🔹 Scatter Plot

- **What it does**: Shows the relationship between two continuous variables.
- **When to use**: When you wanna check if two variables are correlated.
- **Components**: Points (each one is an (x, y) pair), optional trend lines.
- **Data Type**: **Continuous**

Example:

📊 *Analyzing student study hours vs exam scores* – Spotting trends and correlations.

🧬 *Height vs weight comparison* in medical research.

📱 *Ad spend vs app downloads* in marketing analytics.

Code: sns.scatterplot(x='age', y='salary', data=df)

🔹 Box Plot

- **What it does**: Summarizes a distribution using quartiles; highlights median, spread, and outliers.
- **When to use**: When you want to compare distributions across groups.
- **Components**: Box (IQR), whiskers, median line, outlier dots.
- **Data Type**: **Continuous (on y-axis), Categorical (on x-axis)**

Example:

🏫 *Comparing test scores across different schools* – See variation and outliers.

🏥 *Patient recovery times across treatment types*.

💸 *Salaries across different job roles*.

Code: sns.boxplot(x='department', y='salary', data=df)

🔹 Violin Plot

- **What it does**: Like a box plot but with a KDE (smoothed distribution) on both sides.
- **When to use**: When you want to see both distribution and summary stats.
- **Components**: Violin shape (density), median line, sometimes IQR.
- **Data Type**: **Continuous + Categorical**

Example:

🎶 *Distribution of streaming times on Spotify* by genre.

👩‍🎓 *Analyzing test scores across genders with visible density*.

🧠 *Reaction times for different age groups* in psychology studies.

Code: sns.violinplot(x='gender', y='test_score', data=df)

🔹 Swarm Plot

- **What it does**: Like a scatter plot but for categorical data—it avoids overlapping points.
- **When to use**: To see individual data points while also comparing groups.
- **Components**: Dots (each dot = one data point)
- **Data Type**: **Categorical + Continuous**

Example:

🎯 *Each student's individual grade by class section*.

🧃 *Customer ratings by product* to see every review point.

🏃 *Sprint times by athlete group*—keeping the individuality intact.

Code: sns.swarmplot(x='team', y='performance', data=df)

🔹 Heatmap

- **What it does**: Color-coded matrix used to show values, usually correlations or counts.
- **When to use**: When you want to show magnitude in a matrix form.
- **Components**: Grid, color intensity, optional annotations.
- **Data Type**: **Continuous or Categorical (converted to matrix)**

Example:

🧪 *Gene expression levels across conditions* (bioinformatics).

📅 *Attendance over days and hours in a school*.

🧠 *Correlation between mental health variables*.

Code: sns.heatmap(df.corr(), annot=True)

🔹 Histogram

- **What it does**: Shows distribution of a single continuous variable by binning values.
- **When to use**: When you want to understand frequency and distribution.
- **Components**: Bars, bins.
- **Data Type**: **Continuous**

Example:

🧑‍💼 *Age distribution of employees in a company*.

💰 *Distribution of daily expenses* from a budget tracker app.

📷 *Pixel brightness levels* in an image-processing task.

Code: sns.histplot(df['height'], bins=10)

🔹 Bar Plot

- **What it does**: Displays the mean or total of a variable for different categories.
- **When to use**: Comparing groups.
- **Components**: Bars, error bars (optional), x and y axis.
- **Data Type**: **Categorical (x) + Aggregated Continuous (y)**

Example:

🍕 *Sales by pizza topping* – Classic categorical count.

💻 *Revenue by quarter* in a company report.

📈 *Number of users per platform* (iOS, Android, Web).

Code: sns.barplot(x='city', y='income', data=df)

🔹 Factor Plot (Now deprecated; use `catplot`)

- **What it does**: High-level plot for drawing categorical plots.
- **When to use**: Multi-faceted plots by category.
- **Components**: Varies depending on plot type (bar, box, etc.)
- **Data Type**: **Categorical + Continuous**

Example:

🧍 *Average walking speed by age and gender* with subplots.

🍎 *Fruit consumption by country, split by year*.

🏢 *Job satisfaction scores across departments with gender split*.

Code: sns.catplot(x='day', y='total_bill', hue='sex', kind='box', data=tips)

🔹 Density Plot (KDE Plot)

- **What it does**: Smooths out a histogram using a kernel density estimation.
- **When to use**: To estimate the probability density function of a variable.
- **Components**: Smooth curve.
- **Data Type**: **Continuous**

Example:

🌡️ *Temperature patterns over time* – smooth look.

💉 *Cholesterol level distribution* for a health survey.

🎓 *GPA density curves* to show academic performance.

Code: sns.kdeplot(df['age'])

🔹 Joint Distribution Plot

- **What it does**: Combines scatter/histogram/KDE in one view to show joint and marginal distributions.
- **When to use**: Analyzing relationship + distribution at once.
- **Components**: Central scatter plot + histograms/KDEs on top and right.
- **Data Type**: **Continuous**

Example:

⚡ *Electricity usage vs outside temperature* with marginal distributions.

🚗 *Speed vs fuel efficiency* in vehicle performance.

🧾 *Income vs expenditure* to assess financial behavior.

Code: sns.jointplot(x='height', y='weight', data=df, kind='kde')

TL;DR: Which to use when?

Plot	Use Case	Data Type
Scatter	Correlation check	Continuous × Continuous
Box	Compare distributions	Continuous × Categorical
Violin	Distribution + density	Continuous × Categorical
Swarm	Show all points	Continuous × Categorical
Bar	Compare group stats	Aggregated Continuous × Categorical
Histogram	Frequency dist.	Continuous
KDE / Density	Smoothed dist.	Continuous
Heatmap	Matrix viz (e.g. correlation)	Continuous/Categorical
Jointplot	Relationship + distribution	Continuous × Continuous
Catplot / Factor Plot	Multi-category plot	Mixed
Overlay	Combine plots	Varies