



# Statistical Graphics:

## What is Exploratory Data Analysis?

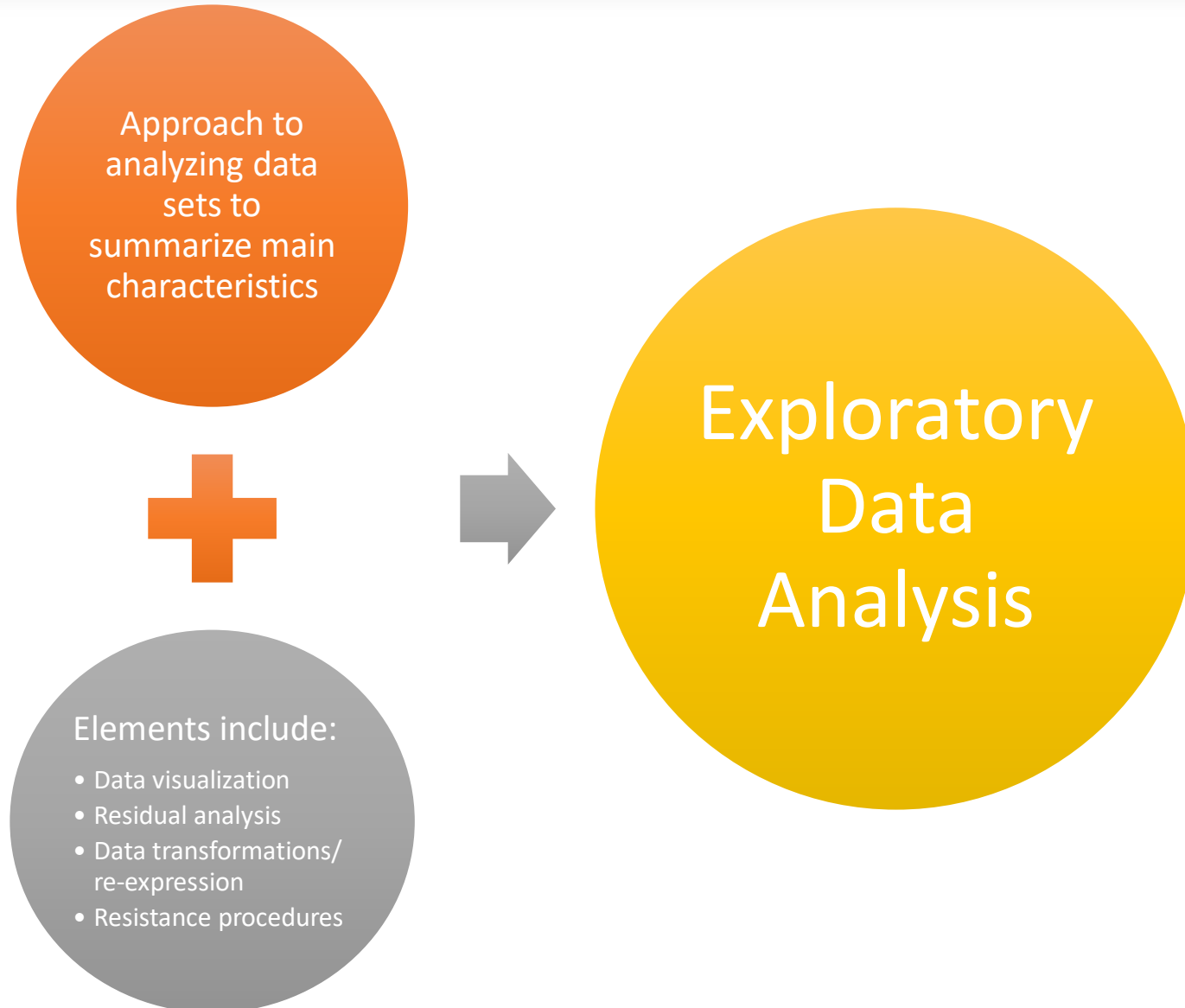
# Objective

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Objective  
Describe  
exploratory  
data analysis

# Exploratory Data Analysis



# Data Visualization



| Data visualization facilitates advanced data analysis

| Checks distributional and other assumptions

| Observes time-based processing

| Spots outliers

| Examines relationships

| Discriminates clusters

| Compares mean differences



## The type of data distribution affects

- How it should be analyzed
- How it should be visualized

## Key step is pre-conditioning data



# The Normal Distribution

## Normal (Gaussian) Distribution

- Popular
- Fully characterizes with two parameters
- Probability is determined knowing distance from mean
- Many measures and tests are designed for this

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

# Mean and Standard Deviation

| For sample population  $X = \{x_1, \dots, x_n\}$  the mean is defined as:

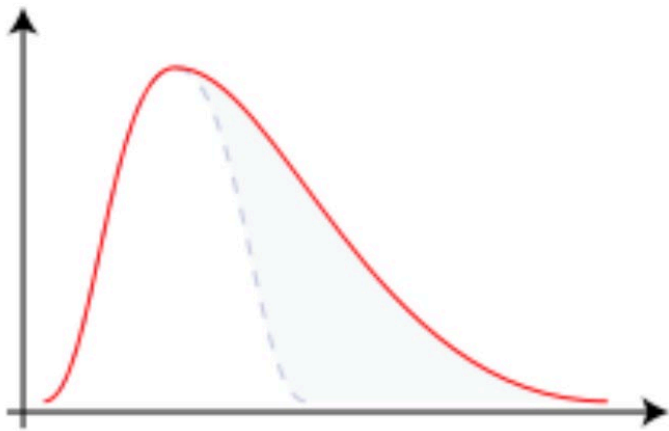
$$\mu = \frac{1}{N} \sum_{i=0}^N x_i$$

| The standard deviation is defined as:

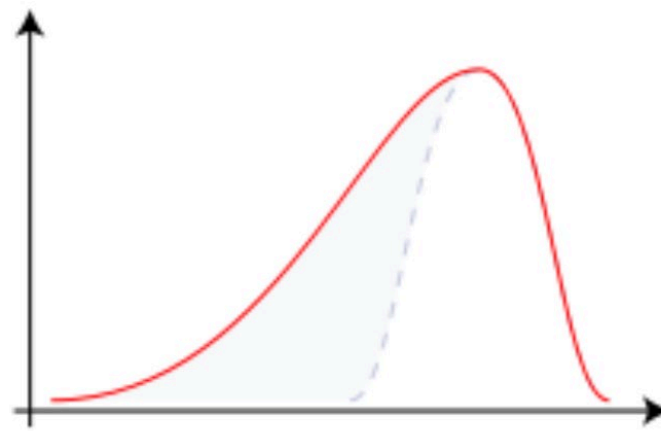
$$\sqrt{\frac{1}{N} \sum_{i=0}^N (x_i - \mu)^2}$$

# Skewness

Measure of the asymmetry of the probability distribution



Positive Skew



Negative Skew



# Skewed Data

For a sample of N values, the sample skewness is:

$$\gamma = \frac{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^3}{\left( \frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2 \right)^{3/2}}$$