

Foundations of Artificial Intelligence

Prof. Dr. B. Nebel, Prof. Dr. W. Burgard
C. Plagemann, P. Pfaff, D. Zhang, R. Mattmüller
Summer Term 2007

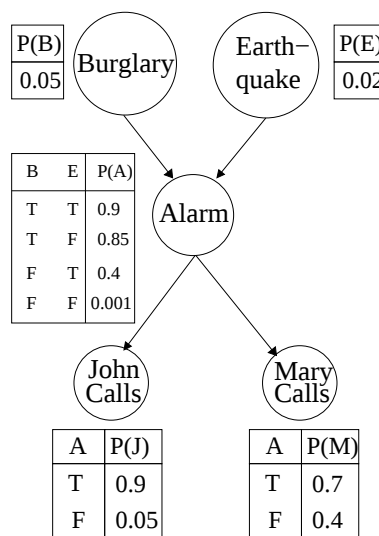
University of Freiburg
Department of Computer Science

Exercise Sheet 10

Due: Friday, July 6, 2007

Exercise 10.1 (Bayesian Networks)

Consider the following Bayesian Network.



Infer the probabilities for:

- The causal case $P(\text{JohnCalls} \mid \text{Burglary})$
- The diagnostic case $P(\text{Burglary} \mid \text{JohnCalls})$

(a) Illustrate your solution for at least one of the cases.

(b) Which of the following independence statements are correct?

- JohnCalls is independent from Burglary given Earthquake.
- JohnCalls is independent from Burglary given Alarm.
- Burglary is independent from JohnCalls given Alarm.
- Burglary is independent from JohnCalls given Alarm and Earthquake.

Give a short explanation of your answer.

Exercise 10.2 (Robot juggler)

Oscar the robot juggler quite often drops balls when his battery is low. Earlier experiments showed that the probability is 90% that Oscar drops a ball when

his battery is low. But if the battery is not low the probability to drop a ball is only 10%. The battery has been charged shortly before and our best estimate indicates that with a probability of 5% the battery is low. A robot observer with a slightly unreliable robot observation system sends the information that Oscar dropped a ball. The reliability of the robot observer is described by the following 1% error probabilities:

$$P(\text{observer reports Oscar dropped ball} \mid \text{Oscar dropped ball}) = 0.99$$

$$P(\text{observer reports Oscar dropped ball} \mid \text{Oscar did not drop ball}) = 0.01$$

- (a) Draw the Bayesian Network.
- (b) Calculate the probability that the battery is low given the information of the robot observer.

The exercise sheets may and should be worked on in groups of three (3) students. Please write all your names and the number of your exercise group on your solution.