

Probability and Statistics

$$* P(A \text{ or } B) = P(A) + P(B) - P(A \cap B) = P(A \cup B)$$

↓

The addition rule of probability is used to find the probability that at least one of the two events occurs.

$$* P(A \text{ or } B) = P(A \cup B) = P(A) + P(B)$$

↓

if A and B are mutually exclusive

* The multiplication rule of probability is used to find the probability of two events occurring together

$$* P(A \cap B) = P(A) \times P(B)$$

↓

if events A and B are independent

$$* P(A \cap B) = P(A) \times P(B|A)$$

↓

if events A and B are dependent (the occurrence of A affects the occurrence of B)

Here $P(B/A)$ = is the likelihood of event B happening when event A has already occurred

e.g.

What is the probability of choosing a card of spade which is king.

ideally $P = \frac{1}{52}$

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

$$= P(\text{choosing a spade}) \times P(\text{choosing a king when spade is already chosen})$$

$$= \frac{13}{52} \times \frac{1}{13} = \frac{1}{52}$$

Bayes' Rule

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

It is used to update probabilities based on new evidence. It calculates probability of ^{an} event A happening given the occurrence of another event B.

Statistics Formula

$$\text{Mean } \bar{x} = \frac{\sum x_i}{N} = \frac{\text{Sum of all values}}{\text{Total no. of values}}$$

Median (Sorted)

→ odd n = value at $(\frac{n+1}{2})$

→ even n = $\frac{\text{value}(\frac{n}{2}) + \text{value}(\frac{n}{2} + 1)}{2}$

Mode — value that is most frequent in dataset.

$$\text{Variance } \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{N}$$

$$= \frac{\sum (\text{Each value} - \text{Mean})^2}{\text{Total no. of values}}$$

↓
Measures how spread out the values in a dataset are.

Standard deviation, $\sqrt{\text{variance}}$

$$\sqrt{\sigma^2} = \sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N}}$$

It provides a more interpretable measure of how spread out the values are in comparison to the mean.