**Task:**

1. **Line Plot**

**What:**

Displays data points connected by lines. Shows trends over time.

**When to Use:**

Use a line plot when you want to show how something changes over time. For example:

* Stock prices every day
* Temperature across the week

Showing continuous data over intervals.

**How:**

Use plt.plot(x, y) from Matplotlib.

**Example:**

Import matplotlib.pyplot as plt

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

Y = [36, 21, 28, 39, 130]

plt.plot(X, Y)

plt.title(“Line Plot”)

plt.xlabel(“Days”)

plt.ylabel(“Sales”)

plt.show()

**Applications:**

* Stock Price Trends
* Temperature
* Sensor’s measurements

1. **Bar Chart**

**What:**

Represents categorical data with rectangular bars.

**When to Use:**

Use it to compare categories. For example:

* Comparing revenue from different products
* Number of students in different classes

**How:**

Use plt.bar(categories, values)

**Example:**

categories = ['A', 'B', 'C']

values = [4, 7, 1]

plt.bar(categories, values)

plt.title("Bar Chart")

plt.xlabel("Category")

plt.ylabel("Count")

plt.show()

**Applications:**

* Product Comparison
* Comparing prices or quantities

1. **Horizontal Bar Chart**

**What:**

Like a bar chart but horizontal.

**When to Use:**

* Long category names
* Better readability

**Example:**

Categories = [‘A’, ‘B’, ‘C’, ‘D’]

Values = [1, 2, 3, 4]

plt.barh(categories, values)

plt.title("Horizontal Bar Chart")

plt.show()

1. **Histogram**

**What:**

A histogram looks like a bar chart but is used to show frequency distribution. It groups values into ranges (called bins) and shows how many fall into each range.

**When to Use:**

* Understand frequency distribution.
* Identify skewness or normally distributed

**How:**

Use plt.hist(data, bins=number)

**Example:**

import numpy as np

data = np.random.randn(1000)

plt.hist(data, bins=30)

plt.title("Histogram")

plt.xlabel("Values")

plt.ylabel("Frequency")

plt.show()

**Applications:**

* Exam scores distribution
* Age distribution
* Income levels

1. **Scatter Plot**

**What:**

Plots individual points on x-y axes to show relationships.

A scatter plot shows dots that represent values for two different variables. It helps identify patterns, trends, or outliers.

**When to Use:**

* To know correlation or clustering between two variables.
* To find anomalies

**How:**

Use plt.scatter(x, y)

**Example:**

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

y = [5, 6, 4, 7, 8]

plt.scatter(x, y)

plt.title("Scatter Plot")

plt.xlabel("Study Hours")

plt.ylabel("Scores")

plt.show()

**Applications:**

* Correlation between spend vs revenue
* Height vs weight
* Age vs income

1. **Pie Chart**

**What:**

A circular chart that shows parts of a whole. Each slice represents a category's contribution to the total.

**When to Use:**

Show proportions or percentages.

**How:**

Use plt.pie(sizes, labels=labels, autopct='%1.1f%%')

**Example:**

labels = ['A', 'B', 'C']

sizes = [20, 30, 50]

plt.pie(sizes, labels=labels, autopct='%1.1f%%')

plt.title("Pie Chart")

plt.show()

**Applications:**

* Market share of companies
* Survey responses

1. **Box Plot (Box and Whisker Plot)**

**What:**

Shows median, quartiles, and outliers of data.

And also shows minimum, maximum.

**When to Use:**

Statistical summary

Detect outliers

To know distribution of data

**How:**

Use plt.boxplot(data)

**Example:**

data = [7, 15, 13, 12, 15, 14, 19, 20]

plt.boxplot(data)

plt.title("Box Plot")

plt.show()

**Applications:**

* Compare exam performance across classes
* Salary distribution

1. **Heatmap**

**What:**

A heatmap shows data in a matrix format, where each cell’s color intensity represents a value. It's great for showing patterns.

**When to Use:**

* Show correlation between variables
* Display matrix-style data

**How:**

Use Seaborn's sns.heatmap(data)

**Example:**

import seaborn as sns

import numpy as np

data = np.random.rand(5, 5)

sns.heatmap(data, annot=True, cmap='coolwarm')

plt.title("Heatmap")

plt.show()

**Applications:**

* Correlation matrix
* Confusion matrix
* Sensor networks

1. **Pair Plot**

**What:**

Creates scatter plots for all variable pairs and histograms on diagonals.

Shows pairwise relationships between multiple features in a dataset. We can see scatter plots and histograms in one combined chart.

**When to Use:**

Explore relationship between multiple features.

To look for clusters, correlations, or trends

**Example:**

import seaborn as sns

from seaborn import load\_dataset

df = load\_dataset("iris")

sns.pairplot(df, hue='species')

plt.show()

**Applications:**

* Feature relationship exploration
* Cluster detection

1. **Area Plot**

**What:**

An area plot is like a line plot, but the area below the line is filled with color. It emphasizes the magnitude of values over time.

**When to Use:**

Cumulative data over time

To show how data adds up over time

**Example:**

import pandas as pd

df = pd.DataFrame({

'Year': [2015, 2016, 2017, 2018],

'Sales': [100, 120, 150, 180]

})

df.set\_index('Year', inplace=True)

df.plot(kind='area')

plt.title("Area Plot")

plt.show()

**Applications:**

* Revenue over years
* Market growth

1. **Violin Plot**

**What:**

Combines box plot and KDE (Kernel Density Estimate) to show data distribution.

**When to Use:**

* Visualize distribution with probability density.
* To show more detail than a box plot

**Example:**

sns.violinplot(x='species', y='length', data=df)

plt.title("Violin Plot")

plt.show()

1. **Stacked Bar Chart**

**What:**

Bar chart showing parts of the whole with stacked bars.

**When to use it?**

* To show total values along with sub-groups
* To compare composition within a category

**Example:**

A = [3, 4, 5]

B = [2, 3, 4]

labels = ['X', 'Y', 'Z']

plt.bar(labels, A, label='A')

plt.bar(labels, B, bottom=A, label='B')

plt.legend()

plt.title("Stacked Bar Chart")

plt.show()

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| --- | --- |
| **Plot Type** | **Purpose** |
| Line Plot | Show trends over time |
| Bar Chart | Compare categories |
| Horizontal Bar | Same as bar chart, better for long labels |
| Histogram | Understand frequency/distribution |
| Scatter Plot | Show relationships between variables |
| Pie Chart | Show proportions of a whole |
| Box Plot | View summary and detect outliers |
| Heatmap | Visualize patterns in a matrix |
| Pair Plot | Analyze all variable pairs at once |
| Area Plot | Show cumulative data |
| Violin Plot | Visualize distribution and density |
| Stacked Bar Chart | Compare totals and breakdowns |