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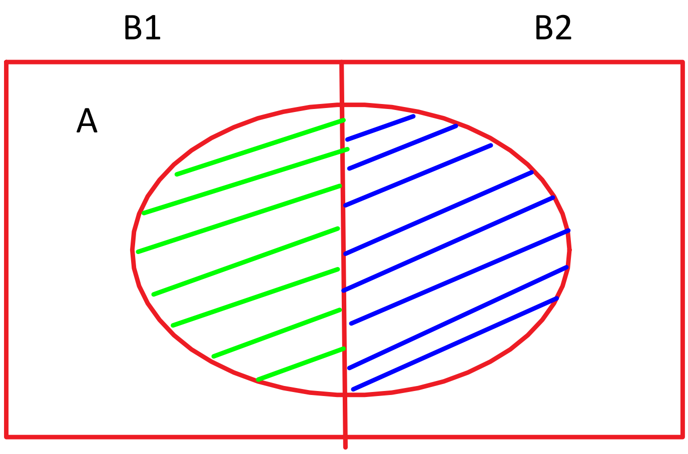
BAYE'S LAW:

It will help us to find in two components.

1. Total Probability
2. Conditional Probability

Total Probability:



P(A) = P($B1 \cap A$) + P($B2 \cap A$) ....(1)
= Total Probability of A

Here, Sample space S = B1 U B2 is also called as Universal Set.

Therefore, A ∈(B1 U B2) or we can called as A is the subset of B1 and B2.

Conditional Probability

We know our old theorem says

$$P(B/A) = \frac{P(B \cap A)}{P(A)} \quad = \text{---> } P(B \cap A) = P(B/A).\ P(A)$$ similarly

$$P(A/B) = \frac{P(A \cap B)}{P(B)} \quad = \text{---> } P(A \cap B) = P(A/B).\ P(B)$$

In general, we can also write as $P(Bi \cap A) = P(Bi/A).\ P(A)$
Similarly, $P(Bi \cap A) = P(A/Bi).\ P(B)$

Take again our conditional probability $P(B/A) = \dfrac{P(B \cap A)}{P(A)}$

Use equation (1) in denominator, so now $P(B1/A) = \dfrac{P(B1 \cap A)}{P(B1 \cap A) + P(B2 \cap A)}$

$$= \frac{P(A/B1).\ P(B1)}{P(A/B1).\ P(B1) + P(A/B2).\ P(B2)}$$

So, in general Baye's rule can be written as $\boxed{P(Bi/A) = \dfrac{P(A/Bi).\ P(Bi)}{\Sigma\ P(A/Bi).\ P(Bi)}}$

The above numerator is called conditional probability and the below is called total probability.
So, It is a ratio of conditional probability and Total probability.