INFERENTIAL STATISTICS

INTRODUCTION

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TOPIC OUTLINE

Inferential Statistics

Distribution

Histogram

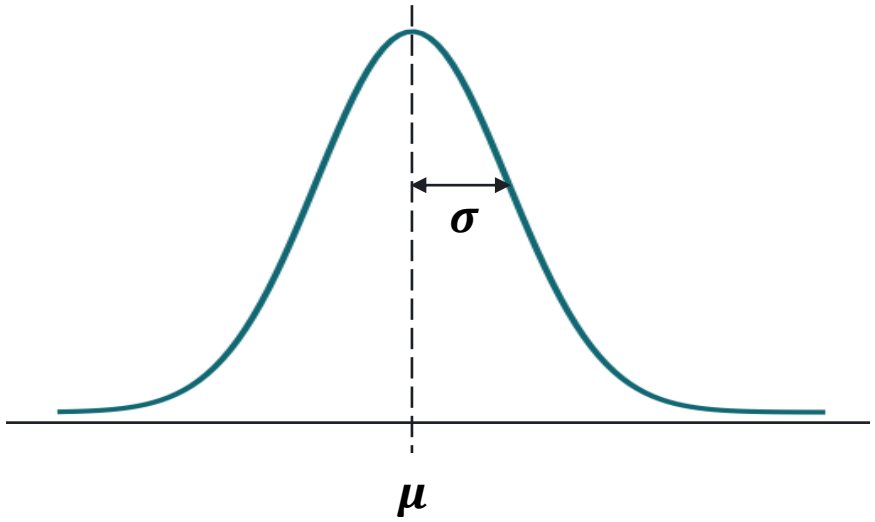
Normal Distribution

DISTRIBUTION

INFERENTIAL STATISTICS

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

Normal Distribution



DISTRIBUTION

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

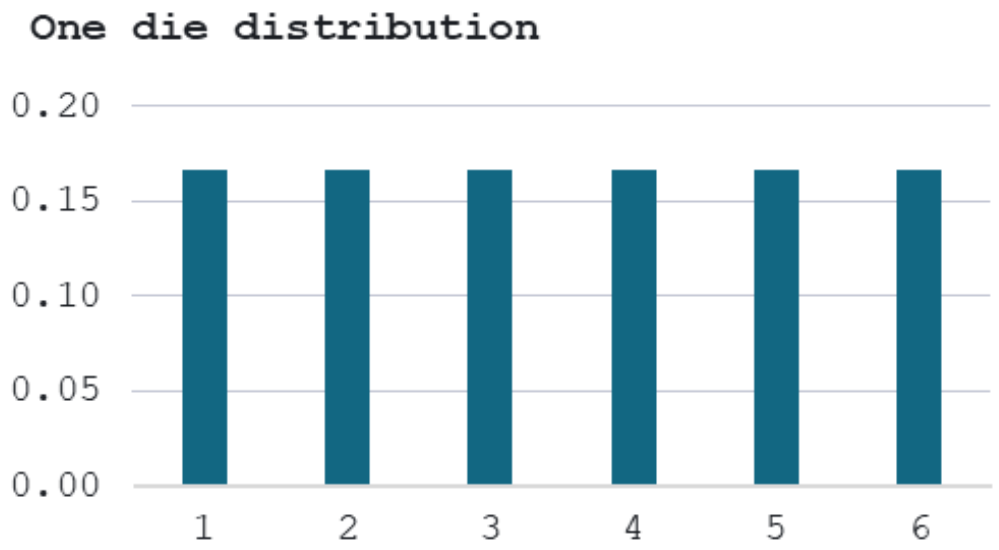
Rolling one die

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%

UNIFORM DISTRIBUTION

Discrete data



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Sum of probabilities = 1 or 100%

DISTRIBUTION

36 possible outcomes

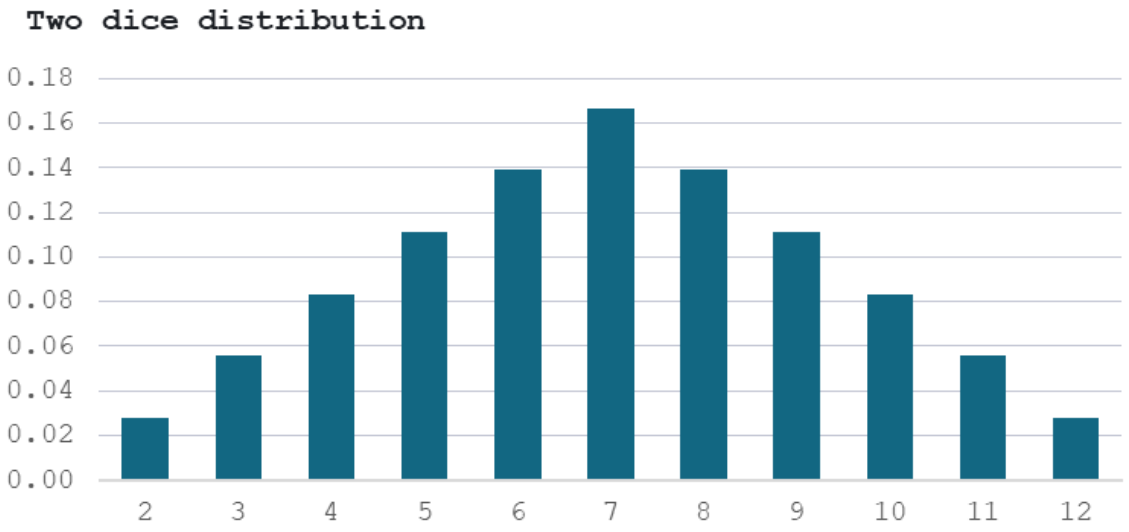
(1,1)	(2,1)	(3,1)	(4,1)	(5,1)	(6,1)
(1,2)	(2,2)	(3,2)	(4,2)	(5,2)	(6,2)
(1,3)	(2,3)	(3,3)	(4,3)	(5,3)	(6,3)
(1,4)	(2,4)	(3,4)	(4,4)	(5,4)	(6,4)
(1,5)	(2,5)	(3,5)	(4,5)	(5,5)	(6,5)
(1,6)	(2,6)	(3,6)	(4,6)	(5,6)	(6,6)

Rolling two dice

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

Discrete data



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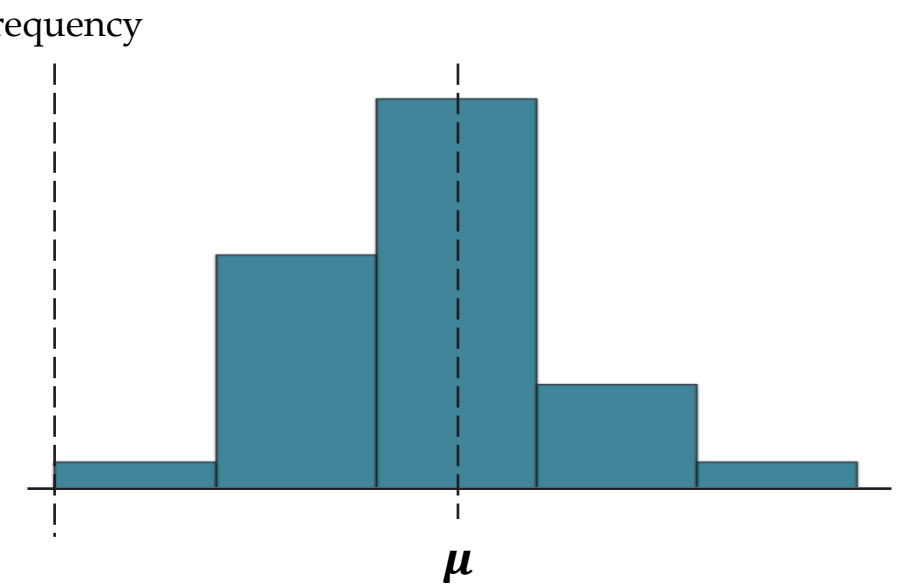
12	0.03
All else	0

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.

Histogram



syntax

```
import matplotlib.pyplot as plt

plt.hist(data, bins = 10)

plt.show()
```

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

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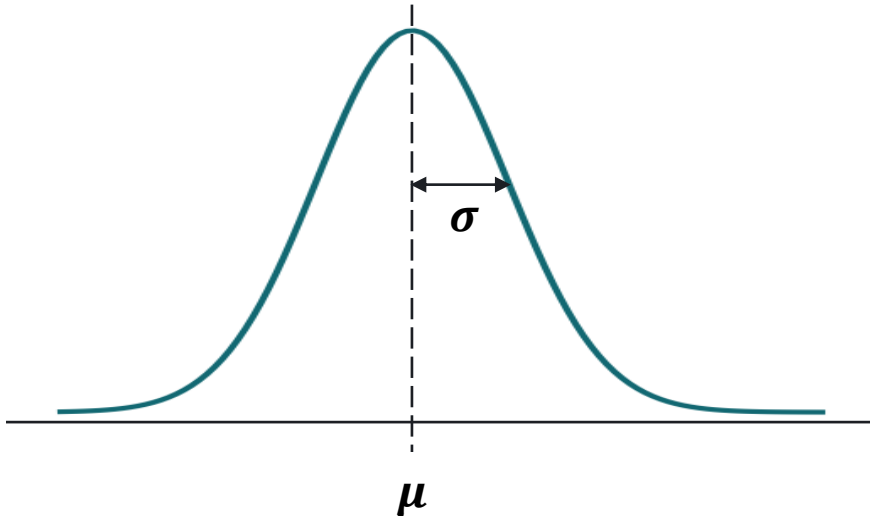
Denoted by

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

Bell Curve



mean = median = mode

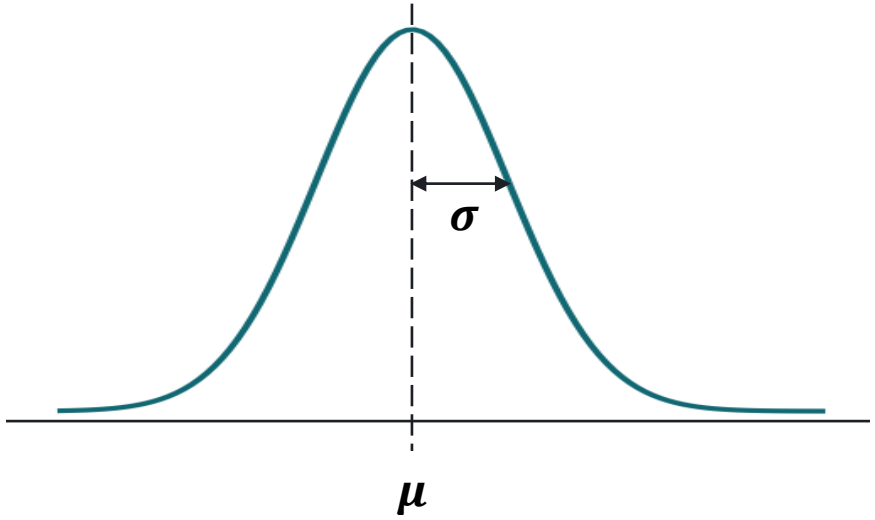
NORMAL DISTRIBUTION

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.

Formula

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

Bell Curve



mean = median = mode

syntax

```
p = stats.norm.pdf(x, mean, std)
plt.plot(x, p)
plt.show()
```

EXERCISE

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

dataset

`current-test.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