kelavali 108
Palasdari 103
100 KARJAT
Bhivpuri Rd. 93
Neral 87
Shelu 83
Vangani 78
BADLAPUR 68
AMBERNATH 60
Ulhasnagar 58
Vithalwadi 56
KALYAN 54
Dativili
Nilaje
Taloja
Navade Rd.
Kalamboli
Airoli
Rabale
Ghansoli
KoparKhairane
Turbhe
ROHA 144
Nagothane 131
Khasu 118
Pen 104
Hamrapur 98
Apta 84
Rasayani 80
PANVEL 49
Khandeshwar 46
Kharghar 41
BELAPUR 39
Seawood 37
Nerul 35
Jui Nagar 32
Sanpada 31
VASHI 29
MANKHURD 22
Govandi 19
Chembur 18
Kurla Terminus
Tilak Nagar 17
KURLA
Chunabhatti 14
GTB Nagar 12
Wadala Rd. 10
Sewri 8
Cotton Green 6
Reay Rd. 5
Dockyard Rd. 4
Sandhurst Rd. 3
Masjid 2
Slow
Fast
Western Rly.
Slow
Fast
Cenral Rly.
Harbour Rly.
All Distance are approximate
NOT TO SCALE