CSE 250A Quiz 4

Tuesday October 30, 2012

Instructions. You should do this quiz in partnership with exactly one other student. Write both your names at the top of this page. Discuss the answer to the question with each other, and then write your joint answer below the question. It is ok if you overhear other students' discussions, because you still need to decide if they are right or wrong. You have seven minutes.

Consider the loopy network $X \rightarrow Y, X \rightarrow E, Y \rightarrow Q, E \rightarrow Q$ where each node is a binary random variable. Suppose that

$$
\begin{aligned}
p(X = 1) &= 0.3 \\
p(Y = 1|X = 0) &= p(E = 1|X = 0) = 0.4 \\
p(Y = 1|X = 1) &= p(E = 1|X = 1) = 0.5 \\
p(Q = 1|Y = y, E = e) &= 0.5(e + y).
\end{aligned}
$$

When evaluating $p(Q = 1|E = 1)$ by rejection sampling, what fraction of samples will be rejected?

Answer: A sample will be rejected if and only if $E = 0$. The probability of this event is

$$
p(E = 0) = p(X = 0, E = 0) + p(X = 1, E = 0) = 0.7 \cdot 0.6 + 0.3 \cdot 0.5 = 0.57.
$$

So 57% of samples will be rejected.