ISTANBUL TECHNICAL UNIVERSITY

COMPUTER ENGINERING DEPARTMENT

BLG 527E MACHINE LEARNING

CRN: 13817

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Homework #4

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Answers

Q1)

P(A) = 0.3

P(B|A) = 0.7

P(B|~A) = 0.5

P(C|A) = 0.2

P(C|~A) = 0.6

P(D|C) = 0.7

P(D|~C) = 0.7

a) P(A,B,C,D)

= P(D|C) * P(C|A) * P(B|A) * P(A)

= 0.7 * 0.2 * 0.7 * 0.3

= 0.0294

b) P(A|B)

= (P(B|A) * P(A)) / P(B)

= (P(B|A) * P(A)) / (P(B|A) * P(A) + P(B|~A) * P(~A))

= (0.7 * 0.3) / (0.7 * 0.3 + 0.5 * 0.7)

= 0.375

c) P(C|B)

= (P(B|C) * P(C)) / P(B)

= (P(B) * P(C)) / P(B)

= P(C)

= P(C|A) * P(A) + P(C|~A) * P(~A)

= 0.2 * 0.3 + 0.6 * 0.7

= 0.48

Q2)

$\alpha_1(S_1) = 0.9 * 0.1 = 0.09$

$\alpha_1(S_2) = 0.1 * 0.9 = 0.09$

$\alpha_2(S_1) = \left[\sum_{i=1}^{2} \alpha_1(S_i) a_{i1} \right] b_1(O_2)$

$= [\alpha_1(S_1)_{\alpha 11} + \alpha_1(S_2)_{\alpha 21}] \, b_1(O_2)$

$= [0.09 * 0.8 + 0.09 * 0.2] * 0.9$

$= 0.081$

$\alpha_2(S_2) = \left[\sum_{i=1}^{2} \alpha_1(S_i) a_{i2} \right] b_2(O_2)$

$= [\alpha_1(S_1)_{\alpha 12} + \alpha_1(S_2)_{\alpha 22}] \, b_2(O_2)$

$= [0.09 * 0.2 + 0.09 * 0.8] * 0.1$

$= 0.009$