Table 5.11. Data set for Exercise 8.

Instance	A	B	C	Class
1	0	0	1	$-$
2	1	0	1	$+$
3	0	1	0	$-$
4	1	0	0	$-$
5	1	0	1	$+$
6	0	0	1	$+$
7	1	1	0	$-$
8	0	0	0	$-$
9	0	1	0	$+$
10	1	1	1	$+$

(b) Use the conditional probabilities in part (a) to predict the class label for a test sample $(A = 1, B = 1, C = 1)$ using the naïve Bayes approach.

(c) Compare $P(A = 1)$, $P(B = 1)$, and $P(A = 1, B = 1)$. State the relationships between A and B.

(d) Repeat the analysis in part (c) using $P(A = 1)$, $P(B = 0)$, and $P(A = 1, B = 0)$.

(e) Compare $P(A = 1, B = 1|Class = +)$ against $P(A = 1|Class = +)$ and $P(B = 1|Class = +)$. Are the variables conditionally independent given the class?

9. (a) Explain how naïve Bayes performs on the data set shown in Figure 5.46.

(b) If each class is further divided such that there are four classes ($A1$, $A2$, $B1$, and $B2$), will naïve Bayes perform better?

(c) How will a decision tree perform on this data set (for the two-class problem)? What if there are four classes?

10. Repeat the analysis shown in Example 5.3 for finding the location of a decision boundary using the following information:

(a) The prior probabilities are $P(\texttt{Crocodile}) = 2 \times P(\texttt{Alligator})$.

(b) The prior probabilities are $P(\texttt{Alligator}) = 2 \times P(\texttt{Crocodile})$.

(c) The prior probabilities are the same, but their standard deviations are different; i.e., $\sigma(\texttt{Crocodile}) = 4$ and $\sigma(\texttt{Alligator}) = 2$.

11. Figure 5.47 illustrates the Bayesian belief network for the data set shown in Table 5.12. (Assume that all the attributes are binary).

(a) Draw the probability table for each node in the network.