Advanced Artificial Intelligence

Workshop 2 Answer Sheet

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1 Task 1: Number of Parameters in Bayesian Networks

1.1 How is the joint distribution expressed? In other words, calculate $P(S, C, B, X, D)$.

$P(s, C, B, X, D) = P(X|C, S) \cdot P(D|C, B) \cdot P(C|S) \cdot P(B|S) \cdot P(S)$

1.2 What is the number of parameters i.e. probabilities?

$2^1 + 2^2 + 2^2 + 2^3 + 2^3 = 26$

1.3 What is the number of parameters, assuming that random variable $S = Smoking$ has three values instead of two, and the other random variables remain binary?

$3^1 + (3^1 + 2^1) + (3^1 + 2^1) + (3^1 + 2^2) + 2^3 = 28$