

Naive Bayes classifier

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Introduction

1. Naive Bayes classifiers are a family of simple probabilistic classifiers that are based on applying Bayes theorem with strong (naive) assumptions of independence between the features.
2. Despite its strong assumptions of independence, this method remains quite popular in text categorization applications, and with proper pre-processing can compete against more sophisticated algorithms like SVM.
3. This is a highly scalable classifier since it requires a number of parameters linear in the number of features.
4. An advantage of Naive Bayes classifiers is that they require a small number of training examples to estimate the parameters necessary for classification.

Probabilistic model

1. Abstractly, naive Bayes is a conditional probability model, i.e., given an observation $x = (x_1, x_2, \dots, x_n)$, it assigns to this instance probabilities:

$$p(C_k|x_1, \dots, x_n)$$

for each of K possible outcomes.

Using Bayes theorem, this conditional probability can be written as:

$$p(C_k|x) = \frac{p(C_k)p(x|C_k)}{p(x)}$$

in Bayesian probability terminology, this is equivalent to $posterior = \frac{prior \times likelihood}{estimate}$

2. Note that the denominator in the above equation does not depend on C_k and is constant for a given observation x . Therefore, we can ignore the *estimate* in our calculations.
3. The numerator is equivalent to the joint probability distribution $P(C_k, x_1, x_2, \dots, x_n)$

References:

1. Naive Bayes classifier. (2017, January 20). In Wikipedia, The Free Encyclopedia. Retrieved 01:02, February 22, 2017, from https://en.wikipedia.org/w/index.php?title=Naive_Bayes_classifier&oldid=761016630