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Machine Learning for Computer Vision
Winter term 2018

9. November 2018
Topic: Probabilistic Graphical Models

Exercise 1: Reading a graphical model

We have the following graphical model:

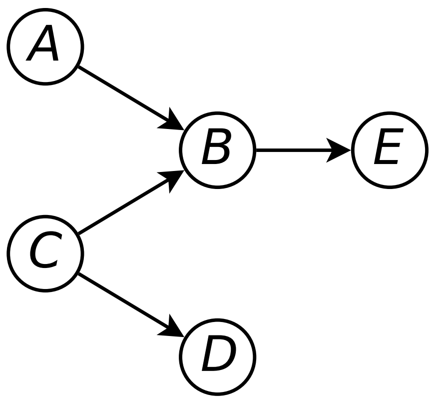


Abbildung 1: Graphical model.

a) Write the joint probability distribution corresponding to the graphical model depicted in Fig. 1.

b) What are the conditional independence assumptions of this model?

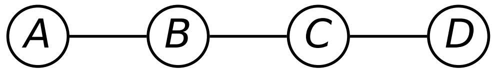
c) Which of the following assertions are true, and why?

- B is d-separated from D by C,
- A is d-separated from C by E,
- A is d-separated from C by D,
- E is d-separated from D by B,
- E is d-separated from D by A.

d) Write a program in python, which can prove for a hardcoded graph if two nodes are d-separated from each other, by a third node. You can use the given *graph.py* on the website.

Exercise 2: Markov Chain

We have the following Markov Chain:



a) Write the joint probability distribution associated to this Markov Chain.

b) Each variable can take value 0 or 1, and we want to express that it is 9 times more probable that neighboring variables have equal values than they have different value. Give the potential functions of this Markov Chain.

c) Compute the probability distributions $p(A)$ and $p(C)$.

d) Now, we observe that D is 1, recompute the distributions over A and C: $p(A \mid [D = 1])$ and $p(C \mid [D = 1])$.

e) Compute $p(C \mid [A = 0], [D = 1])$.