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Conditional probability

$P(A|B)$ = the probability A, given that B occurred

This essentially means "change the sample space to B, and then renormalize the probabilities so they sum to 1.

In other words,

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

Multiplication rule

$$P(A \cap B \cap C) = P(A) \cdot P(B|A) \cdot P(C|A \cap B)$$

Total probability theorem

For k pairwise disjoint sets, if $\cup_{i=1}^{k} A_i = B$, then

$$P(B) = \sum_{i=1}^{k} P(A_i) \cdot P(A_i|B)$$

Bayes' theorem

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$$