

## Bayesian Networks - Exercise Sheet 2

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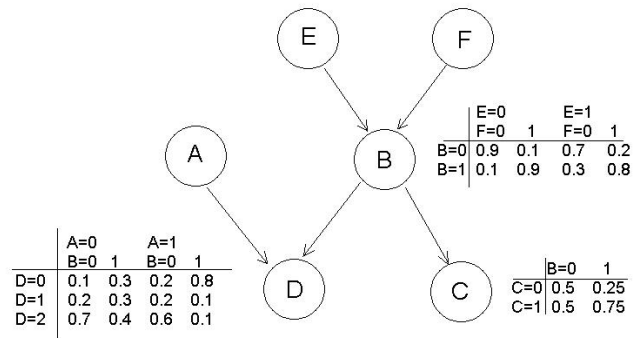
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Solutions need to be handed in until **Monday, October 7th 12:00pm**

### Exercise 1: Designing Simple Bayesian Networks

For the upcoming examples, model all *variables of interest* and their dependencies in a DAG (make a sketch of the graph) and write down the joint probability in the factorized form.

- a) Thomas suffers (as all students do) from the lack of sleep. One morning, Thomas enjoys a *cup of coffee* which makes him *stay awake in lectures*. On another morning, Thomas *took a walk* and also realized that he had no trouble *staying awake in lecture*.
- b) Marc found out that actually *being interested in the lecture* helps him greatly in understanding and staying awake during lecture. Resulting from his interest, he also *passes all exercise sheets* which give him additional points to *pass the exam*. Is that not wonderful?
- c) On the one hand, Franziska discovered that *going to the gym* and working out makes her *lose weight*. On the other hand, she once exercised, fell and broke her left leg, which made her think that *going to the gym* can result in *heavy injury*.
- d) From the stories above, we know that *Thomas drinks coffee*, *Marc is actually interested in the lecture* and furthermore *Franziska goes to a gym*.
- e) Timm likes to *drink coffee* and also likes to *take a walk*, as both helps him to *stay awake in lecture*. Because Timm was so *awake during lecture*, he is very *knowledgeable of Bayesian Networks*. Although they were asleep in lecture, other students at his age are also very *knowledgeable of Bayesian Networks*, probably due to *intensive studying at home*, which was due to their above-the-average *coffee consumption*.



### Exercise 2: Sample Bayesian Network

Consider the Bayesian Network given in the following figure. Suppose we observe  $A = 0, E = 0, F = 0$ . We are interested in the value of  $D$ . Which setting of  $D$  is the most probable?