Probabilistic Generative Model

$P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A,B)}{P(B)}$: the probability of A given B. By definition,

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

There are two classes C_1, C_2. The probability of x is

$$P(x) = P(x \mid C_1)P(C_1) + P(x \mid C_2)P(C_2)$$

The posterior probability

$$P(C_1 \mid x) = \frac{P(x \mid C_1)P(C_1)}{P(x)} = \frac{P(x \mid C_1)P(C_1)}{P(x \mid C_1)P(C_1) + P(x \mid C_2)P(C_2)}$$