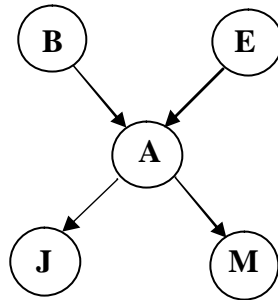


CSE458: Bayesian Models

Exercise 4

Message Passing

Consider the following Bayesian Network from Russell & Norvig “*Artificial Intelligence: A Modern Approach*”.



The letters **B**, **E**, **A**, **J** and **M** represent *Burglary*, *Earthquake*, *Alarm*, *John Calls* and *Mary Calls* respectively. Moreover, the conditional probabilities are:

$P(\mathbf{B}) = 0.01$, $P(\mathbf{E}) = 0.002$, and

b	e	$P(A b,e)$
t	t	0.95
t	f	0.94
f	t	0.29
f	f	0.001

a	$P(J a)$
t	0.90
f	0.05

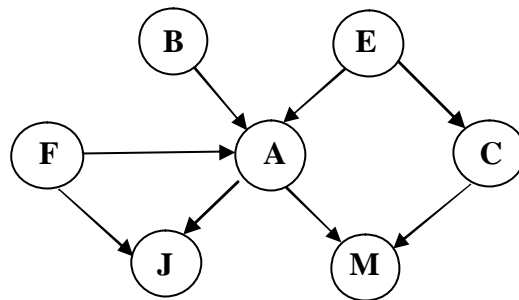
a	$P(M a)$
t	0.70
f	0.01

For the following problems show all \mathbf{p} and \mathbf{l} messages.

- Using the message passing algorithm given in the lecture notes, initialize the network.
- Assume now that *John calls*, and update the network using the message passing algorithm

Junction Tree

Consider the following Bayesian Network.



Using the algorithm given in the copy of Chapter 7 “Probabilistic Reasoning in Expert Systems: Theory and Algorithm” by R. Neapolitan:

1. Draw the moral graph corresponding to the above network.
2. State the cliques corresponding to the moral graph.
3. Construct the **S** and **R** sets corresponding to definition 7.2.
4. Draw the junction tree.