

CS 486 — Lecture 12: Bayesian Networks Continued

1 Bayes Networks

- A node is conditionally independent of its non-descendants given its parents.
- A Markov blanket of a node consists of its parents, its children, and its children's parents.
- A node is conditionally independent of all other nodes given its Markov blanket.
- Given a Bayesian network, how do we determine if two variables X and Y are independent if we observe the values of a set of variables E ?
- We define *d-separation* as: A set of variables E d-separates X and Y if E blocks every undirected path between X and Y in the network.
- If E d-separates X and Y , then X and Y are conditionally indep. given E .
- Three cases:
 - $A \rightarrow E \rightarrow B$ — if E is observed then it blocks
 - $A \leftarrow E \rightarrow B$ — if E is observed then it blocks
 - $A \rightarrow E \leftarrow B$ — if E and its descendants are *not* observed they block

2 Constructing Bayesian Networks

- For a joint probability distribution there are multiple correct Bayesian networks.
- We prefer one network over another if it requires fewer probabilities (smaller and easier to work with).