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Pop-Up!

Bayes's Rule

If the events $B_1, B_2, B_3, \ldots, B_r, \ldots, B_k$ constitute a partition of the sample space S such that $P(B_i) \neq 0$ for $i = 1, 2, 3, \ldots, r, \ldots, k$, then for any event A in S such that $P(A) \neq 0$,

$$P(B_r|A) = \frac{P(B_r \cap A)}{P(A)} = \frac{P(B_r)\,P(A|B_r)}{\sum_{i=1}^{k} P(B_i)P(A|B_i)}.$$

Bayes's Rule for the case of two stages is simplified as

$$P(B_r|A) = \frac{P(B_r)\,P(A|B_r)}{P(B_1)\,P(A|B_1) + P(B_2)\,P(A|B_2)}.$$

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