Key Probability Concepts

Prior Probability

The prior probability, denoted by $P(A)$, represents the initial probability before any additional information is considered.

Posterior or Conditional Probability

The posterior or conditional probability, denoted by $P(A \mid B)$, represents the probability of A given that B has occurred.

Joint Probability

The joint probability of two events A and B occurring together is denoted by $P(A \wedge B)$. For example:

$$P(\text{Cavity} \wedge \text{Toothache}) = 0.04$$

Marginal Probability

The marginal probability is obtained by summing over the joint probabilities of all possible outcomes of the other variables. For example:

$$P(\text{Toothache}) = P(\text{Cavity} \wedge \text{Toothache}) + P(\neg\text{Cavity} \wedge \text{Toothache})$$

$$= 0.04 + 0.01 = 0.05$$

Conditional Probability

The conditional probability of A given B is calculated as:

$$P(\text{Cavity} \mid \text{Toothache}) = \frac{P(\text{Cavity} \wedge \text{Toothache})}{P(\text{Toothache})}$$

$$= \frac{0.04}{0.05} = 0.8$$