MACHINE LEARNING PROGRAM

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CONTENT

- **Basics of Python**
  - Introduction To Variables
  - Loops and Lists_Tuples
  - Pandas, Numpy
  - Functions And Strings
  - Data Aggregations using Pandas
- Introduction to Data Science
- Introduction to Machine Learning
  - Supervised Learning
  - Un-Supervised Learning
- Introduction to NLP
- Project

PYTHON BASIC, NUMPY, PANDAS

- **Lets see it on Jupiter Notebook**

ALGEBRA

Broad parts of mathematics, together with number theory, geometry and analysis.

WHAT IS LINEAR ALGEBRA?

- Linear algebra is a sub-field of mathematics concerned with vectors, matrices, and operations on these data structures.

- In this we mostly work with Matrices and Vectors.

WHY IS LINEAR ALGEBRA IMPORTANT TO MACHINE LEARNING?

- Linear Algebra is elementary unit for Machine Learning.
- Its concepts are a crucial prerequisite for understanding the theory behind all Machine Learning Algorithms.
- Linear algebra is used in data preprocessing, data transformation, and model evaluation.

LINEAR ALGEBRA INCLUDES

- Vectors
- Matrices
- Transpose of a matrix
- Inverse of a matrix
- Determinant of a matrix
- Dot product
- Eigenvalues
- Eigenvectors

LINEAR ALGEBRA – KEY CONCEPT

- Linear Algebra Notation
- Linear Algebra Arithmetic
- Linear Algebra for Statistics
- Matrix Factorization
- Linear Least Squares

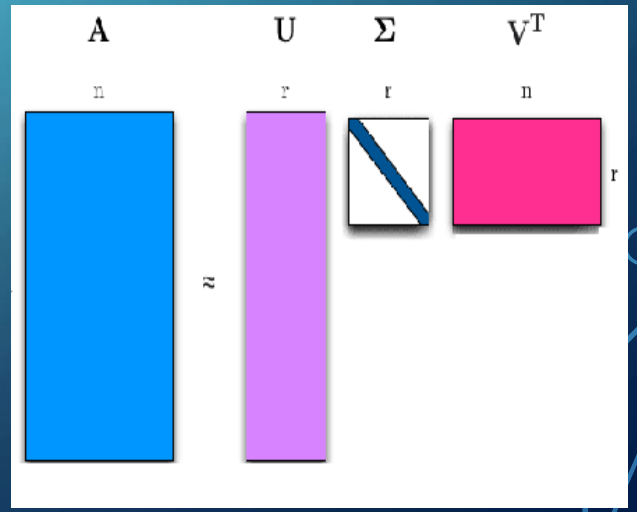
Matrix **A**: $\mathbf{A} = \begin{pmatrix} 1 & 7 \\ 3 & 11 \end{pmatrix}$

Transpose of **A**: $\mathbf{A}^T = \begin{pmatrix} 1 & 3 \\ 7 & 11 \end{pmatrix}$

Row Vector **a**: $\mathbf{a} = \begin{pmatrix} 5 & 0 & 4 \end{pmatrix}$

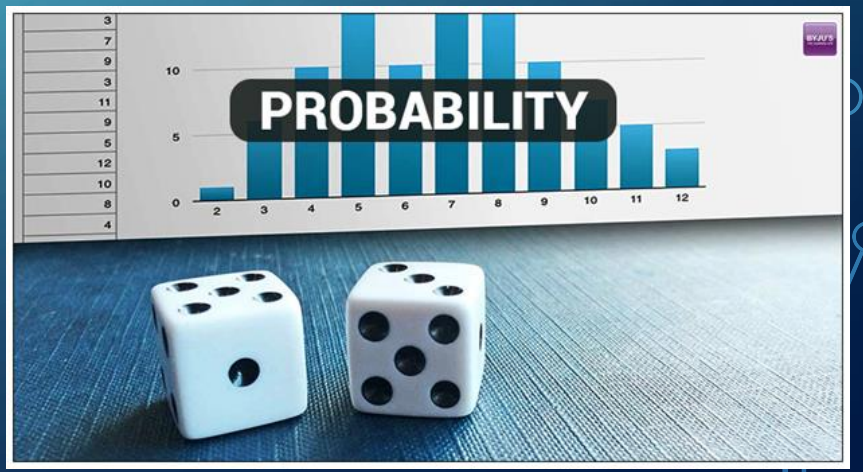
Addition	+
Subtraction	−
Multiplication	×
Division	÷

$$\text{RSS} := \sum_{i=1}^{N} (y_i - \hat{y}_i)^2$$



PROBABILITY

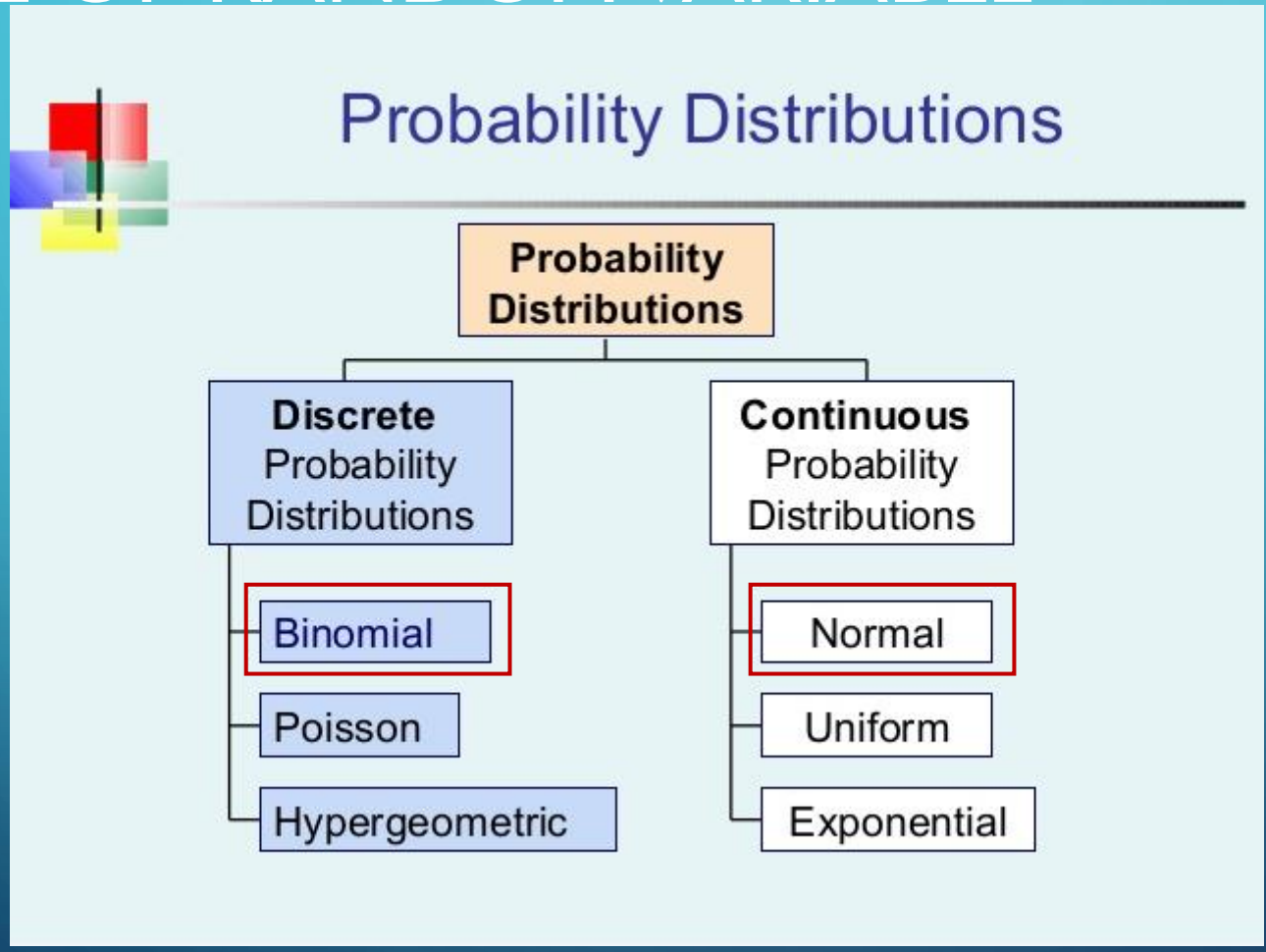
- Measure quantifying the likelihood that events will occur.



PROBABILITY TERMINOLOGY

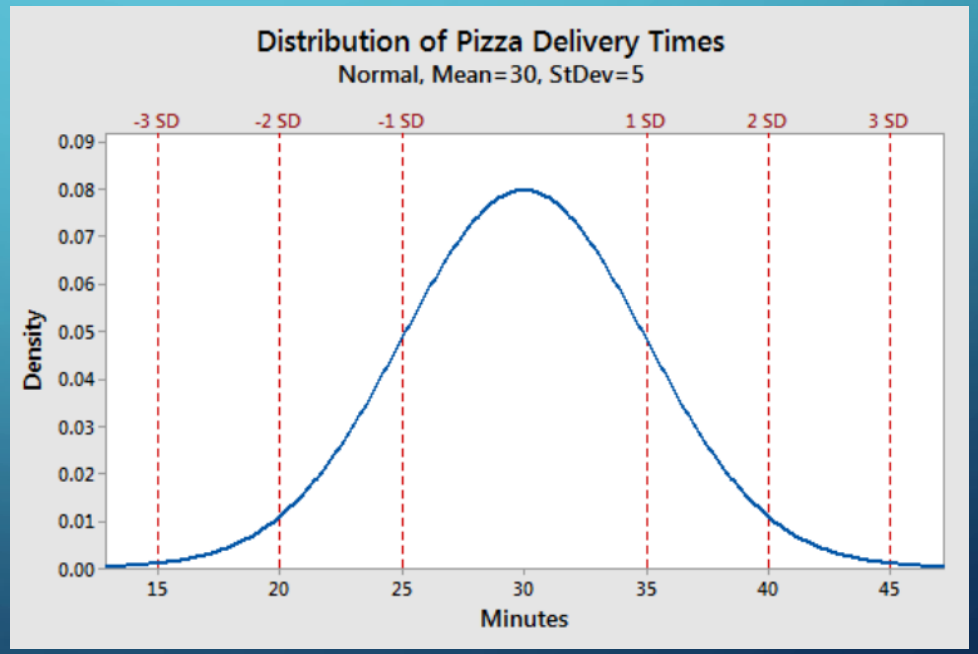
- **Experiment:** An occurrence with an uncertain outcome that we can observe. For example, rolling a die.
- **Outcome:** The result of an experiment; one particular state of the world. What Laplace calls a "case." For example: 4.
- **Sample Space:** The set of all possible outcomes for the experiment. For example, {1, 2, 3, 4, 5, 6}.
- **Event:** A subset of possible outcomes that together have some property we are interested in. For example, the event "even die roll" is the set of outcomes {2, 4, 6}.

TYPE OF RANDOM VARIABLE



PROBABILITY DISTRIBUTION

- A probability distribution tells you what is the probability of an event happening is.
- It can show **simple events**, like tossing a coin or picking a card or **complex events**, like the probability of a certain drug successfully treating cancer.



BINOMIAL DISTRIBUTION

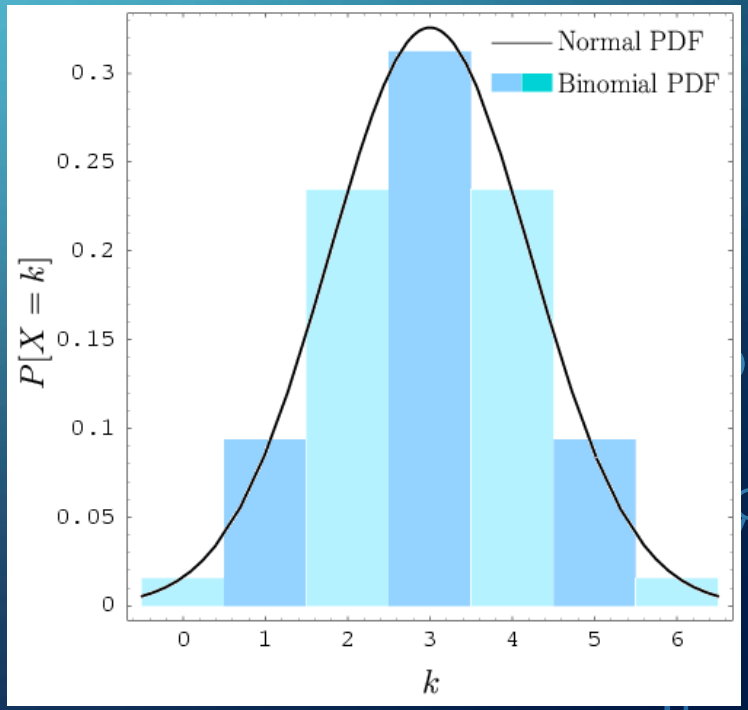
- The word "**Binomial**" literally means "**two numbers**"
- A binomial distribution for a random variable X is one in which there are only two possible outcomes either success or failure.
- **Success** and **Failure**, must be mutually exclusive

Example:

- Let's assume we are flipping a coin 6 times.
  - Success: "the coin lands heads" {p = 0.5}
  - Failure "the coin lands tails." {q = 0.5}

Possible Outcomes
HHHHHT
HHHHTH
HHHTHH
HHTHHH
HTHHHH
THHHHH

As the number of trials increases,
the binomial distribution will approach the normal distribution.



NORMAL DISTRIBUTION

- The normal distribution is a continuous distribution or a function that can take on values anywhere on the real line.
- The normal distribution is parameterized by two parameters: **the mean of the distribution μ and the variance σ2.**

Example:

- Suppose that we measure and record the heights of 1000 girls selected at random.

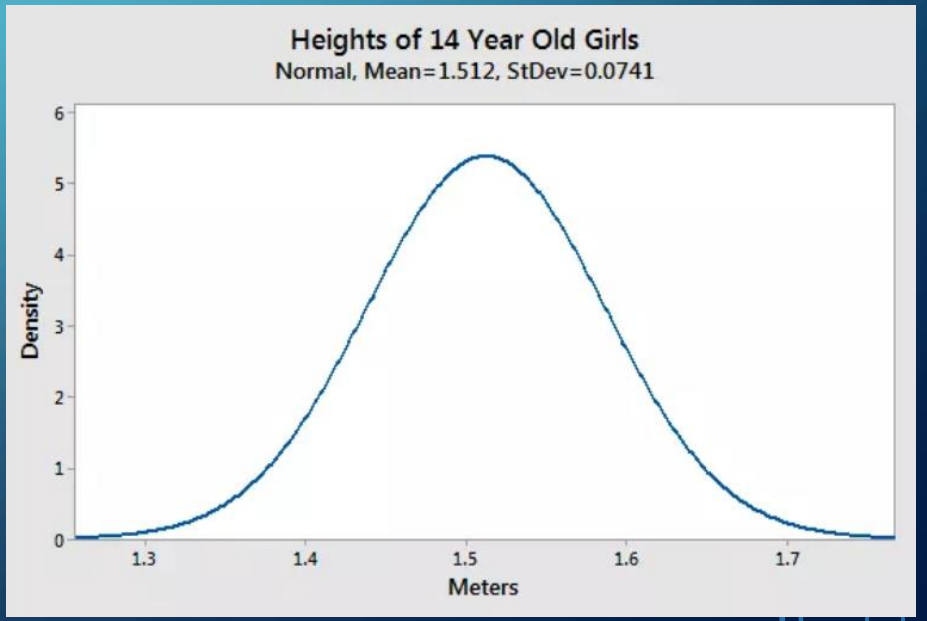
{1.35,1.43,1.57,1.66,1.72….}

- **Probability of occurrence of (1.35) =**
  - **No. of times 1.35 has occurred / total no. of entries**

P(1.35) = 67/1000 = 0.067

P(1.66) = 205/1000 = 0.205

P(1.72) = 445/1000 = 0.445



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Thank you.

Questions?