

# What is Plotly?

Plotly is a **powerful interactive visualization library**. Unlike Matplotlib and Seaborn, it creates:

- ✓ **Interactive charts** (Zoom, hover effects, tooltips)
  - ✓ **3D Plots**
  - ✓ **Dashboards**
  - ✓ **Web-friendly visualizations**
- 

## 1. Install and Import Plotly

If you haven't installed Plotly, run:

```
pip install plotly
```

Then import it:

```
import plotly.express as px # High-level API for easy plotting
import plotly.graph_objects as go # Advanced customization
```

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## 2. Basic Interactive Line Plot

```
import plotly.express as px
# Sample data
df = px.data.gapminder().query("country == 'Pakistan'")
# Create interactive line chart
fig = px.line(df, x="year", y="gdpPercap", title="Pakistan GDP Over Time")
fig.show()
```

- ✓ **Hover over points** to see values
  - ✓ **Zoom in/out, pan, and reset**
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## 3. Scatter Plot (With Colors & Sizes)

```
df = px.data.iris()
# Scatter plot with interactive tooltips
fig = px.scatter(df, x="sepal_width", y="sepal_length", color="species",
                size="petal_length",
                title="Iris Dataset Scatter Plot")
fig.show()
```

- ✓ **Color by species**
  - ✓ **Size based on petal length**
- 

## 4. Bar Chart (With Sorting)

```
df = px.data.tips()
```

```
fig = px.bar(df, x="day", y="total_bill", color="sex", title="Total Bill per Day")
```

```
fig.show()
```

✅ **Interactive bar chart with hover effects**

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## 🔥 5. Histogram (Distribution of Data)

```
fig = px.histogram(df, x="total_bill", nbins=20, title="Total Bill Distribution")
```

```
fig.show()
```

✅ **nbins=20** → Adjusts the number of bars

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## 🔥 6. Box Plot (Find Outliers)

```
fig = px.box(df, x="day", y="total_bill", color="sex", title="Box Plot of Bills by Day")
```

```
fig.show()
```

✅ **Shows median, quartiles, and outliers**

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## 🔥 7. Heatmap (Correlation Between Variables)

```
import plotly.figure_factory as ff
```

```
import numpy as np
```

```
# Create correlation matrix
```

```
corr_matrix = df.corr().values
```

```
fig = ff.create_annotated_heatmap(corr_matrix, x=df.corr().columns, y=df.corr().columns, colorscale="Viridis")
```

```
fig.show()
```

✅ **Shows correlations between variables**

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## 🔥 8. 3D Scatter Plot

```
fig = px.scatter_3d(df, x="total_bill", y="tip", z="size", color="sex", title="3D Scatter Plot")
```

```
fig.show()
```

✅ **Rotate the graph in 3D!**

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## 🔥 9. Sunburst Chart (Hierarchical Data)

```
fig = px.sunburst(df, path=["sex", "day"], values="total_bill", title="Sunburst Chart Example")
```

```
fig.show()
```

- ✅ Drill down into categories interactively

## 🔥 10. Animations in Plotly

Plotly allows you to create **dynamic visualizations** easily.

- ✅ **Animated Line Plot (Yearly GDP Change)**

```
import plotly.express as px

df = px.data.gapminder()

fig = px.line(df, x="year", y="gdpPercap", color="country",
              animation_frame="year", title="GDP Per Capita Over Time")

fig.show()
```

- ✅ **Hover to see details**
  - ✅ **Use the play button for animation**
- 

## 🔥 11. Interactive Pie Chart

```
df = px.data.tips()

fig = px.pie(df, names="day", values="total_bill", hole=0.3, title="Total Bill by Day")

fig.show()
```

- ✅ **Hover over slices for details**
  - ✅ **hole=0.3 creates a donut chart**
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## 🔥 12. Treemap (Nested Categories)

```
fig = px.treemap(df, path=["sex", "day"], values="total_bill", title="Treemap Example")

fig.show()
```

- ✅ **Drill-down categories interactively**
- 

## 🔥 13. Funnel Chart (Sales Data)

```
fig = px.funnel(df, x="day", y="total_bill", title="Funnel Chart Example")

fig.show()
```

- ✅ **Useful for sales, conversion analysis**
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## 🔥 14. Advanced Customizations (Theme & Layout)

You can **customize themes, legends, and colors** in Plotly.

- ✅ **Change Theme & Style**

```
fig.update_layout()
```

```

    template="plotly_dark", # Other themes: "plotly_white", "ggplot2",
    "seaborn"

    title_font_size=20,
    legend_title="Legend",
    xaxis_title="X-Axis",
    yaxis_title="Y-Axis"
)

fig.show()

```

✅ **Dark mode and professional styling**

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## 🔥 15. Dashboards with Subplots

Combine multiple plots in **one dashboard**.

```

from plotly.subplots import make_subplots

# Create subplot figure
fig = make_subplots(rows=1, cols=2, subplot_titles=("Histogram", "Box Plot"))
# Add histogram
fig.add_trace(px.histogram(df, x="total_bill").data[0], row=1, col=1)
# Add box plot
fig.add_trace(px.box(df, x="day", y="total_bill").data[0], row=1, col=2)
fig.show()

```

✅ **Multiple charts in one figure**

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## 🔥 16. Choropleth Map (World Map Visualization)

```

fig = px.choropleth(df, locations="iso_alpha", color="gdpPercap",
                    hover_name="country", title="World GDP Map")
fig.show()

```

✅ **Visualizes GDP by country on a world map**