6.825 Recitation Problems: Spring Final

Solutions

December 13, 2001

1 Gaussian Units

You were not responsible for this problem.

2 Network Structure

Nodes A and B have no parents.
Node C has two parents: A and B
Node D has one parent: C

3 At the Races

1. You should bet on Bell. The expected value is $0.40.

2. You should take the $2 insurance and bet on Belle. The expected value is $1.7.

4 Still At The Races

Nodes F and H have no parents.
Node W has two parents: H and F.
Node B has one parent: H
Node T has one parent: B

\[ P(W) = \Sigma_{F,H} P(W|F,H) P(F) P(H) \]

\[ P(W|T) = \frac{P(W,T)}{P(T)} = \frac{\Sigma_{B,H,F} P(W|H,F) P(H) P(F) P(T|B) P(B|H)}{\Sigma_{B,H} P(T|B) P(B|H) P(H)} \]

5 Logic

1. \( \forall x. B(x) \land H(x) \rightarrow S(x) \)

2. \( \forall x. S(x) \land H(x) \rightarrow B(x) \)

3. \( \forall x. S(x) \rightarrow B(x) \land H(x) \)

4. \( \exists x. S(x) \land H(x) \land B(x) \)

5. \( \exists x. H(x) \land B(x) \land \forall y. (x \neq y \land H(x) \rightarrow Slower(x, y)) \)

6. \( \forall r. R(r) \rightarrow \exists x. W(x, r) \)
6 Clausal Form
\[ \neg o(r) \lor w(f(r)) \]

7 Logic
\[ p(b) = false \]
And one (or both) of \( p(a) \) and \( p(c) \) is \text{true}.

So any of the following three would work
\[\begin{align*}
p(a) &= true; p(b) = false; p(c) = false \\
p(a) &= false; p(b) = false; p(c) = true \\
p(a) &= true; p(b) = false; p(c) = true
\end{align*}\]

8 Bayesian Network Structure

- No
- Yes
- Yes
- No

Remove node G.
Now node I has parents E, F, H.
Node H has parent, E, F.

9 True and False

1. False
2. True
3. True
4. False
5. False
6. False
7. True
8. False