

DATA DISTRIBUTIONS

1. Normal Distribution (Gaussian Distribution)

Definition

Normal distribution is a continuous probability distribution that is symmetric around the mean. It forms a bell-shaped curve where most values cluster around the mean.

Parameters

- Mean (μ): Center of the distribution
- Standard Deviation (σ): Spread of the data

Use Cases

- Heights and weights of people
- Exam scores
- Measurement errors
- Machine learning model assumptions

2. Binomial Distribution

Definition

Binomial distribution is a discrete probability distribution that represents the number of successes in a fixed number of independent trials.

Parameters

- n : Number of trials
- p : Probability of success
- $(1 - p)$: Probability of failure

Use Cases

- Coin toss experiments
- Pass/Fail analysis
- Quality testing
- Yes/No outcomes

3. Poisson Distribution

Definition

Poisson distribution is a discrete probability distribution that shows the probability of a given number of events occurring in a fixed interval of time or space.

Parameters

- λ (Lambda): Average rate of occurrence

Use Cases

- Customer arrivals per hour
- Number of phone calls
- Number of defects per batch
- Event frequency analysis

4. Uniform Distribution

Definition

Uniform distribution is a probability distribution where all values within a given range have equal probability.

Parameters

- a: Minimum value
- b: Maximum value

Use Cases

- Random number generation
- Simulations
- Equal probability sampling

5. Exponential Distribution

Definition

Exponential distribution is a continuous probability distribution that models the time between independent events occurring at a constant average rate.

Parameters

- λ (Lambda): Rate parameter
- Scale ($1/\lambda$)

Use Cases

- Waiting time between events
- System failure time
- Survival analysis

6. Logistic Distribution

Definition

Logistic distribution is a continuous probability distribution similar to normal distribution but with heavier tails.

Parameters

- Mean (μ)
- Scale (s)

Use Cases

- Logistic regression
- Growth modeling
- Classification problems

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