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Assignment 3: Bayes Net

**CSC384 Winter 2015 Assignment 3 Question 1**

a) Pr(b|a)

0.5

b) Pr(c|a)

0.5

c) Pr(c|a,-e)

0.5714285714285714

d) Pr(c|a,-f)

0.5

**CSC384 Winter 2015 Assignment 3 Question 2**

1.

V1 = ss , V2 = sm , V3 = cc

P(cc|ss) = P(cc|ss,sm)

P(cc = true|ss = okay) = 0.80 = P(cc = true|ss = okay, sm = okay) = 0.80

P(cc = false|ss = okay) = 0.20 = P(cc = false|ss = okay, sm = okay) = 0.20

P(cc = true|ss = okay) = 0.80 = P(cc = true|ss = okay, sm = faulty) = 0.80

P(cc = false|ss = okay) = 0.20 = P(cc = false|ss = okay, sm = faulty) = 0.20

P(cc = true|ss = faulty) = 0.05 = P(cc = true|ss = faulty, sm = okay) = 0.05

P(cc = false|ss = faulty) = 0.95 = P(cc = false|ss = faulty, sm = okay) = 0.95

P(cc = true|ss = faulty) = 0.05 = P(cc = true|ss = faulty, sm = faulty) = 0.05

P(cc = false|ss = faulty) = 0.95 = P(cc = false|ss = faulty, sm = faulty) = 0.95

These statements illustrate that probability of *cc* is conditionally independent on *sm* given *ss*.

2.

V = sq , d = bad

V1 = pv , d1 = weak

V2 = sp , d2 = fouled

P(pv = weak) = 0.178

P(sp = fouled) = 0.200

P(pv = weak | sq = bad) = 0.533

P(sp = fouled | sq = bad) = 0.311

P(pv = weak | sq = bad , sp = fouled) = 0.000

P(sp = fouled | sq = bad, pv = weak) = 0.000

These statements illustrate that *sq = bad* increases the probability of *pv = weak* and *sp = fouled*. However, once it is known that *sp = fouled*, which explains away the reason *sq = bad*, probability of *pv = weak* decreases and vice-versa.

3.

V = ss , d = okay

V1 = sm , d1 = okay

V2 = mf , d2 = okay

V3 = bv , d3 = strong

P(ss = okay|sm = okay) < P(ss = okay|sm = okay, mf = okay) < P(ss = okay|sm = okay, mf = okay, bv = strong)

P(ss = okay|sm = okay) = 0.598

P(ss = okay|sm = okay, mf = okay) = 0.605

P(ss = okay|sm = okay, mf = okay, bv = strong) = 0.980

These statements illustrate that probability of *ss = okay* increases monotonically as we add the evidence items of *sm = okay*, *mf = okay*, and *bv = strong*.

4.

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V = st , d = true

V1 = sq , d1 = bad

V2 = fs , d2 = faulty

V3 = tm , d3 = good

V4 = asys , d4 = faulty

V5 = cc , d5 = true

P(st = true|sq = bad) > P(st = true|sq = bad, fs = faulty) < P(st = true|sq = bad, fs = faulty, tm = good) > P(st = true|sq = bad, fs = faulty, tm = good, asys = faulty) < P(st = true|sq = bad, fs = faulty, tm = good, asys = faulty, cc = true)

[0.2803836125216086, 0.7196163874783914]

P(st = true|sq = bad) = 0.462

P(st = true|sq = bad, fs = faulty) = 0.032

P(st = true|sq = bad, fs = faulty, tm = good) = 0.034

P(st = true|sq = bad, fs = faulty, tm = good, asys = faulty) = 0.015

P(st = true|sq = bad, fs = faulty, tm = good, asys = faulty, cc = true) = 0.020

These statements illustrate that probability of *st = true* both increases and decreases as we add the evidence items of *sq = bad*, *fs = faulty*, *tm = good*, *asys = faulty*, and *cc = true*.