

1 Probability

Use the probability table to calculate the following values:

X_1	X_2	X_3	$P(X_1, X_2, X_3)$
0	0	0	0.05
1	0	0	0.1
0	1	0	0.4
1	1	0	0.1
0	0	1	0.1
1	0	1	0.05
0	1	1	0.2
1	1	1	0.0

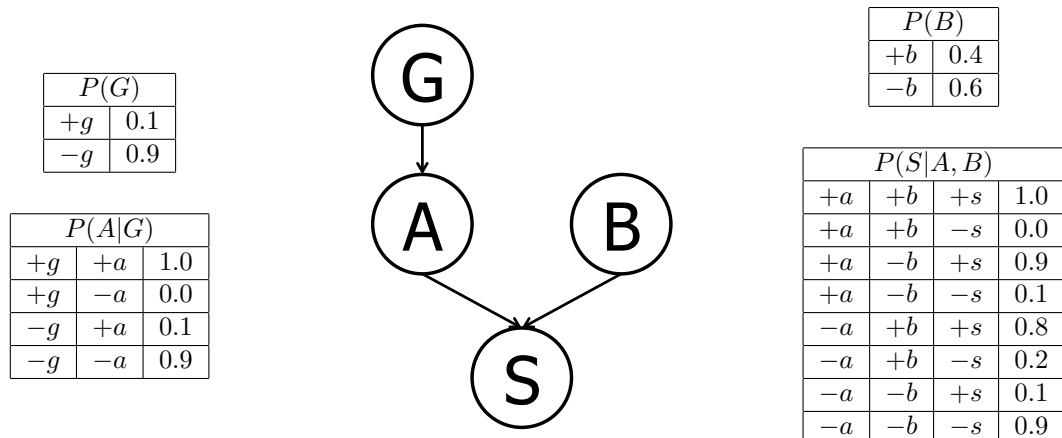
1. $P(X_1 = 1, X_2 = 0)$

2. $P(X_3 = 0)$

3. $P(X_2 = 1|X_3 = 1)$

4. $P(X_1 = 0|X_2 = 1, X_3 = 1)$

5. $P(X_1 = 0, X_2 = 1|X_3 = 1)$



2 Bayes' Nets Representation and Probability

Suppose that a patient can have a symptom (S) that can be caused by two different diseases (A and B). It is known that the variation of gene G plays a big role in the manifestation of disease A . The Bayes' Net and corresponding conditional probability tables for this situation are shown below. For each part, you may leave your answer as an arithmetic expression.

- (a) Compute the following entry from the joint distribution:

$$P(+g, +a, +b, +s) =$$

- (b) What is the probability that a patient has disease A ?

$$P(+a) =$$

- (c) What is the probability that a patient has disease A given that they have disease B ?

$$P(+a | +b) =$$

- (d) What is the probability that a patient has disease A given that they have symptom S and disease B ?

$$P(+a | +s, +b) =$$

- (e) What is the probability that a patient has the disease carrying gene variation G given that they have disease A ?

$$P(+g | +a) =$$