

Introduction

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1 The Naive Bayes algorithm

Naive Bayes methods are a set of supervised learning algorithms based on applying Bayes theorem with the naive assumption of conditional independence between every pair of features given the value of the class variable.

Remark 1.1. Baye's Theorem

Bayes theorem states the following relationship, given class variable y and dependent feature vector x_1 through x_n

$$P(y|x_1, \dots, x_n) = \frac{P(y)P(x_1, \dots, x_n|y)}{P(x_1, \dots, x_n)} \quad (1)$$

Example: Baye's Rule

Let's assume that there is a specific type of cancer, say C that occurs in about 1% of the population; $P(C) = 0.01$. The test for this cancer type is positive with 90% probability if the patient actually has the cancer (we usually call this the **sensitivity** of the test). The test sometimes is positive even if the patient does not have the cancer C . Concretely, with 90% chance is negative if the patient does not have C (we usually call this the **specitivity**). Let's assume that a patient takes the test and the test returns positive results. What is the probability of having C ?

We know that $P(C) = 0.01$ and $P(Pos|C) = 0.9$. The posterior is $P(C|Pos) = P(C)P(Pos|C)$. Also $P(\text{not } C|Pos) = P(\text{not } C)P(Pos|\text{not } C)$

References

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