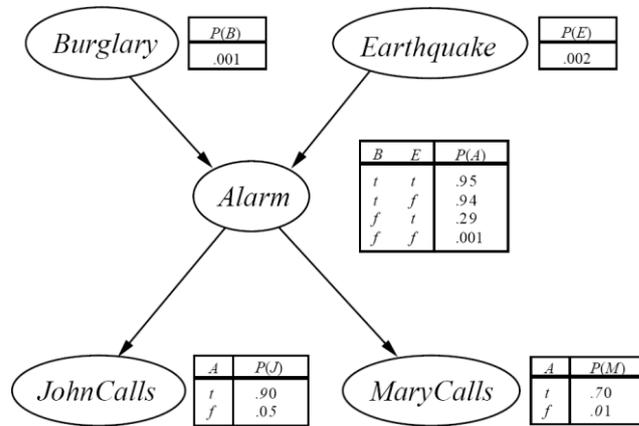# Mid Term

4190.408 Artificial Intelligence

Dept. of Computer Science and Engineering, Seoul National University

April 17th, 2014

Answer to the questions below. Each answer should not be longer than a page.
Use graphs, figures or mathematical formulas for explanation if possible.

1. (20 points) Explain the structure and features of Bayesian network.
    Briefly describe how the Bayesian network is learnt from given dataset D.
    Explain how the value of unobserved variable is inferred using Bayesian network obtained through learning, when new data is observed.
    Explain the probabilistic inference rules used in the process above.
    (Sum rule, product rule, bayes rule)

2. (20 points) In order to understand natural language texts, a computer needs analysis techniques based on morphology, syntax, semantics, and pragmatics.
    Explain what each analysis is.
    If there is something needed, other than linguistic knowledge, for a computer to understand natural language, what is it?

3. (20 points) In order to make a computer perform intelligent information processing, it is important to represent knowledge well in the computer and utilize it.
    Explain what each method of knowledge representation is, and give examples of using the methods.
    (a) semantic networks
    (b) frames
    (c) scripts

4. (20 points) Classical artificial intelligence systems relied on knowledge representation and inference using symbolic systems based on logic. Describe strong points and weak points of this method. Give two examples of new methods introduced to overcome the weak points of classical ones, and describe what they are.

5. (20 points) Answer the questions using the Bayesian network in the given figure and conditional probability table.

B	E	P(A)
t	t	.95
t	f	.94
f	t	.29
f	f	.001

Burglary — P(B): .001

Earthquake — P(E): .002

A	P(J)
t	.90
f	.05

A	P(M)
t	.70
f	.01

a) (10 points) Describe $p(A,B,E,J,M)$ in the form of probabilistic formula.
   (A = Alarm, B = Burglary, E = Earthquake, J = JohnCalls, M = MaryCalls)

b) (10 points) Calculate the probability of Burglary having occurred, given that John is calling.

(100 points in total)