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Data Visualization and EDA

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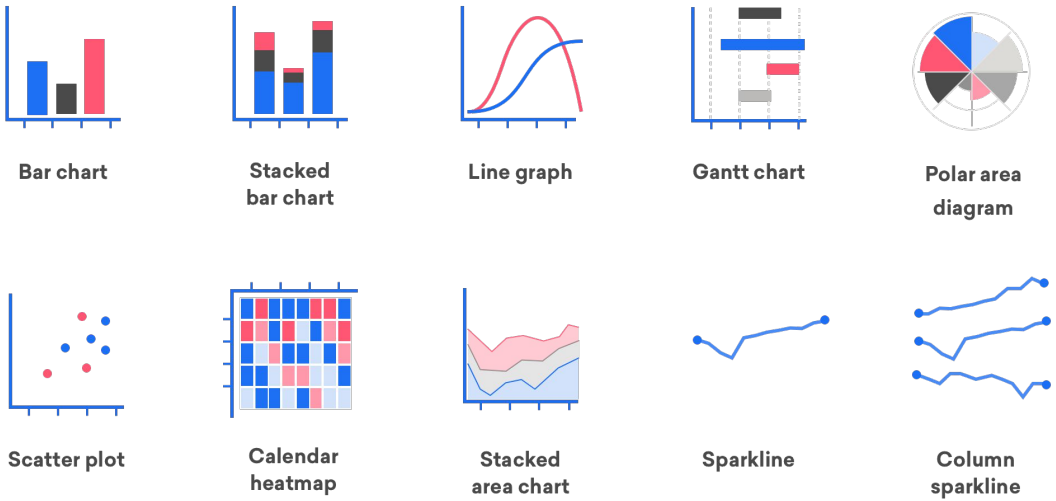
Agenda

1. Introduction to Visualization
2. Common libraries for Visualization
3. Univariate and Multivariate Analysis
4. Pandas profiling

Introduction to Visualization

- Data visualization is the representation of data or information in a graph, chart, or other visual format to communicate relationships of the data with images.
- We need data visualization because a visual summary of information makes it easier to identify patterns and trends than looking through thousands of rows on a spreadsheet.



Source: https://morphocode.com/location-time-urban-data-visualization/

Common libraries for Visualization

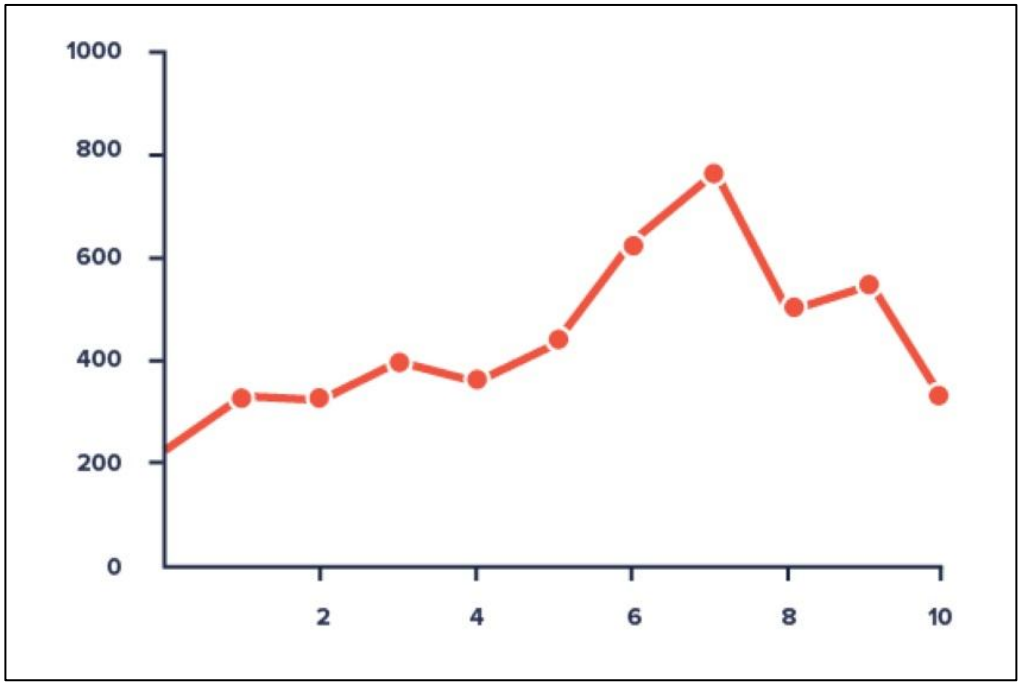
1. **Matplotlib:**
   - Matplotlib is a popular graphical subroutine and is used widely for data visualization applications.
   - It provides a context, one in which one or more plots can be drawn before the image is shown or saved to file. The context can be accessed via functions on *pyplot*.

1. **Seaborn:**
   - Seaborn is complementary to Matplotlib and it specifically targets statistical data visualization.
   - A saying around matplotlib and seaborn is, "*matplotlib tries to make easy things easy and hard things possible, seaborn tries to make a well-defined set of hard things easy too.*"

1. **Plotly:**
   - Plotly provides a web-service for hosting graphs.
   - It is mainly used for interactive visualization, dashboards etc.

Line Chart

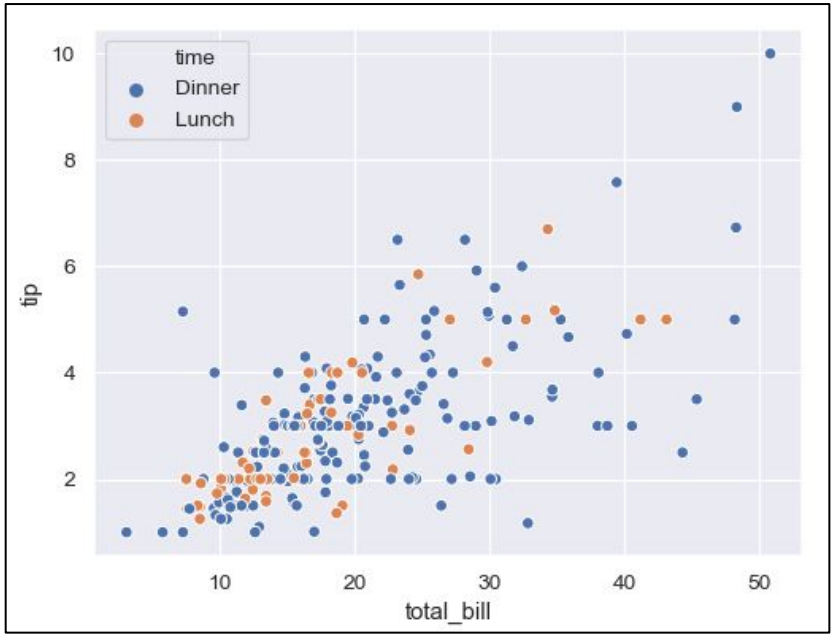
A **line graph** is a graphical display of information that changes continuously over time.



- This plot shows the relationship between the sales and the no. of days
- We can say that sales has been the highest on day 7

Scatter Plot

- A **scatter plot** uses dots to represent values for two different numeric variables.
- The position of each dot on the horizontal and vertical axis indicates values for an individual data point.
- Scatter plots are used to observe relationships between variables.



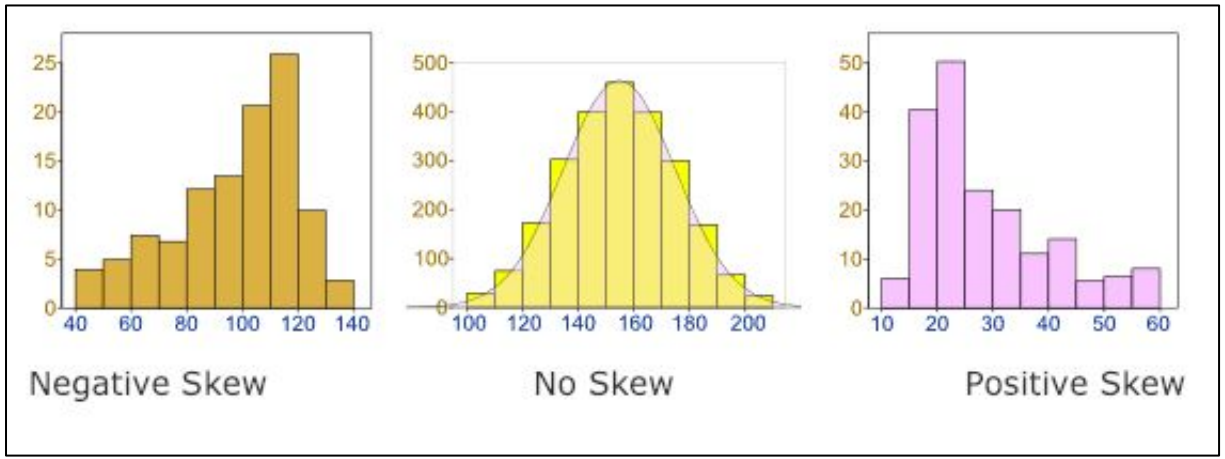
- This plot shows the relationship between the tip and the total bill at the time of lunch and dinner.
- We can say if the total bill is large, the tip can also be large

Histogram and skewness in data

- A **histogram** is a graphical display of data using bars of different heights.
- In a histogram, each bar groups numbers into ranges

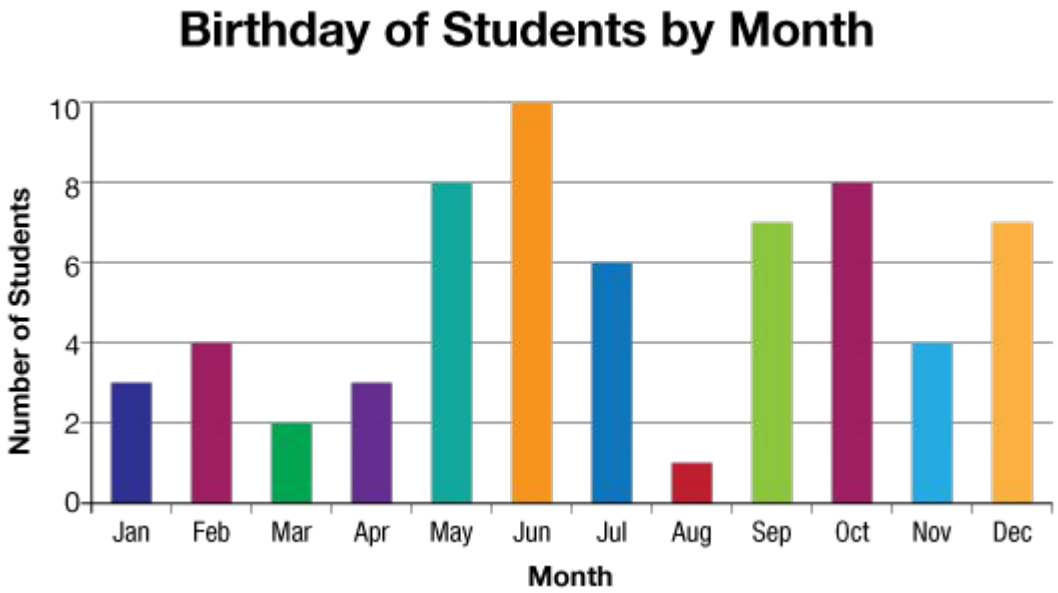
Skewness refers to distortion or asymmetry in a symmetrical bell curve in a set of data

- If the curve is shifted to the left, it is called left skewed. (leftmost curve in the below fig.)
- If the curve is shifted to the right, it is called right skewed. (rightmost curve in the below fig.)



Bar Plot

- A bar chart is a chart that presents categorical data with rectangular bars with heights or lengths proportional to the values that they represent.
- The bars can be plotted vertically or horizontally.



- Most of the students celebrated their birthday in June.
- In August, very less students celebrated their birthdays.

Chart Selection

X Variable	Y Variable	Purpose of analysis	Type of chart	Example
Continuous (numerical)	Continuous (numerical)	How Y changes with X	Scatter plot	How cholesterol varies with Age?
Continuous (numerical)	Categorical	How range of X varies for various category levels	Box plot	Cholesterol variation with Men and Women
Categorical	Categorical	What is the number or % of records of X which falls under each category	Stacked bar	How many men have heart disease compared to women?
Continuous	-	Look at the distribution of the values of the X variable	Histogram, boxplot	Distribution of cholesterol ranges
Impact of 2 X variables on a Y variable			Facet_grid()	Distribution of chol across mean and women – compared for people who have and don't have heart disease

Univariate and Multivariate Analysis

Univariate Analysis: Univariate analysis refers to the analysis of a single variable. It is a simplest form of analysis that summarizes and find patterns in the data. **Examples:** Frequency distribution, averages, measure of dispersion etc.

You have several options for describing data with univariate data:

- Frequency distribution tables
- Bar charts
- Histograms
- Frequency polygons

Multivariate Analysis: Multivariate analysis is used to study the interaction between more than one variable. Examples: Correlation, Regression analysis etc.

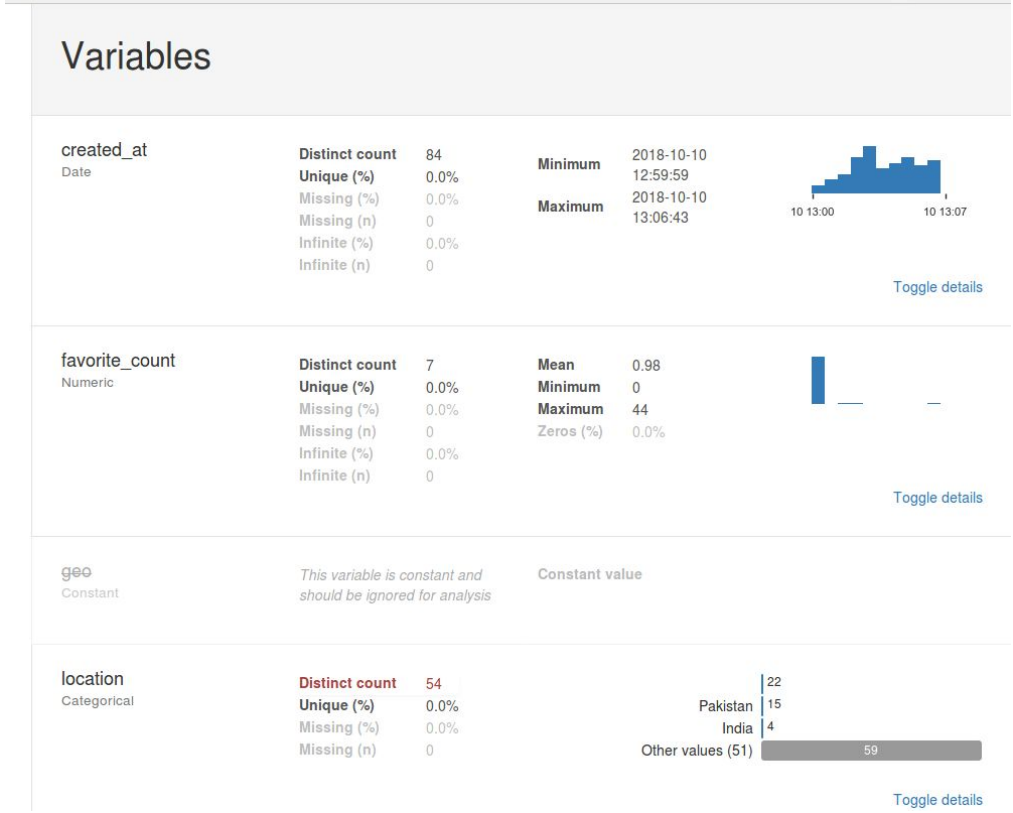
You have several options for describing data with multivariate data:

- Scatter plot
- Pair plot
- Heatmap

Pandas Profiling

- Pandas profiling is an open source python module which helps us do quick exploratory data analysis with a few lines of code.
- It saves all the work of visualizing and checking distribution of each variable.
- It generates a report with all the information available.
- The only problem with pandas profiling is working with large datasets, it takes a lot of time to generate the report.

Sample Report



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Happy Learning !