Advanced Machine Learning Assignment 3

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1 Q1

(a)
Yes, A is independant of B in both cases 2 and 3, as neither B nor D occuring influence the occurence of A.

(b)
In case 2, B is conditionally independant of D given A, but not given C. In case 3, B is conditionally independant of D given either A or C.

2 Q2

For this question, since Heart Disease is only dependant on Exercise and Healthy Diet, we can ignore blood pressure.
$P(HD, E, D) = P(HD|E, D)P(E)P(D) = (0.25x0.7x0.25) = 0.04375$
Thus we have the probability of the individual having heart disease.

3 Q3

For this problem, we take some assumed values of Sysadmin Upgrade, Attempted Intrusion, A1, A2, and Detection of Intrusion as outlined in the graph.

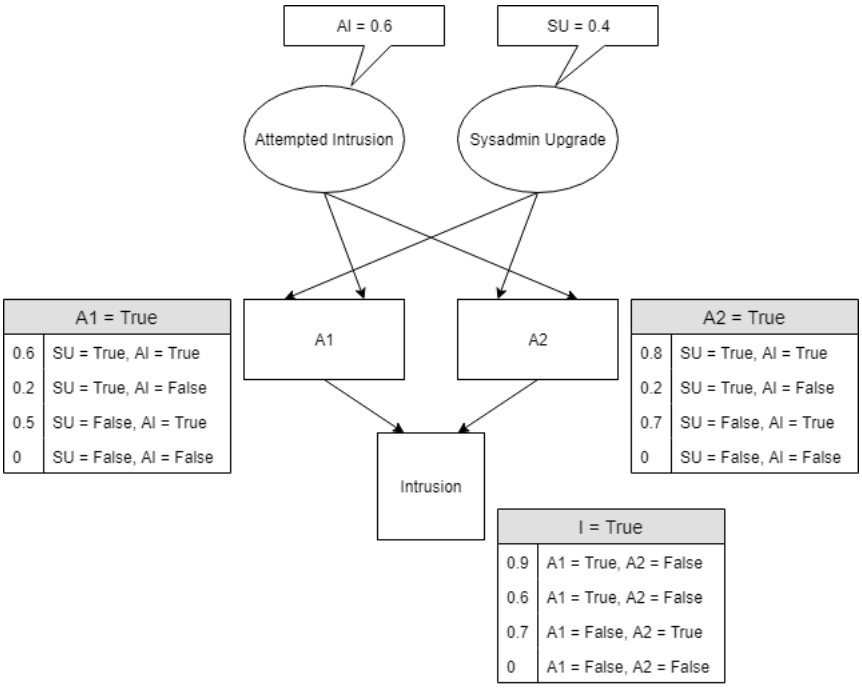

Diagram.png

$Pr(SU, AI, A1) = Pr(A1|SU, AI)Pr(SU)Pr(AI)$

We take the sum of each possibility.

$(0.6 * 0.6 * 0.4) + (0.2 * 0.4 * 0.6) + (0.5 * 0.4 * 0.6) + (0) = 0.312$

$Pr(\neg A2, SU, AI) = Pr(\neg A2|SU, AI)Pr(SU)Pr(AI)$

We take the sum of each possibility.

$(0.2 * 0.6 * 0.4) + (0.8 * 0.4 * 0.6) + (0.3 * 0.4 * 0.6) + (0) = 0.312$

$Pr(I, A1, A2) = Pr(I|A1, A2)Pr(A1)Pr(A2)$

We take the sum of each possibility.

$(0.9 * 0.312 * 0.688) + (0.6 * 0.312 * 0.312) + (0.7 * 0.688 * 0.312) + (0) = 0.0378$

Thus it is unlikely to be an intrusion.