INFERENTIAL STATISTICS

INTRODUCTION

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TOPIC OUTLINE

Inferential Statistics

Normal Distribution

**Histogram**

Normality Test

INFERENTIAL STATISTICS

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Normal Distribution:

Inferential statistics is a branch of statistics that analyzes and interprets data to make **conclusions** beyond the observed dataset. It focuses on drawing meaningful inferences about a population based on a sample using techniques such as **hypothesis testing**, **confidence intervals**, and **regression analysis**.
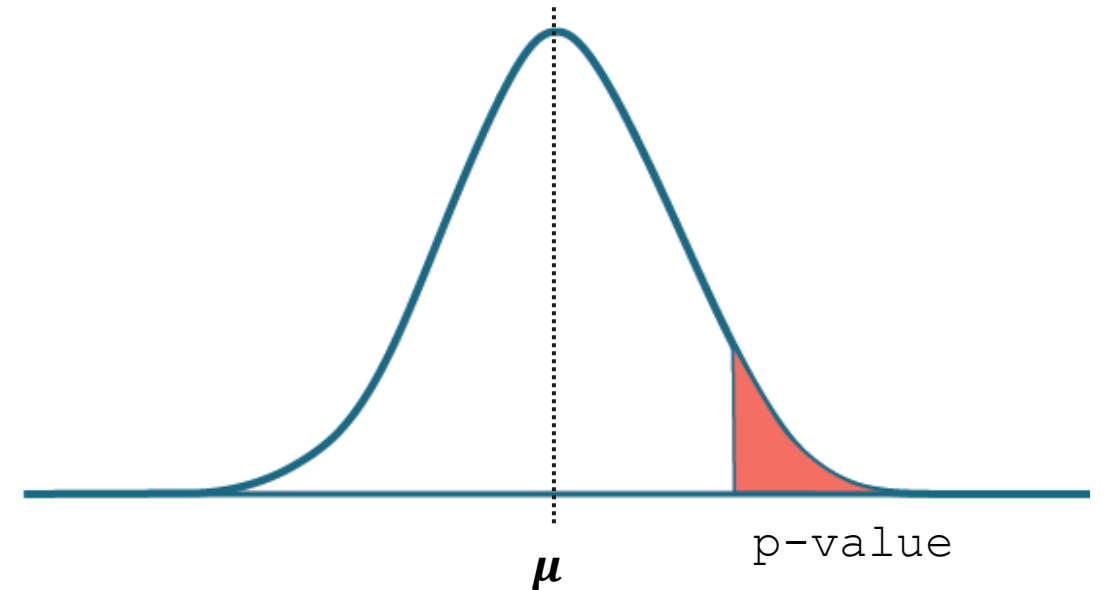
μ

p-value

NORMAL DISTRIBUTION

A **normal distribution** is a probability distribution where the values of a random variable are distributed symmetrically. Also known as **Gaussian distribution** or bell curve because of its shape.
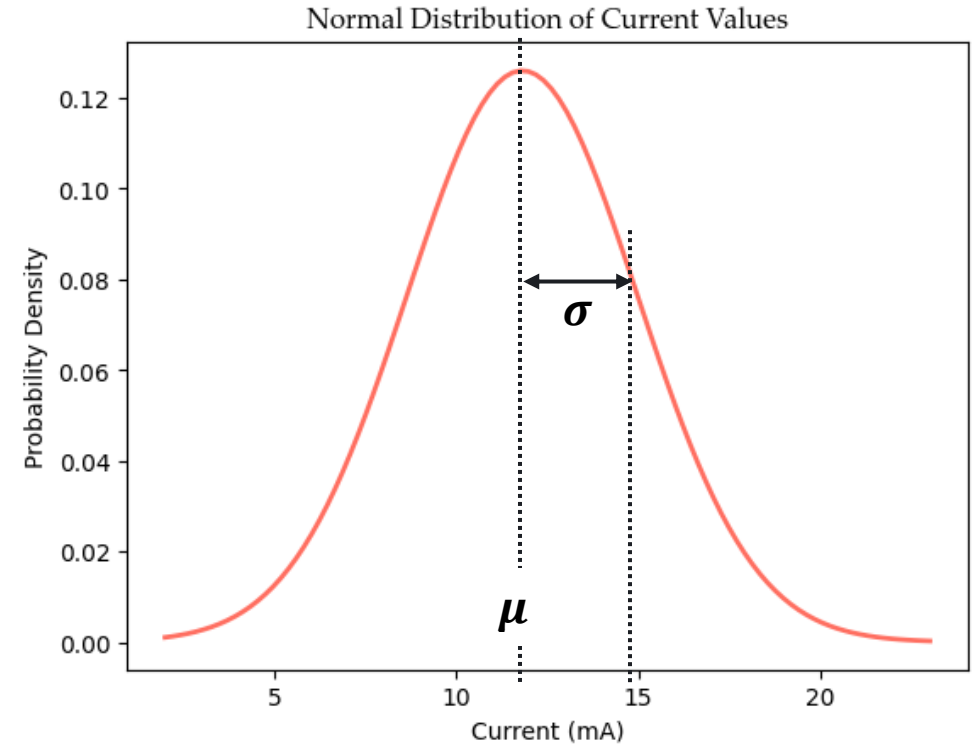
Johann Carl Friedrich Gauss

NORMAL DISTRIBUTION

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Formula:

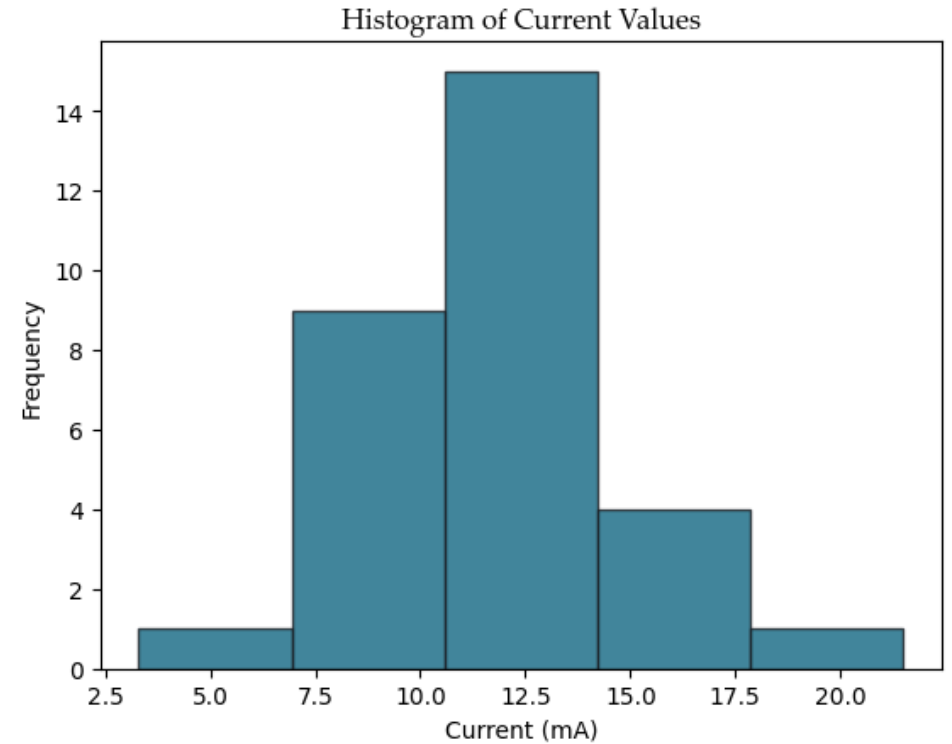$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

Bell Curve:

Normal Distribution of Current Values

HISTOGRAM

Histogram:

Histograms are used to visualize the **shape**, **spread**, and **central tendency** of data, making them a useful tool for assessing whether a dataset follows a normal distribution or deviates from it.

NORMALITY TEST

Test	Recommendation
Shapiro-Wilk	Small sample sizes (< 50)
Anderson-Darling	Moderate sample sizes ($50 - 5000$)
Kolmogorov-Smirnov	Large sample sizes (> 5000)

Interpreting the p-value in a Normality Test

High p-value ($p > 0.05$):

The data may be normally distributed.

Low p-value ($p \leq 0.05$):

The data is likely **not** normally distributed.

EXERCISE

The dataset consists of 30 samples of current measurements (in mA). Generate a **normal distribution plot** and assess the normality of the data using the **Shapiro-Wilk** test in a Jupyter Notebook.

Dataset:

L14-current-data.csv

Current Response

Sample	Current
1	12.0
2	15.0
3	8.3
4	9.7
5	12.0
6	13.9
7	14.1
8	9.2
9	12.4
10	13.7
11	10.6
12	21.5
13	12.0

LABORATORY