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**Experiment Number:** 7

**Aim of the Experiment**: Study of Netica Software (free version) and use of it to build a small Bayesian Network.

**Program/ Steps:**

1. Consider the Bayesian Network Diagram given below containing six random variables: "Burglary", "Earthquake", "Alarm", "JohnCalls", “ MaryCalls” and “Radio Announcement”

In this, "Burglary" and "Earthquake" are independent, and "Burglary" and "Radio Announcement" are independent given "Earthquake." This is to say that there is no event that affects both burglaries and earthquakes.

As well, "Burglary" and "Radio Announcements" are independent given "Earthquake" - meaning that while a radio announcement might result from an earthquake, it will not result as a repercussion from a burglary.

2. Create a Bayesian Network using Netica (free version) and explore the functions of Netica on the created network.

**Results: (Softcopy submission):**

Graphical user interface

Description automatically generated

Graphical user interface, application

Description automatically generated

Graphical user interface

Description automatically generated

Diagram

Description automatically generated

**Questions:**

**Q1.** **List the features of Netica.**

Ans:

Netica will print out a confusion matrix, error rate, logarithmic and quadratic (Brier) scoring rule results, calibration table and surprise indexes for each node desired. Can do utility-free sensitivity analysis.

Compiles belief (Bayesian) networks into a junction tree of cliques for fast probabilistic reasoning. It is extensive built-in and [online](http://www.norsys.com/WebHelp/NETICA.htm) help.It can be used for Utility-free sensitivity analysis. It allows the entry of probabilistic relations by equation, with an extensive built-in library of probabilistic functions and other mathematical functions. It has facilities for the easy discretization of continuous variables and it can reverse individual links and "sum out" nodes of influence diagrams or belief nets, for model exploration.

**Q2**. **State the following statements with respective to the diagrams are true or false and Justify your answer.**Diagram

Description automatically generated

1. JohnCalls is independent of Burglary, given Alarm. **TRUE**

Diagram

Description automatically generated

Diagram

Description automatically generated

Here we can see that after changing Jhoncalls there is no change in burglary.

Hence, JhonCalls is independent of Burglary, given alarm is true.

2. Burglary is independent of Earthquake (not knowing Alarm) but Burglary and Earthquake become dependent, given Alarm. **FALSE**

Diagram, engineering drawing

Description automatically generated

Diagram

Description automatically generated

There is no change in Burglary even with huge change in Earthquake. This means without Alarm, Burglary is independent of Earthquake i.e. after fluctuating input for earthquake no change in burglary.

3. MaryCalls is independent of JohnCalls, given Alarm **TRUE**

Initial

Diagram

Description automatically generated

Making a change in probability of JohnCalls.

Diagram

Description automatically generated

The probability of marycalls change very little even with high change in the Johncalls. Hence, MaryCalls is independent of JohnCalls.

**Outcomes:** CO4: Comprehend problems with uncertainty, formalize the problem and understand how solutions are found.

**Conclusion:** We understood how Bayesian Network Problem can be solved using Netica Software by implementing it on a real life case.

**References:**

* Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach,

Second Edition, Pearson Publication

* Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1999.