

# Naive Bayesian Classifier | ML LAB 5

# What is Bayes Theorem?

A handwritten diagram illustrating Bayes' Theorem. The central equation is  $P(A|B) = \frac{P(B|A) P(A)}{P(B)}$ . Annotations with arrows explain each term:   
 - Above the equation, an arrow points from the text "THE PROBABILITY OF 'B' BEING TRUE GIVEN THAT 'A' IS TRUE" to the term  $P(B|A)$ .   
 - To the right, an arrow points from the text "THE PROBABILITY OF 'A' BEING TRUE" to the term  $P(A)$ .   
 - Below the equation, an arrow points from the text "THE PROBABILITY OF 'A' BEING TRUE GIVEN THAT 'B' IS TRUE" to the term  $P(A|B)$ .   
 - Below the denominator, an arrow points from the text "THE PROBABILITY OF 'B' BEING TRUE" to the term  $P(B)$ .

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

Bayes theorem  
talks about  
Conditional  
probability.

# Naive Bayesian Classifier Algorithm

## Algorithm:

**NaiveBaiseClassifier(training\_examples, New\_Instance)**

Each instance  $\mathbf{x}$  is described by a conjunction of attribute values( $a_i$ ) and the target  $V$  can take  $j$  finite set of values.

- For each value  $j$  in target estimate the  $P(V_j)$
- For each attribute in the training example estimate Estimate the  $P(a_i|V_j)$
- Classify each instance as per the rule in equation

$$v_{NB} = \underset{v_j \in V}{\operatorname{argmax}} P(v_j) \prod_i P(a_i|v_j)$$

Where  $V_{NB}$  denotes the target value output by the naive Bayes classifier

- Output  $V_{NB}$