## Bayes' Theorem

At the root, we use

$$P(A \cap B) = P(A)P(B \mid A) = P(B)P(A \mid B)$$

To compute Bayes' Theorem,

$$P(A \mid B) = \frac{P(A)P(B \mid A)}{P(B)}$$

Here's another way to remember the statement of Bayes' Theorem

$$P(B)P(A \mid B) = P(A \cap B) = P(A)P(B \mid A)$$

Rewrite this without putting the $P(A \cap B)$ in the middle

$$P(B)P(A \mid B) = P(A)P(B \mid A)$$

and divide throughout by $P(B)$, then you have the basic statement of Bayes' Theorem

$$P(A \mid B) = \frac{P(A)P(B \mid A)}{P(B)}$$