

# Test and their types

Parametric test and Non-parametric test

## Tests and their types

<b>Parametric Tests</b> <ul style="list-style-type: none"> <li>• More Reliable results</li> <li>• First we have to meet the assumptions</li> </ul>	<b>Non-Parametric tests</b> <ul style="list-style-type: none"> <li>• Less reliable results</li> <li>• Calculates the rank of data</li> <li>• No need to meet the assumptions</li> </ul>
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equal? based on the rankings



## Step-1 Normality test

### BEFORE STARTING

I repeat before starting the data analysis:

## Step-1 Normality Test

Tests to be used:

- 1. Shapiro-Wilk test**
  - Specific (Reliable)
- 2. Kolmogorov-Smirnov Test**
  - General (Less reliable)



## Step-2 Homogeneity Test

- we will do levene test

**BEFORE STARTING**

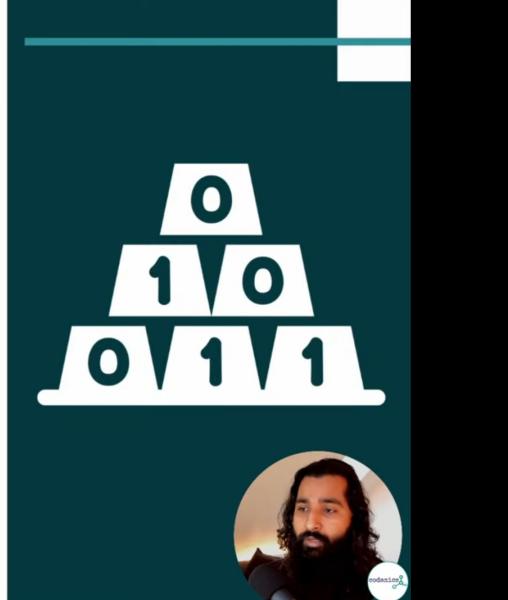
I repeat before starting the data analysis:

## Step-2 Homogeneity Test

The variance of the variable in data are equal

Test to be used:

## Levene's test



## Step-3 Purpose

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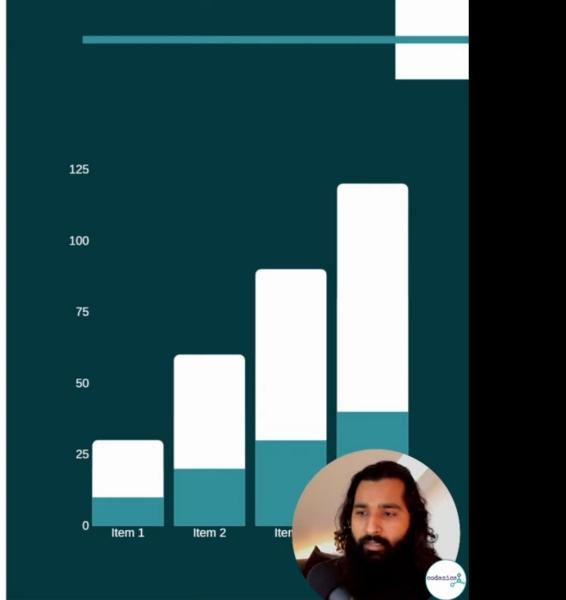
- purpose of our research question

**BEFORE STARTING**

I repeat before starting the data analysis:

## Step-3 Purpose

*KNOW THE PURPOSE OF YOUR RESEARCH QUESTION*



## Step-3 Purpose

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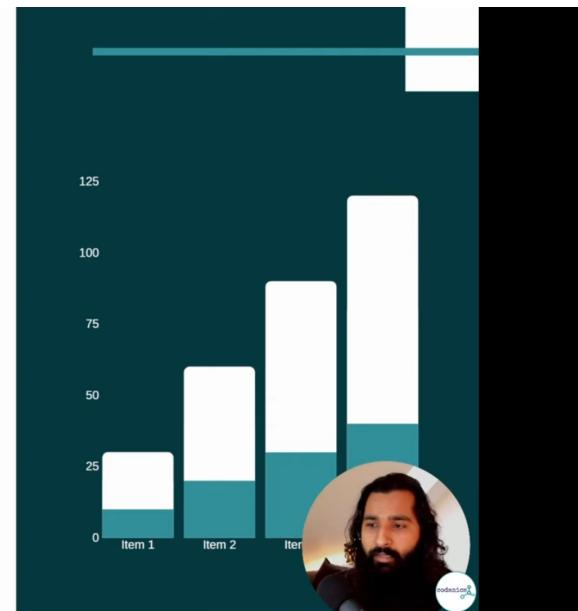
- purpose of our research question
- Two types of purposes

**BEFORE STARTING**

I repeat before starting the data analysis:

**Step-3 Purpose**

*KNOW THE  
**PURPOSE** OF YOUR  
RESEARCH  
QUESTION*

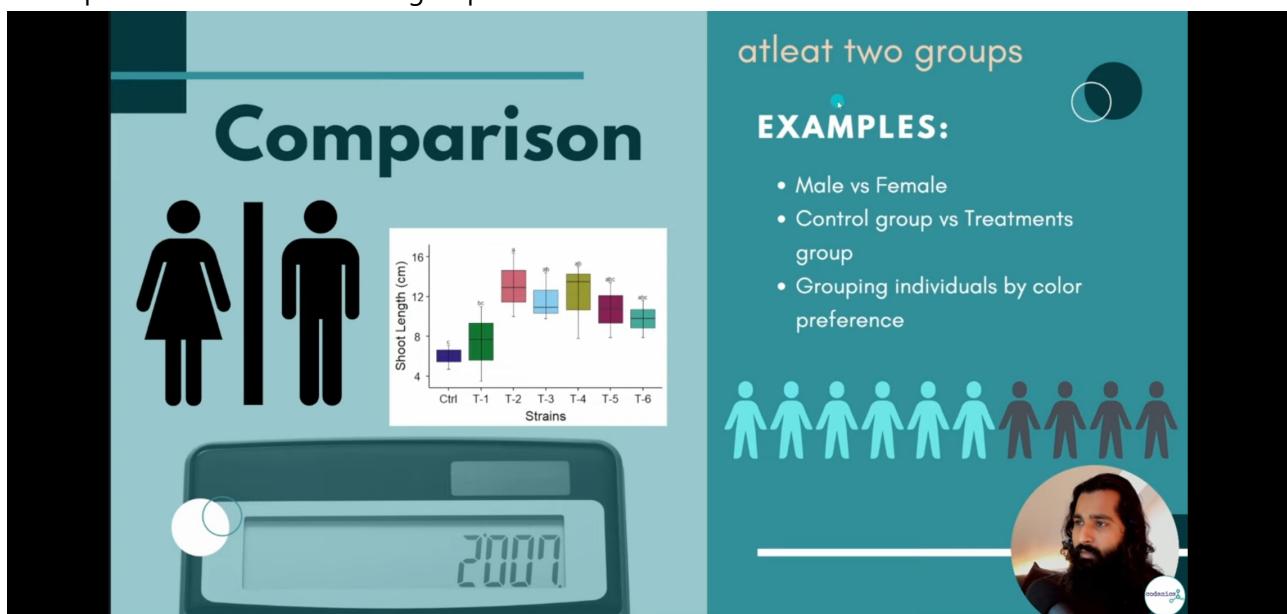


comparision and relationship

- samosa example

**Two types of purposes**

- if comparision must be atleast 2 groups



**Comparison**

atleast two groups

**EXAMPLES:**

- Male vs Female
- Control group vs Treatments group
- Grouping individuals by color preference

A bar chart titled "Shoot Length (cm)" showing shoot length for different strains. The y-axis ranges from 4 to 16 cm. The x-axis shows "Strains" (Ctrl, T-1, T-2, T-3, T-4, T-5, T-6). The bars are colored: Ctrl (blue), T-1 (green), T-2 (red), T-3 (light blue), T-4 (yellow), T-5 (purple), T-6 (teal). Error bars are present on each bar.

- if relationship must be connection between them

- it is corelation or relationship



**Relationship**

find a connection

**EXAMPLES:**

- Can food predict weight of a group of individuals
- Do fertilizer application increases crop growth?

Three line graphs illustrating relationships:

- Graph 1: Weight vs Food. Blue line with circles. Y-axis: Weight. X-axis: Food.
- Graph 2: Quantity-2 vs Quantity-1. Blue line with circles. Y-axis: Quantity-2. X-axis: Quantity-1.
- Graph 3: Plant Weight (g) vs Fertilizer. Orange line with circles. Y-axis: Plant Weight (g). X-axis: Fertilizer.

We seek following here:

- Connection
- Correlation
- Causation
- Prediction

## Step-4 Data Type

Either it is catagorical or continuous

## Two types of Data

### CATEGORICAL

Qualitative  
No numerical meaning  
Represented in texts  
(e.g: character, factors)

### CONTINUOUS

Quantitative  
Numerical  
Mostly represented in number  
(e.g: Numerical variable, int and float)



- catagorical

## Categorical



TRUE FALSE YES OR NO

qualitative



**EXAMPLES:**

- Yes and No answers  
(Have you ever been to Lahore?)  
Which gene was expressed?  
Do you like Mangoes? "yes" or "No"



- continuous

The slide features a teal header with the word "Continuous" in large, bold, dark teal letters. Below the title are three icons: a stick figure pointing at a bar chart, a magnifying glass over a document with a dollar sign, and a digital scale displaying "200g". The background is white with a dark teal sidebar on the right.

quantitative

EXAMPLES:

- Amount
- Number
- Age
- Plant Height
- Number of bacterial colonies
- Chlorophyll content
- Fertilizer Amount

A circular profile picture of a man with long dark hair and a beard, wearing a dark t-shirt. Below the picture is a small logo with the text "codesimply".

- example

Muhammad Awon • 1 mo ago

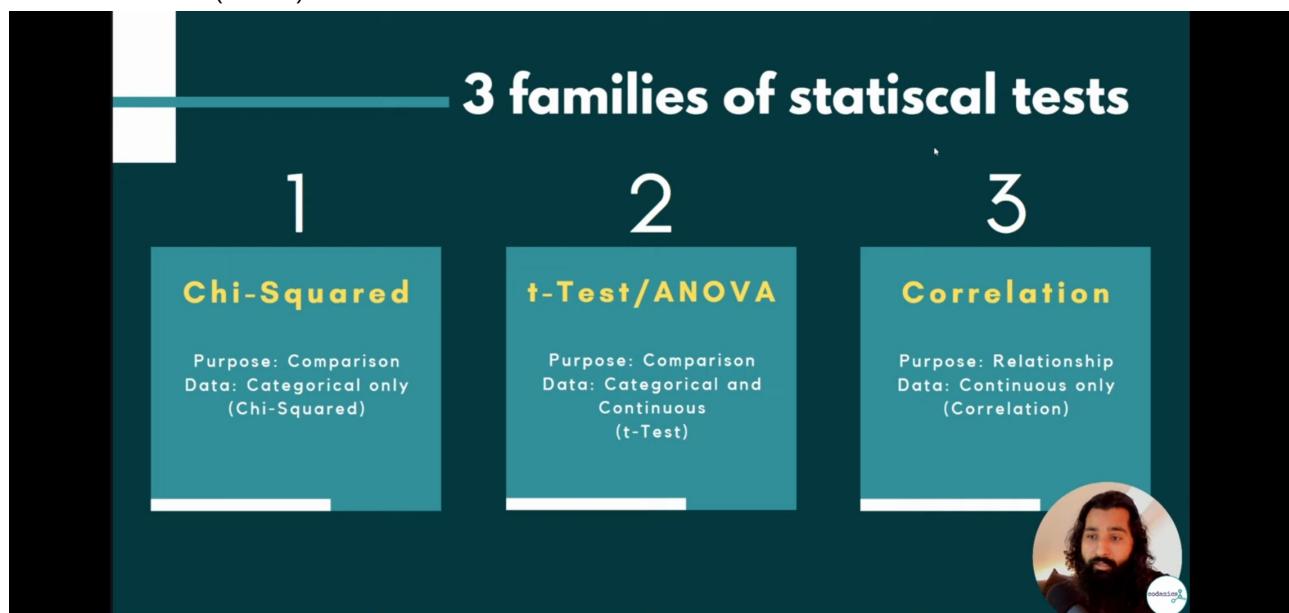
@ 12:40 kashti walay dataset mein variables types:

survived -> binomial  
pclass -> ordinal  
sex -> binomial  
age -> ordinal  
sibsp -> ordinal  
parch -> discrete  
fare -> discrete  
embarked -> ordinal  
class -> ordinal  
who -> ordinal  
adult\_male -> binomial  
deck -> ordinal  
embark\_town -> ordinal  
alive -> binomial  
alone -> binomial

1    1    1

# Step-5 Stastitical Test

- under 3 families (basics)



## chi-square test

**When and where to use?**

- 1 **Chi-Squared**  
Purpose: Comparison  
Data: Categorical only (Chi-Squared)

**Types:**  
1. Chi-Squared test of homogeneity  
2. Chi-squared test of independence

**When to use?**

- Nothing effects this,
- Can be used with any number of levels or groups

**You must remember the purpose and data type**



## t-Test/ANOVA test

### one-sample t-Test

- compare from a known value (up and down data), like height of all samples from a known value (5. 5 feet)

### paired t-Test

- just females height difference

### un-paired t-Test

- both female and male height difference

## ANOVA

- more than 2 groups

**When and where to use?**

**Types:**

1. **One-sample t-Test** (for one sample group with a known mean)
2. **Two-sample t-Test:**
  - Un-paired t-Test (Two different groups)
  - Paired t-Test (Same group Twice)
3. **ANOVA** (Analysis of Variance) [3+ levels or groups are involved]
  - **One-way ANOVA** (Even one of group is significant you will get significant results, but doesn't tell you which one; )
  - **Two-way ANOVA**
  - **Repeated measures of ANOVA** (3+ paired groups, scale up of Paired t-Test)

## Corelation

- relationship between continuous variables in a dataset

**When and where to use?**

**Types:**

1. **Pearson's Correlation** (one-Independent and One-Dependent Variable)
2. **Regression** (one-Independent and One-Dependent Variable):

**Correlation:** Tells us how closely connected two variables are?  
"Is food a predictor of weight gain?"

**Regression:** Tells us a specific mathematical equation that describes the relationship.  
(This helps us to find the data points not measured yet e.g: missing values can be predicted like this!)

## Importane things

Your data must be normal or follow a gaussian distribution.

If data is not normal, we will normalize it with different method.

If not reliable results, then we disturbed all test.

## Important Things

**Assumptions about your data**

These tests trusts you that:

- Your data is **Normally distributed**
- or follow a **Gaussian distribution**

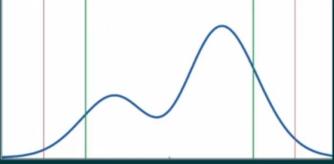
**Non-reliable results**

If you do not follow the assumptions and break the trusts of 3-test families, they will not happy with you!



If data is not normal and assumption are not same then we have to do first normality , then secondly check homogeneity.

**Assumptions are not met!**



If,



1. **Normalize your Data**
  - a. Standardization
  - b. Min-max scaling
  - c. Log transformation
2. **Use Alternative Non-Parametric Tests**



If still not normal and non-parametric test then

**Good News!**

**Non-parametric alternatives**

- 1 **Chi-Squared**  
Purpose: Comparison  
Data: Categorical only (Chi-Squared)
- 2 **t-Test/ANOVA**  
1. One-sample t-Test  
2. Two-sample t-Test
  - a. Unpaired t-Test
  - b. Paired t-Test
 3. ANOVA
- 3 **Correlation**  
Pearson's Correlation Regression

**Pearson's Correlation (Spearman's Correlation) & (Kendall's Tau) Regression**

**Comments 792**

**comparison**

Muhammad Awon • 1 mo ago statistics statistics statistics .... statistics, ap ny 4x statistics kahah

MOHAMMAD EHTESHAM UL... • 1 mo ago 28:57 non parametric test

Translate to English

## Types of ANOVA

**Types of ANOVA**

- 2 **ANOVA's**  
Purpose: Comparison  
Data: Categorical and Continuous [3+ levels or groups are involved]

**ANOVA (Analysis of Variance) [3+ levels or groups are involved]**

- 1. **One-way ANOVA** (Even one of group is significant you will get significant results, but doesn't tell you which one; )
- 2. **Two-way ANOVA** (2 factors involved)
- 3. **Repeated measures of ANOVA** (3+ paired groups, scale up of Paired t-Test)

**ANCOVA (Analysis of Co-variance)**

- Compare the means of 3+ independent groups which can not be tested by ANOVA because the variables are affected by co-variance (pre-test and post-Test of class)

**MANOVA (Multi-variate analysis of Variance)**

**MANCOVA (Multi-variate analysis of Co-variance)**

MOHAMMAD EHTESHAM UL... • 1 mo ago

## Some other tests

# Some Other tests

## Reliability tests

- Kunder-Richardson's Formula 20 and 21 (KR20/21)
- Cronbach's Alpha

## Inter-rater Reliability tests

- Krippendorf's Alpha
  - (Categorical or continuous)
- Fleis's Kappa
  - (Only Categorical)

## Validity tests

- Krippendorf's Alpha Test
- Fleis's Kappa Test

## Sample size computation

How to make sure how many samples are valid?

- Cochran's Q Test
- Yamane's Test
- many others.....



## flow diagram of this whole lecture

