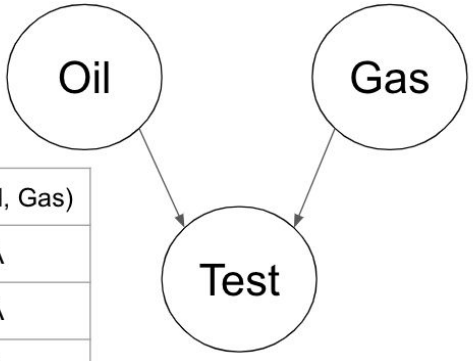
CS 161 HW6

705315195 Yu-Chen Lin ericlin8545@cs.ucla.edu

1.

a.

Oil	P(Oil)
T	0.3
F	0.7



Gas	P(Gas)
T	0.2
F	0.8

Oil	Gas	Test	P(Test|Oil, Gas)
T	T	T	N/A
T	T	F	N/A
T	F	T	0.8
T	F	F	0.2
F	T	T	0.2
F	T	F	0.8
F	F	T	0.1
F	F	F	0.9

b.

$Pr(Oil \mid Test) = Pr(Oil, Test) / Pr(Test)$

$= \Sigma_{Gas} Pr(Oil, Test, Gas) / \Sigma_{Oil}\Sigma_{Gas} Pr(Oil, Test, Gas)$

$= 0.3 * 0.8 / [0.3 * 0.8 + 0.2 * 0.2 + 0.1 * 0.5]$

$= 24/33 =$ **0.73**

2.

a. $Pr(A, B, C, D, E, F, G, H)$

$= Pr(A)*Pr(B)*Pr(C|A)*Pr(D|A, B)*Pr(E|B)*Pr(F|C, D)*Pr(G|F)*Pr(H|E, F)$

b. $Pr(E, F, G, H)$

$= Pr(G|F)*Pr(H|E, F)*\Sigma_A Pr(A) \Sigma_B Pr(B)*Pr(E|B) \Sigma_C Pr(C|A) \Sigma_D Pr(D|A, B)*Pr(F|C, D)$

$= f_7(F, G)*f_8(E, F, H) \Sigma_A f1(A) \Sigma_B f_2(B)*f_5(B, E) \Sigma_C f_3(A, C) \Sigma_D f_4(A, B, D)*f_6(C, D, F)$

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

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

$= 0.1 * 0.4 * Pr(c|a) * 0.6 * 0.2 * Pr(f|c, d) * Pr(\neg g|f) * Pr(h|\neg e, f)$

$= 0.0048 * Pr(c|a) * Pr(f|c, d) * Pr(\neg g|f) * Pr(h|\neg e, f)$

d. $Pr(\neg a, b) = Pr(\neg a) * Pr(b) = 0.9 * 0.6 =$ **0.54**

$Pr(\neg e \mid a) = Pr(\neg e) = Pr(\neg e|b) * Pr(b) + Pr(\neg e|\neg b) * Pr(\neg b)$
$= 0.9 * 0.6 + 0.2 * 0.4$
$= \mathbf{0.62}$

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

f. {A, B, C, F}

g.
$Pr(D|AB) = f_1(A, B, D)$
$Pr(E|B) = f_2(B, E)$
$f_1(A, B, D) \times f_2(B,E) = f_3(A, ,B, D, E)$

A	B	D	E	$f_3(A, B, D, E)$
T	T	T	T	0.07
T	T	T	F	0.63
T	T	F	T	0.03
T	T	F	F	0.27
T	F	T	T	0.48
T	F	T	F	0.12
T	F	F	T	0.32
T	F	F	F	0.08
F	T	T	T	0.02
F	T	T	F	0.18
F	T	F	T	0.08
F	T	F	F	0.72
F	F	T	T	0.64
F	F	T	F	0.16
F	F	F	T	0.16
F	F	F	F	0.04

h.

f4(A, B, E) = f_3(A, B, d, E) + f_3(A, B, -d, E)

A	B	E	f_4(A, B, E)
T	T	T	0.1
T	T	F	0.9
T	F	T	0.8
T	F	F	0.2
F	T	T	0.1
F	T	F	0.9
F	F	T	0.8
F	F	F	0.2