Hochschule Bonn-Rhein-Sieg

Probabilistic Reasoning, WS21

Quiz

Instructions for submission :

- Please restart and run all cells before submitting
- Make sure your user name is correct
- No need to submit a pdf file, only the ipython is sufficient
- Write down theory questions in markdown format

Good luck !!

In [1]:

```
1 from IPython.display import Image
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Username :

1. Write down a short definition of the following terms. (20 Points)

1. Probability theory

2. Utility theory

3. Decision theory

4. atomic event

5. prior probability

6. full joint probability distribution

1)

2)

3)

4)

5)

6)

2. Associate each of the rules (1)-(5) with one of the equations (A)-(G)
(20 points)

1. Chain Rule
2. Conditioning rule
3. Bayes' Rule
4. Product Rule
5. Marginalization Rule

A. $P(Y) = \sum_z P(Y, z)$

B. $P(X_i) = \prod_{i=1}^{n} P(X_i|Y)P(Y)$

C. $P(Y) = \sum_z P(Y|z)P(z)$

D. $P(x \vee y) = P(x) + P(y) - P(x \wedge y)$

E. $P(x_1, \ldots, x_n) = \prod_{i=1}^{n} P(x_i|x_{i-1}, \ldots, x_1)$

F. $P(Y|X) = \frac{P(X|Y)P(Y)}{P(X)}$

G. $P(X, Y) = P(X|Y)P(Y)$

Sample answer format

name of rule : Equation name

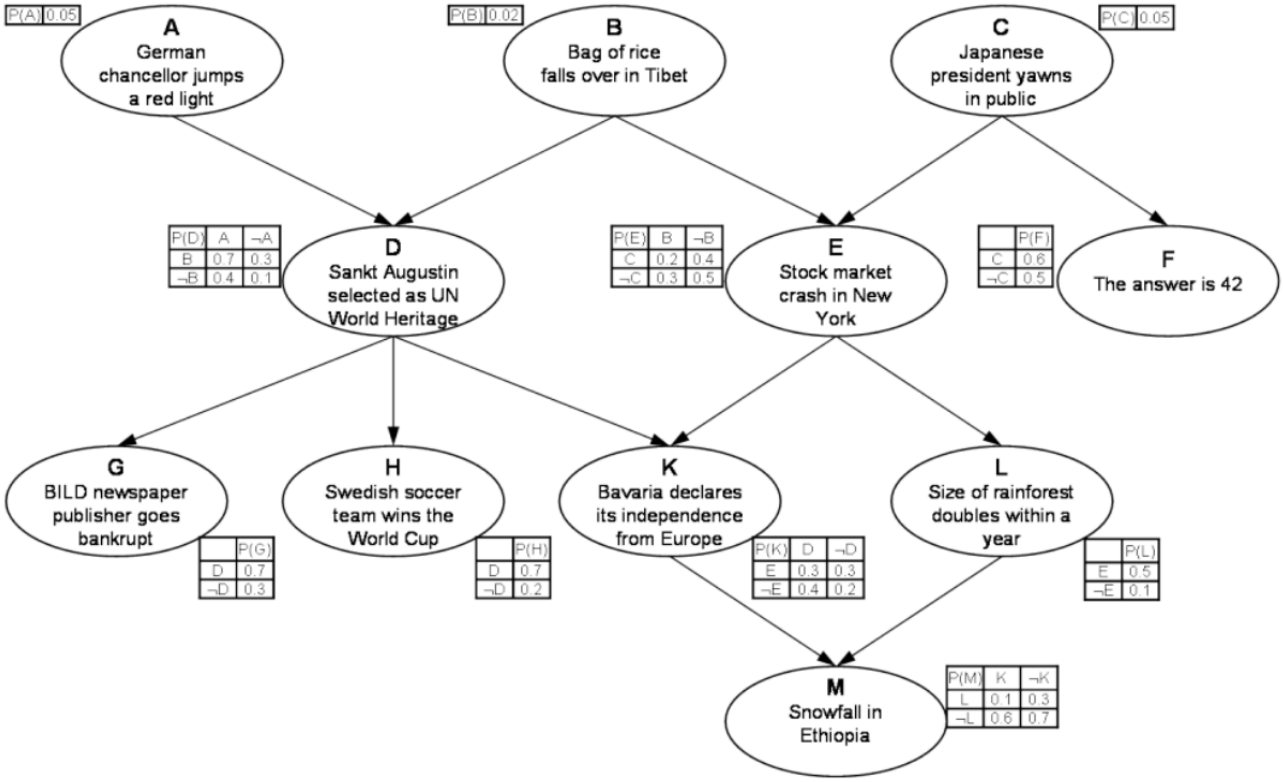
probabilistic rule : Z

3. Write down the axioms of probability (18 points)

1.
2.
3.

4. Bayesian Networks (18 Points)

1. Is the graph below a polytree?
2. When is node F independent from node E?
3. When is node D independent from node M?



1)

2)

3)

5. Inferencing in Bayesian Networks (24 Points)

1. Write down the names of 2 exact inference algorithms for Bayesian networks and why are they not used in practice
2. Write down the names of 3 approximate inference algorithms for Bayesian networks, and briefly describe how each of them works.
3. In one of the approximate inference algorithms for Bayesian networks Markov blanket plays an important role. What is this algorithm ? , and briefly explain why is it important in that algorithm .

1)

2)

3)