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Report Lab 4

Implementing Bayes Networks

Introduction

The following text shows the result of applying the acquired knowledge about Bayes Networks to calculate different probabilities given a probability table.

The case we made was the probability of a tree loses its leaves and the reason being it is sick or it needs water. This is the network
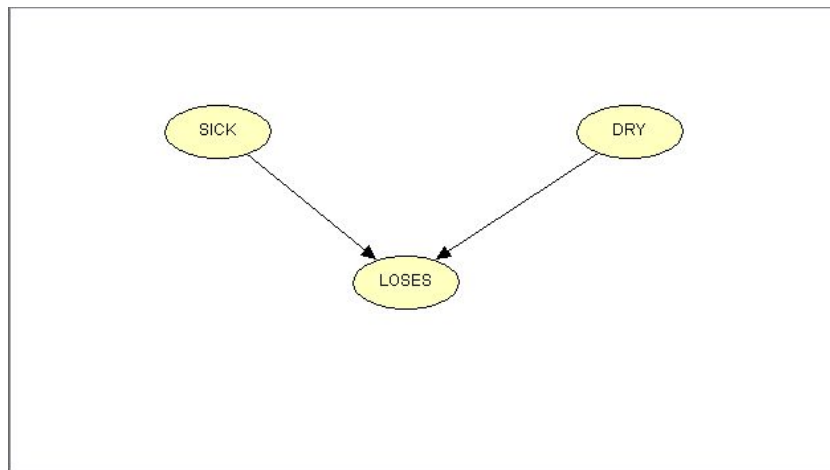
DRY	SICK	LOSES
TRUE		0.1
FALSE		0.9

DRY	SICK	LOSES
TRUE		0.1
FALSE		0.9

DRY SICK LOSES				
DRY	TRUE		FALSE	
SICK	TRUE	FALSE	TRUE	FALSE
TRUE	0.95	0.85	0.9	0.02
FALSE	0.05	0.15	0.1	0.98

Given the following variables and probabilities:

```
Sick,Dry,Loses
6
+Sick=0.1
+Dry=0.1
+Loses|-Dry,+Sick=0.9
+Loses|+Dry,+Sick=0.95
-Loses|-Dry,-Sick=0.98
-Loses|+Dry,-Sick=0.15
```
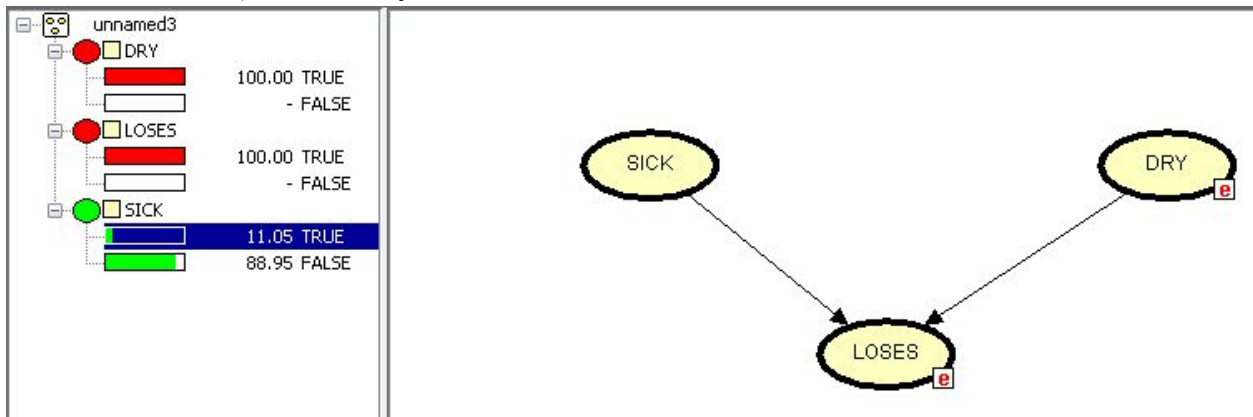
For the queries:

```
5
-Dry
-Loses
-Loses|+Dry,-Sick
+Sick|+Loses,+Dry
-Dry|-Sick,+Loses
```
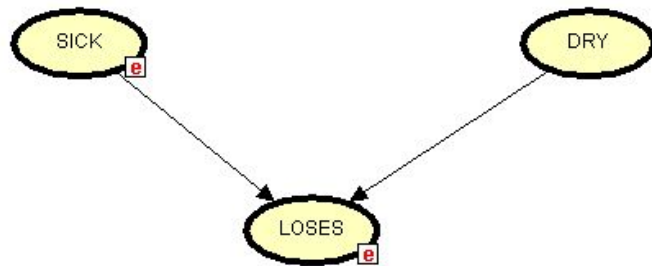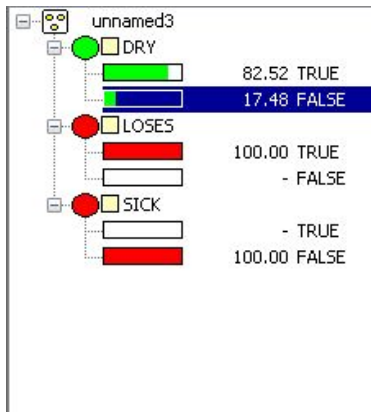
The results are:
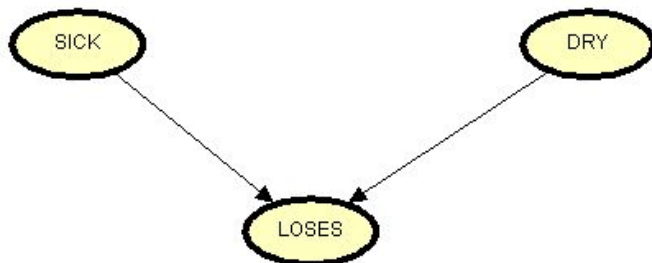
```
0.9
0.1022
0.85
0.4130435
0.9832776
```
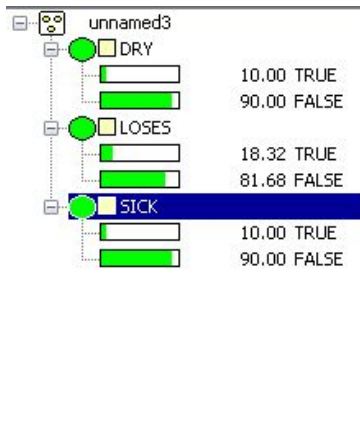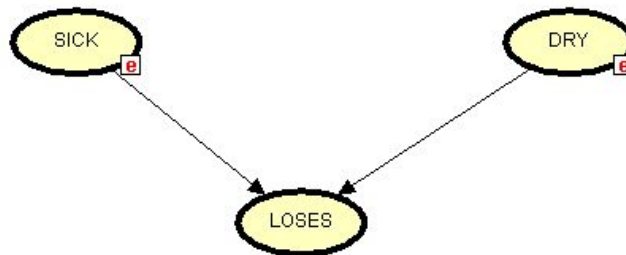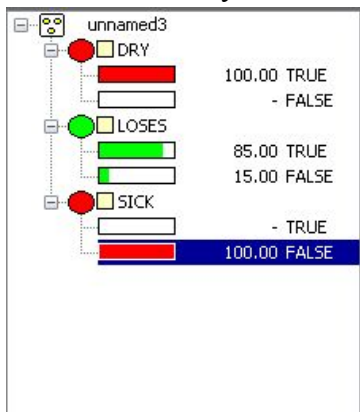
For the case +Sick|+Loses,+Dry

For the case -Dry|-Sick,+Loses

For the cases -Dry and -Loses

Do they use the same algorithms?
The tool hugin computes the probabilities by setting two of evidences at a 100 percent and displaying the probability you are asking. While the algorithm searches for the probabilities it has from the table.

The algorithm of the tool performs the following steps:

- Statistical tests for conditional independence are performed for all pairs of variables
- An undirected link is added between each pair of variables for which no conditional independences were found. The resulting undirected graph is referred to as the skeleton of the learned structure.
- Colliders are then identified, ensuring that no directed cycles occur. (A collider is a pair of links directed such that they meet in a node.)
- Next, directions are enforced for those links whose direction can be derived from the conditional independences found and the colliders identified.
- Finally, the remaining undirected links are directed randomly, ensuring that no directed cycles occur.

In our problem we use the enumeration algorithm, a simple, brute-force algorithm for computing the distribution of a variable in a Bayes network.

What are the common bases?
Both bayes networks need some probabilities to start computing what you ask for, entering a probability table will allow them to compute other probabilities

Which tool would you use for what cases in real life applications?
For some medical diagnostics where you don't have the graph model the algorithm made in the lab will be a good option giving it the correct probabilities that will give to it the necessary data to compute. The hugin model will be useful to make some predictions on different models, like gambling on a horse race

References:

Hugin (s.f) Hugin GUI Help. Retrieved from
http://download.hugin.com/webdocs/manuals/Htmlhelp/