AU332 Quiz17

* 基本信息：

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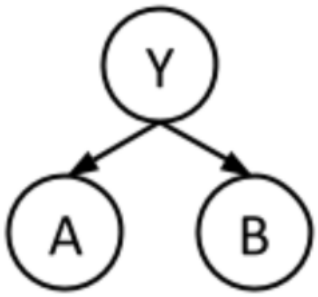
Naive Bayes

In this question, we will train a Naive Bayes classifier to predict class labels Y as a function of input features A and B. Y, A, and B are all binary variables, with domains 0 and 1. We are given 10 training points from which we will estimate our distribution. Fill in the blanks and please reduce the fractions to their simplest form.

A	1	1	1	1	0	1	0	1	1	1
B	1	0	0	1	1	1	1	0	1	1
Y	1	1	0	0	0	1	1	0	0	0



*1. **What are the maximum likelihood estimates for P(Y), P(A|Y), and P(B|Y)?**

P(Y=0) = 3 / 5

P(Y=1) = 2 / 5

P(A=0|Y=0) = 1 / 6

P(A=1|Y=0) = 5 / 6

P(A=0|Y=1) = 1 / 4

P(A=1|Y=1) = 3 / 4

P(B=0|Y=0) = 1 / 3

P(B=1|Y=0) = 2 / 3

P(B=0|Y=1) = 1 / 4

P(B=1|Y=1) = 3 / 4

*2. **Consider a new data point (A = 1, B = 1). What label would this classifier assign to this sample?**

P(Y=0, A=1, B=1) = 1 / 3

P(Y=1, A=1, B=1) = 9 / 40

Our classifier will predict label 0

*3. Let's use Laplace Smoothing to smooth out our distribution. Compute the new distribution for P(A|Y) given Laplace Smoothing with k = 2.

P(A=0|Y=0) = 3 / 10

P(A=1|Y=0) = 7 / 10

P(A=0|Y=1) = 3 / 8

P(A=1|Y=1) = 5 / 8

提交