**Probabilistic Inference Using Bayesian Networks**

CSC 4240 Programming Assignment 3

Due: November 14, 2003

Assignment description:

The program will begin by reading a Bayesian network from a pseudo-XML file called "bn.xml." (See sample file listing below and on the class website.)

Queries can then be made from a command-line prompt. Queries will always ask for the probability distribution of a random variable given some assignment of values to a set of evidence nodes. All variables are discrete, but not necessarily Boolean.

Here are sample queries:

1. P(Burglary|JohnCalls=T,MaryCalls=T)
2. P(Alarm|JohnCalls=T,MaryCalls=F)

For each queries return a probably for each value of the query variable. Here is a sample reply to the first query:

<T=.284,F=.716>

You can assume that you will receive a valid XML file and that there will only be a single query variable in any given query. The set of evidence variables might be empty though.

sample bn,xml

```
<bn>
<vars>
<var><name>Burglary</name><vals><val>T</val><val>F</val></vals></var>
<var><name>Earthquake</name><vals><val>T</val><val>F</val></vals></var>
<var><name>Alarm</name><vals><val>T</val><val>F</val></vals></var>
<var><name>JohnCalls</name><vals><val>T</val><val>F</val></vals></var>
<var><name>Burglary</name><vals><val>T</val><val>F</val></vals></var>
</vars>
<topology>
<node><name>Alarm</name>
<parents><parent>Burglary</parent><parent>Earthquake</parent></parents>
</node>
<node><name>JohnCalls</name><parents><parent>Alarm</parent></parents>
</node>
<node><name>MaryCalls</name><parents><parent>Alarm</parent></parents>
</node>
</topology>
<probabilities>
<node><name>Burglary</name><table>
<row><entry><val>T</val><prob>.001</prob></entry>
<entry><val>F</val><prob>.999</prob></entry></row>
</table></node>
<node><name>Earthquake</name><table>
<row><entry><val>T</val><prob>.002</prob></entry>
<entry><val>F</val><prob>.998</prob></entry></row>
</table></node>
<node><name>Alarm</name><table>
<row><parents><parent><name>Burglary</name><val>T</val></parent>
<parent><name>Earthquake</name><val>T</val></parent></parents>
```

```
<entry><val>T</val><prob>.95</prob></entry>
<entry><val>F</val><prob>.05</prob></entry></row>
<row><parents><parent><name>Burglary</name><val>T</val></parent>
<parent><name>Earthquake</name><val>F</val></parent></parents>
<entry><val>T</val><prob>.94</prob></entry>
<entry><val>F</val><prob>.06</prob></entry></row>
<row><parents><parent><name>Burglary</name><val>F</val></parent>
<parent><name>Earthquake</name><val>T</val></parent></parents>
<entry><val>T</val><prob>.29</prob></entry>
<entry><val>F</val><prob>.71</prob></entry></row>
<row><parents><parent><name>Burglary</name><val>F</val></parent>
<parent><name>Earthquake</name><val>F</val></parent></parents>
<entry><val>T</val><prob>.001</prob></entry>
<entry><val>F</val><prob>.999</prob></entry></row>
</table></node>
<node><name>JohnCalls</name><table>
<row><parents><parent><name>Alarm</name><val>T</val></parent></parents>
<entry><val>T</val><prob>.90</prob></entry>
<entry><val>F</val><prob>.10</prob></entry></row>
<row><parents><parent><name>Alarm</name><val>F</val></parent></parents>
<entry><val>T</val><prob>.05</prob></entry>
<entry><val>F</val><prob>.95</prob></entry></row>
</table></node>
<node><name>MaryCalls</name><table>
<row><parents><parent><name>Alarm</name><val>T</val></parent></parents>
<entry><val>T</val><prob>.70</prob></entry>
<entry><val>F</val><prob>.30</prob></entry></row>
<row><parents><parent><name>Alarm</name><val>F</val></parent></parents>
<entry><val>T</val><prob>.01</prob></entry>
<entry><val>F</val><prob>.99</prob></entry></row>
</table></node>
</probabilities>
</bn>
```