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Bayes Networks

Lab Report

In this laboratory, the objective is comprehending the Bayes Network and the use of the different rules of probability that can be applied, like the chain rule, the division of joints probabilities, the sumatory of the relevant probabilities.

The program was coded in C++ and compiled on Ubuntu. The program use a hash table, or map, to reference to any node created by knowing its name, each node has a vector of all its parents, a map that is its probability table with a string key as the statement of the probability, and a string that contains its own name.

To test the program, as an additional case besides the test cases files in the folder testcases, it was proposed a Bayes Network of "going out with bicycle depending of the weather" and evaluate some queries on the program created and the tool of HuginLite.

The Bayes Network created is the shown one on figure 1.

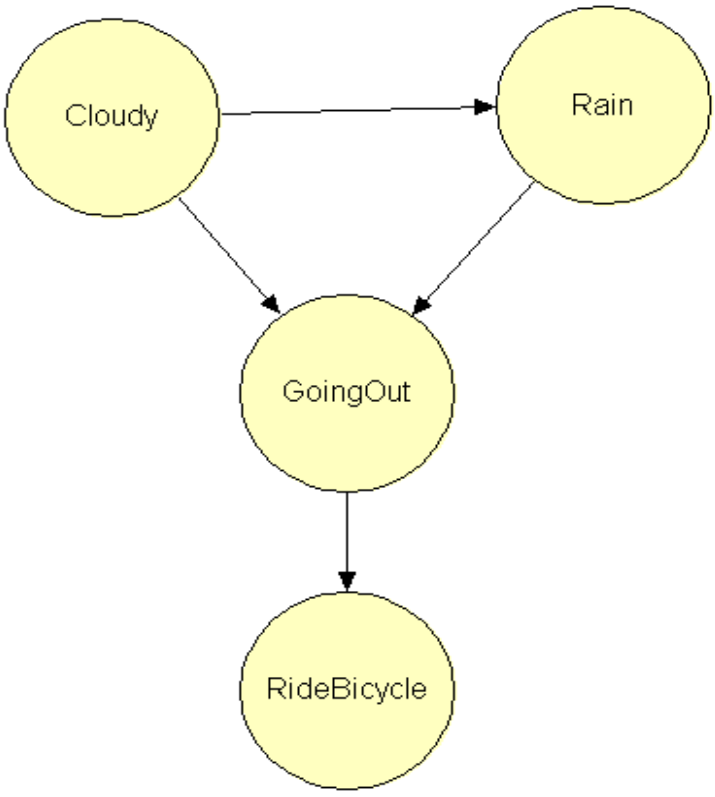

Figure 1. Proposed Bayes Network

Where the probability table of each node are the Tables 1, 2, 3 and 4 for Cloudy, Rain, GoingOut and RideBicycle nodes, respectly.

	TRUE	FALSE
CLOUDY	0.65	0.45

Table 1. Cloudy Node Probability Table

	CLOUDY	NOT CLOUDY
TRUE	0.7	0.004
FALSE	0.3	0.996

Table 2. Rain Node Probability Table

	CLOUDY & RAIN	CLOUDY & NOT RAIN	NOT CLOUDY & RAIN	NOT CLOUDY & NOT RAIN
TRUE	0.0028	0.71	0.47	0.91
FALSE	0.9972	0.29	0.53	0.09

Table 3. GoingOut Node Probability Table

	GOING OUT	NOT GOING OUT
TRUE	0.668	0.07
FALSE	0.332	0.93

Table 4. RideBicycle Node Probability Table

The results of the evaluations of the queries in both tools are in table 5. It can see that there're some difference in the results of each query, especially in the query "+Cloudy", the implementation created gives the value of the probability table of the node Cloudy, but Hugin gives another value than the one in the table. Probably, the algorithm that implements one part of an initial propagation of the probabilities of the network, so that's why the results have difference between the two programs.

QUERIES	HUGIN LITE	LAB IMPLEMENTATION
-RIDEBICYCLE	0.6319	0.65635
+RAIN|+RIDEBICYCLE	0.0821	0.096329
+RAIN	0.4153	0.4564
-GOINGOUT	0.5014	0.54239
+CLOUDY|-RAIN, +GOINGOUT	0.2534	0.30383
-RIDEBICYCLE|+RAIN	0.9272	0.92747
+CLOUDY|+RIDEBICYCLE	0.3187	0.37554
+CLOUDY	0.5909	0.65

Table 5. Comparation between Hugin and the program created

For real applications, maybe the application of Hugin have experience that support them, but in my opinion, I'm confidence about the program that I have created and its utility. But for more specifics applications like the risk factors in the economy field for the prediction of the business plans.