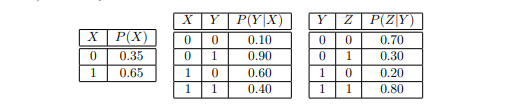
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Part 1

(Reference only)



Question 1)

Q1)

Product rule

P(X, Y, Z) = P(Z | Y) \* P(Y | X) \* P(X)

0,0,0 = 0.7 \* 0.1 \* 0.35 = 0.0245

0,0,1 = 0.3 \* 0.1 \* 0.35 = 0.0105

0,1,0 = 0.2 \* 0.9 \* 0.35 = 0.063

0,1,1 = 0.8 \* 0.9 \* 0.35 = 0.252

1,0,0 = 0.7 \* 0.6 \* 0.65 = 0.273

1,0,1 = 0.3 \* 0.6 \* 0.65 = 0.117

1,1,0 = 0.2 \* 0.4 \* 0.65 = 0.052

1,1,1= 0.8 \* 0.4 \* 0.65 = 0.208



Q2)

P(X, Y) = P(Y | X) \* P(X)

0,0 = 0.1 \* 0.35 = 0.035

0,1 = 0.9 \* 0.35 = 0.315

1,0 = 0.6 \* 0.65 = 0.39

1,1 = 0.4 \* 0.65 = 0.26



Q3)

Using the Sum rule.

(a) P(Z=0) = ∑ P(X=x, Y=y, Z=0) for x,y ∈ {0,1}

= 0.0245 + 0.063 + 0.273 + 0.052

= 0.4125

(b) Using the product rule:

P(X = 0, Z = 0) = P(X = 0, Y = 0, Z = 0) + P(X = 0, Y = 1, Z = 0)

P(X = 0, Z = 0) = 0.0245 + 0.063 = 0.0875

(c)

reverse product rule:

P(X = 1, Y = 0|Z = 1) = P(X = 1, Y = 0 , z = 1)/P(Z = 1)

Normalisation rule:

P(Z = 1) = 1 – P(Z = 0) = 1 – 0.4125 = 0.5875

= 0.117/0.5875

= 0. 1991

(d) reverse product rule

P(X = 0|Y = 0, Z = 0) = P(X = 0, Y = 0, Z = 0) / P(Y = 0, Z = 0)

Using the product rule:

P(Y = 0, Z = 0) = P(X = 0, Y = 0, Z = 0) + P(X = 1, Y = 0, Z = 0)

P(Y = 0, Z = 0) = 0.0245 + 0.273 = 0.2975

P(X = 0|Y = 0, Z = 0) = 0.0245 / 0.2975 = 0.0824

Question 2)

Q1)

Joint probability rule

P(B,C) = P(B|C) \* P(C)

P(B = t,C = t) = P(B = t | C = t) \* P(C = t)

P(B = t, C = t) = 0.2 \* 0.4 = 0.08

Q2)