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PROBABILITY

→ Branch of math that deals with occurence of a random event (possibility)

Some imp terms

→ Experiment → Planned operation carried out under controlled conditions

→ Chance → If result is not pre determined, then experiment is said to be a chance experiment

→ Outcome → result of an experiment

→ Sample Space - experiment is the set of all possible outcomes.

→ Event - Combination of outcomes.

$$0 \leq P(A) \leq 1$$

Certainity ↑

$$P(E) = \frac{\text{No. of trials in which event happened}}{\text{Total no. of trials}}$$

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Equal likely outcome

↳ eg tossing a coin
→ Throwing a die
} same chance of output at each event

Not equal likely outcome

↳ picking a random ball out of many colored ball

Rules of probability

① $0 \leq P(A) \leq 1$

② Sum of probabilities of all possible outcomes is 1

③ Complement rule

$$P(A) + P(A') = 1$$

eg

$$P(\text{head}) + P(\text{Tail}) = 1$$

④ $P(A \text{ or } B) = P(A) + P(B)$

or

$P(A) \cup P(B)$

↳ union

* Mutually exclusive event

↳ events which can not happen simultaneously.

eg getting both head / tail

* $P(A \cup B) = P(A) + P(B)$

* Not mutually exclusive event

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

↳ intersection (common part)

For mutually exclusive

$$P(A \text{ and } B) = P(A \cap B) = P(A) * P(B)$$

Random experiment

An experiment is called random when-

1. it has more than one possible outcomes
2. It is not possible to predict the outcome in advance

* Subset of sample space is called event

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Natural Language Processing (NLP)

Permutation & Combination

↓ Arrangement — ↓ Selecting / Choosing

$${}^nP_r = \frac{n!}{(n-r)!}$$ → Permutation

Selection arranging r things from set of n things

$${}^nC_r = \frac{n!}{r!\,(n-r)!}$$ → Combination

BAYE's THEOREM

↳ describes the probability of occurrence of an event related to any condition

Formula

$$P(A/B) = \frac{P(B/A)\,P(A)}{P(B)}$$ $P(B) \neq 0$

↓

Event A is occuring while B has already occured

Event A → hypothesis
Event B → Evidence / Data

Likelihood ↓

$$P(A/B) = \frac{P(B/A)\,(P(A))}{P(B)}$$

P(A/B) ↙ Posterior

P(A) → Prior

P(B) ↓ Marginalization

$$P(A/B) = P(A \cap B) / P(B)$$

↳ Conditional probability

STATS

* **Central Limit Theorem**

↳ distribution of sample means approximates a normal distribution as sample size gets larger, regardless of population distribution