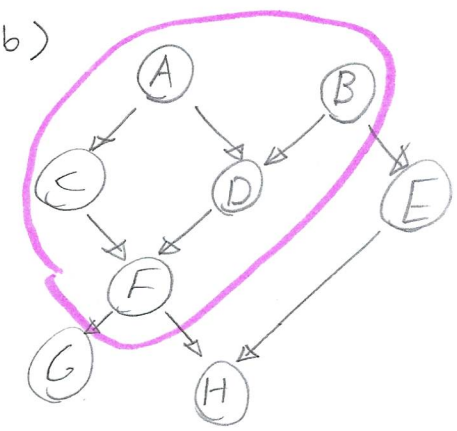
Eugene Choi
UID: 905368197

1.

a) Markovian Assumptions

$A \perp B$
$A \perp E$
$B \perp A$
$B \perp C$
$C \perp D \mid A$
$C \perp B \mid A$
$C \perp E \mid A$
$D \perp C \mid A, B$
$D \perp E \mid A, B$
$E \perp A \mid B$
$E \perp C \mid B$
$E \perp D \mid B$
$E \perp F \mid B$
$E \perp G \mid B$
$F \perp A \mid C, D$
$F \perp B \mid C, D$
$F \perp E \mid C, D$
$G \perp A \mid F$
$G \perp B \mid F$
$G \perp C \mid F$
$G \perp D \mid F$
$G \perp E \mid F$
$G \perp H \mid F$
$H \perp A \mid E, F$
$H \perp B \mid E, F$
$H \perp C \mid E, F$
$H \perp D \mid E, F$
$H \perp G \mid E, F$

b)



The Markov blanket for D consists of $\{A, B, C, F\}$

c) $P(A,B,C,D,E,F,G,H) = Pr(H \mid F,E)\, Pr(A,B,C,D,E,F,G)$

$= Pr(H \mid F,E)\, Pr(G \mid F)\, Pr(A,B,C,D,E,F)$

$= Pr(H \mid F,E)\, Pr(G \mid F)\, Pr(F \mid C,D)\, Pr(A,B,C,D,E)$

...

$= Pr(H \mid E,F)\, Pr(G \mid F)\, Pr(F \mid C,D)\, Pr(E \mid B)\, Pr(D \mid A,B)\, Pr(C \mid A)\, Pr(B)\, Pr(A)$

d) Skipped

e)

f) Piazza post by TA said we could skip

g) $Pr(a, \neg b, c, d, \neg e, f, \neg g, h) =$

$Pr(A=1)\, Pr(B=0)\, Pr(C=1 \mid A=1)\, Pr(D=1 \mid A=1, B=0)\, Pr(E=0 \mid B=0)$
$Pr(F=1 \mid C=1, D=1)\, Pr(\neg G \mid F=1)\, Pr(H=1 \mid E=0, F=1)$

h) $Pr(\neg a, b) = Pr(A=0)\, Pr(B=1)$

$= (.8)(.7)$

$= .56$

i) $Pr(\neg e|a) = Pr(E=0|A=1)$

$$= \frac{Pr(E=0, A=0)}{Pr(A=0)}$$

$$= \frac{Pr(E=0)\,Pr(A=0)}{Pr(A=0)}$$

$$= \frac{\left(Pr(E=0|B=0)Pr(B=0) + Pr(E=0|B=1)Pr(B=1)\right)Pr(A=0)}{Pr(A=0)}$$

$$= (.1)(.3) + (.9)(.7)$$

$$= 0.66$$

2. i) $\forall x \; Food(x) \Rightarrow Likes(John, x)$

ii) $Food(Apples)$

iii) $Food(Chicken)$

iv) $\forall a \; \forall b \; Eats(b,a) \; \& \; \neg Sick(a,b) \Rightarrow Food(a)$

v) $\forall c \; \forall d \; Sick(c,d) \Rightarrow \neg Well(d)$

vi) $Eats(Bill, Peanuts) \; \& \; Well(Bill)$

vii) $\forall g \; Eats(Bill, g) \Rightarrow Eats(Sue, g)$