INFERENTIAL STATISTICS

INTRODUCTION

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TOPIC OUTLINE

Inferential Statistics

Distribution

Histogram
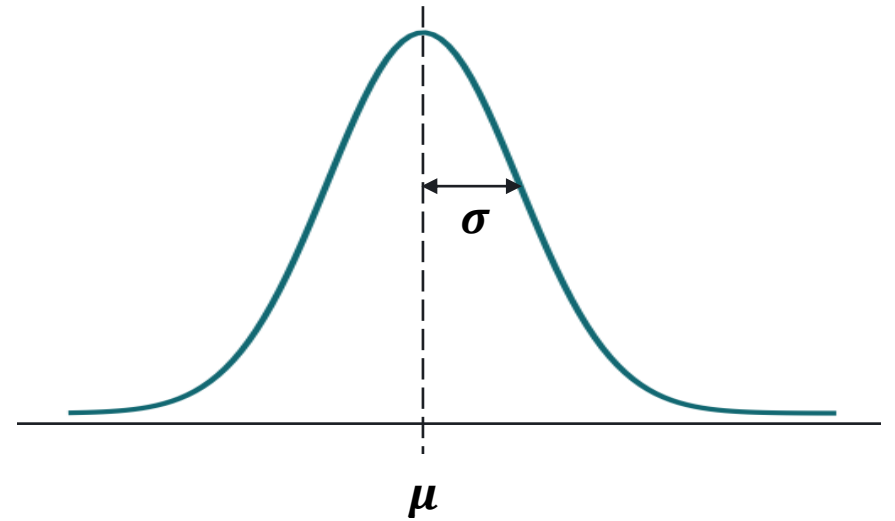
Normal Distribution

DISTRIBUTION

INFERENTIAL STATISTICS

Normal Distribution

Inferential statistics is a branch of statistics that uses sample data to **draw conclusions** (inferences) about a population.

σ

μ

DISTRIBUTION

Rolling one die

Outcome	Probability
1	1/6 or 0.17
2	1/6 or 0.17
3	1/6 or 0.17
4	1/6 or 0.17
5	1/6 or 0.17
6	1/6 or 0.17
7 (all else)	0

Sum of probabilities = 1 or 100%

Distribution or the probability distribution describes the **probabilities** or **frequencies** of different outcomes in an experiment or observed data.

UNIFORM DISTRIBUTION

<u>Discrete data</u>

One die distribution

<u>Rolling one die</u>

Outcome	Probability
1	1/6 or 0.17
2	1/6 or 0.17
3	1/6 or 0.17
4	1/6 or 0.17
5	1/6 or 0.17
6	1/6 or 0.17
7 (all else)	0

Sum of probabilities = 1 or 100%

DISTRIBUTION

Rolling two dice

36 possible outcomes

(1,1) (2,1) (3,1) (4,1) (5,1) (6,1)
(1,2) (2,2) (3,2) (4,2) (5,2) (6,2)
(1,3) (2,3) (3,3) (4,3) (5,3) (6,3)
(1,4) (2,4) (3,4) (4,4) (5,4) (6,4)
(1,5) (2,5) (3,5) (4,5) (5,5) (6,5)
(1,6) (2,6) (3,6) (4,6) (5,6) (6,6)

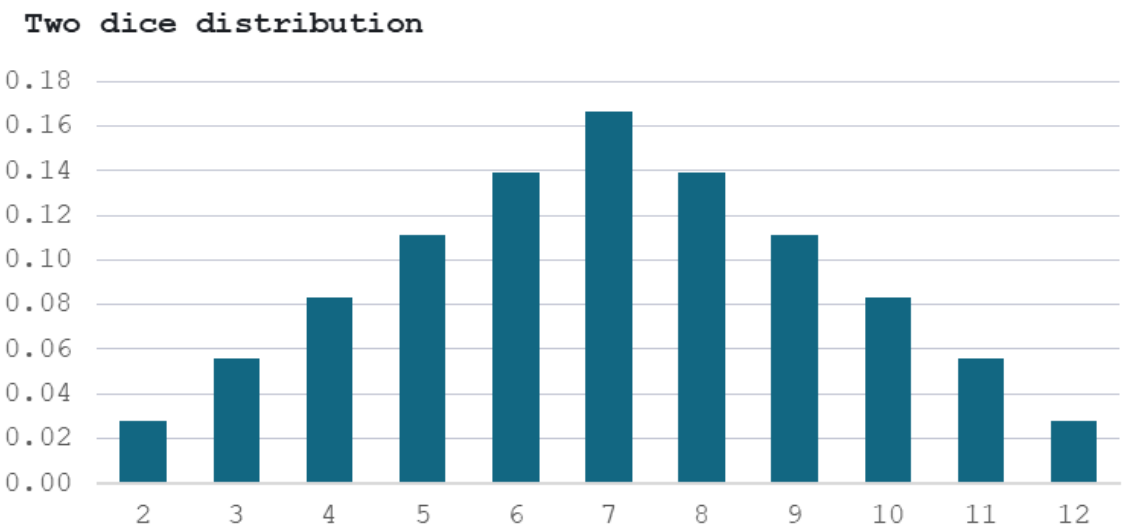| Sum	Probability
2	0.03
3	0.06
4	0.08
5	0.11
6	0.14
7	0.17
8	0.14
9	0.11
10	0.08
11	0.06
12	0.03
All else	0

DISTRIBUTION

<u>Rolling two dice</u>

<u>Discrete data</u>

Two dice distribution

Sum	Probability
2	0.03
3	0.06
4	0.08
5	0.11
6	0.14
7	0.17
8	0.14
9	0.11
10	0.08
11	0.06
12	0.03
All else	0

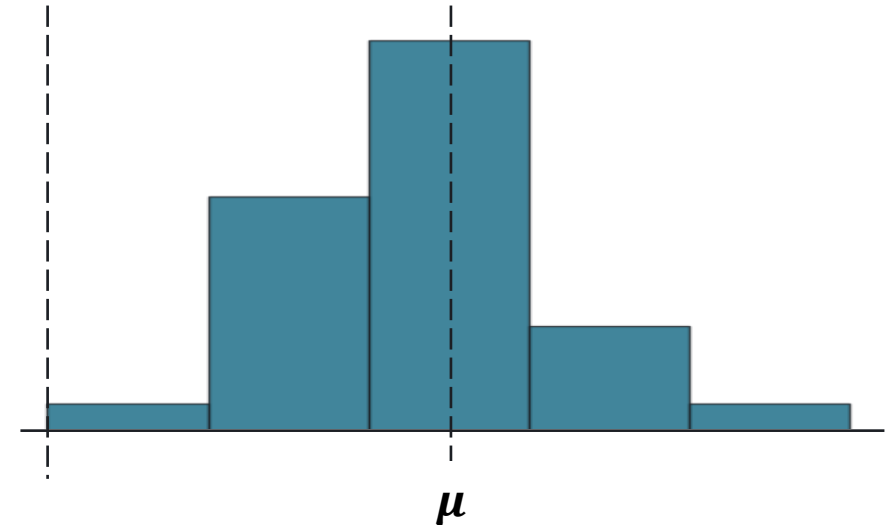# HISTOGRAM

Histogram

Frequency

μ

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.
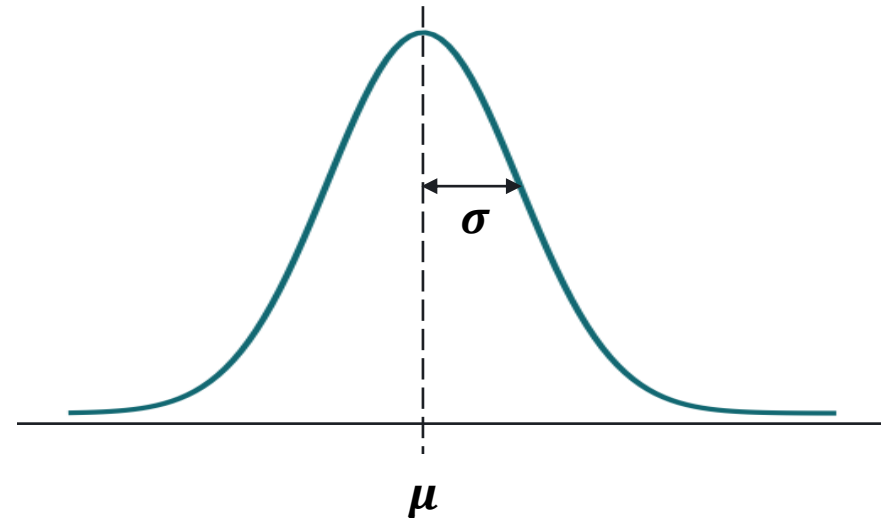
NORMAL DISTRIBUTION

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

Bell Curve

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.

Denoted by:

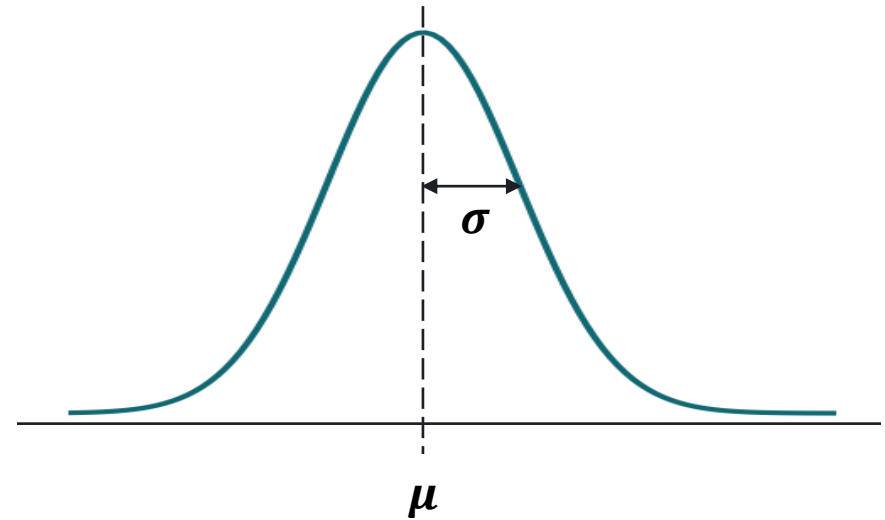$$N(\mu, \sigma^2)$$

mean = median = mode

NORMAL DISTRIBUTION

Bell Curve

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.

Formula:

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

mean = median = mode

LABORATORY

EXERCISE

The dataset consists of 30 samples of current measurements (in mA). Generate a **normal distribution plot** in a Jupyter Notebook.

Dataset:

L16-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