

UCS1504 - Artificial Intelligence Lab

Department of CSE, SSN College of Engineering

8. Bayesian Network

15.11.2022

A patient goes to the doctor for a medical condition, the doctor suspects three diseases as the cause of the condition. The three diseases are D1, D2, D3, which are marginally independent from each other. There are four symptoms S1, S2, S3, S4 which the doctor wants to check for presence in order to find the most probable cause of the condition. The symptoms are conditionally dependent to the three diseases as follows: S1 depends only on D1, S2 depends on D1 and D2. S3 is depends on D1 and D3, whereas S4 depends only on D3. Assume all random variables are Boolean, they are either 'true' or 'false'.

- A. Construct the Bayesian network according to the above symptoms
(**Hint:** Use a suitable data structure to keep track of the parent of every state)
- B. Write a function to provide the expression for the joint probability distribution as a product of conditional probabilities.
- C. Write a function to find the number of independent parameters that is required to describe this joint distribution.
- D. Write a function to find the number of independent parameters required if we assume there were no conditional independence between the variables.
Write a function to find the Markov Blanket of variable S2?

Content to be written in Observation for output verification:

- i. **Solve the problem manually** at the back side of your AI class Note
- ii. Date
- iii. Ex. No
- iv. Title
- v. Aim v. Data structure used (with justification)
- vi. Logic applied or Algorithm (short description)
- vii. Sample input and output