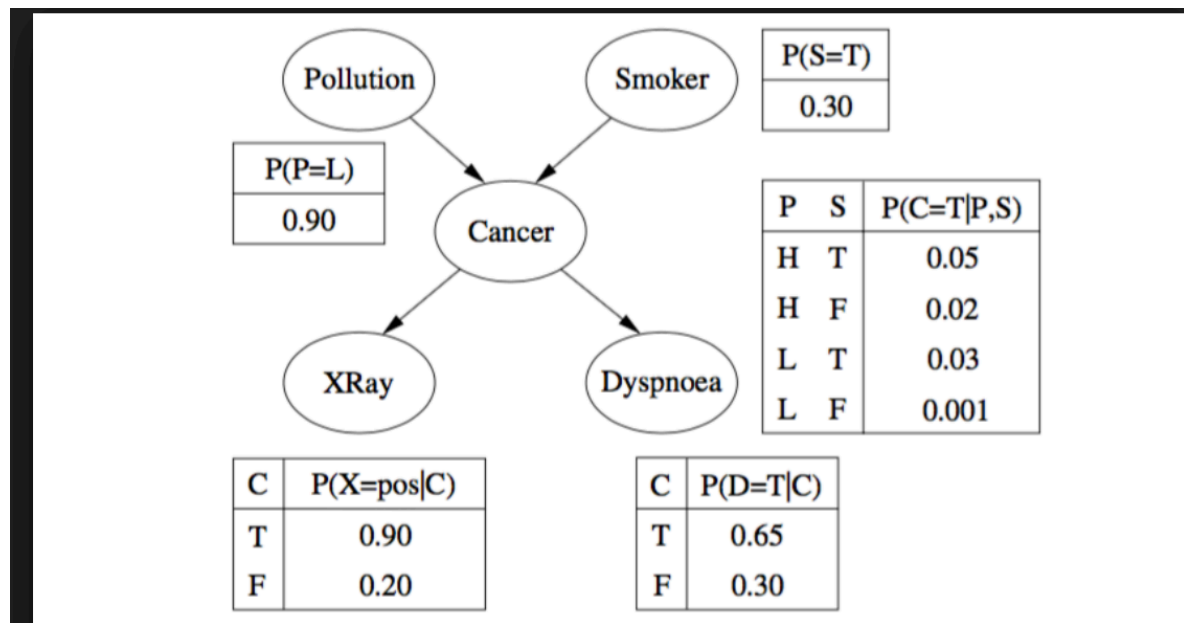


For the example to compare with Hugin, we decide to implement the example given in the lecture about Bayes basis to test both results.



For this example, we need 10 parameters, according to the number of nodes and arcs that are shown in the previous diagram.

Pollution,Smoker,Cancer,XRay,Dyspnoea

10

+Smoker=0.3

-Pollution=0.9

+Cancer|+Pollution,+Smoker=0.05

+Cancer|+Pollution,-Smoker=0.02

+Cancer|-Pollution,+Smoker=0.03

+Cancer|-Pollution,-Smoker=0.001

+XRay|+Cancer=0.9

+XRay|-Cancer=0.2

+Dyspnoea|+Cancer=0.65

+Dyspnoea|-Cancer=0.3

Finally, to test the bayes network, we try with 7 test cases.

7

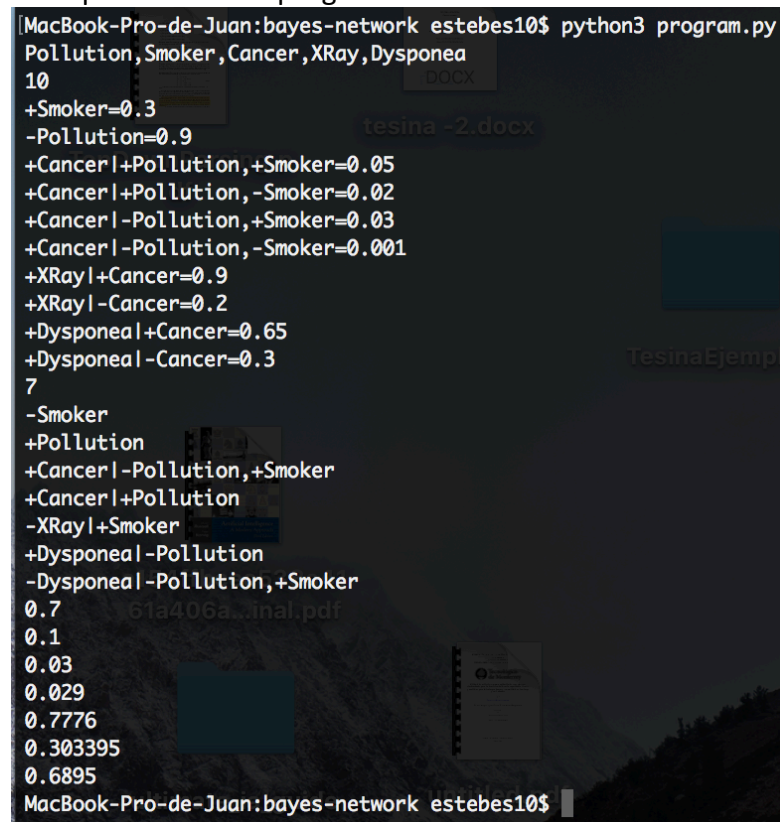
-Smoker

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+Pollution
+Cancer|-Pollution,+Smoker
+Cancer|+Pollution
-XRay|+Smoker
+Dyspnea|-Pollution
-Dyspnea|-Pollution,+Smoker

And the result obtained were:

0.7
0.1
0.03
0.029
0.7776
0.303395
0.6895

Example of how the program run:



```
[MacBook-Pro-de-Juan:bayes-network estebes10$ python3 program.py
Pollution,Smoker,Cancer,XRay,Dyspnea
10
+Smoker=0.3
-Pollution=0.9
+Cancer|+Pollution,+Smoker=0.05
+Cancer|+Pollution,-Smoker=0.02
+Cancer|-Pollution,+Smoker=0.03
+Cancer|-Pollution,-Smoker=0.001
+XRay|+Cancer=0.9
+XRay|-Cancer=0.2
+Dyspnea|+Cancer=0.65
+Dyspnea|-Cancer=0.3
7
-Smoker
+Pollution
+Cancer|-Pollution,+Smoker
+Cancer|+Pollution
-XRay|+Smoker
+Dyspnea|-Pollution
-Dyspnea|-Pollution,+Smoker
0.7
0.1
0.03
0.029
0.7776
0.303395
0.6895
MacBook-Pro-de-Juan:bayes-network estebes10$
```

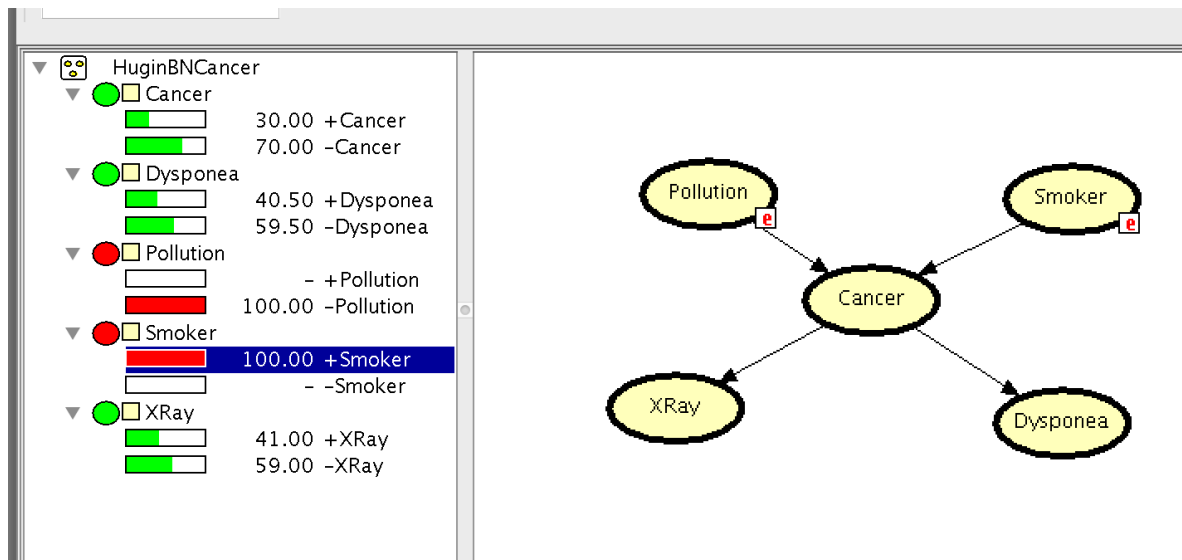
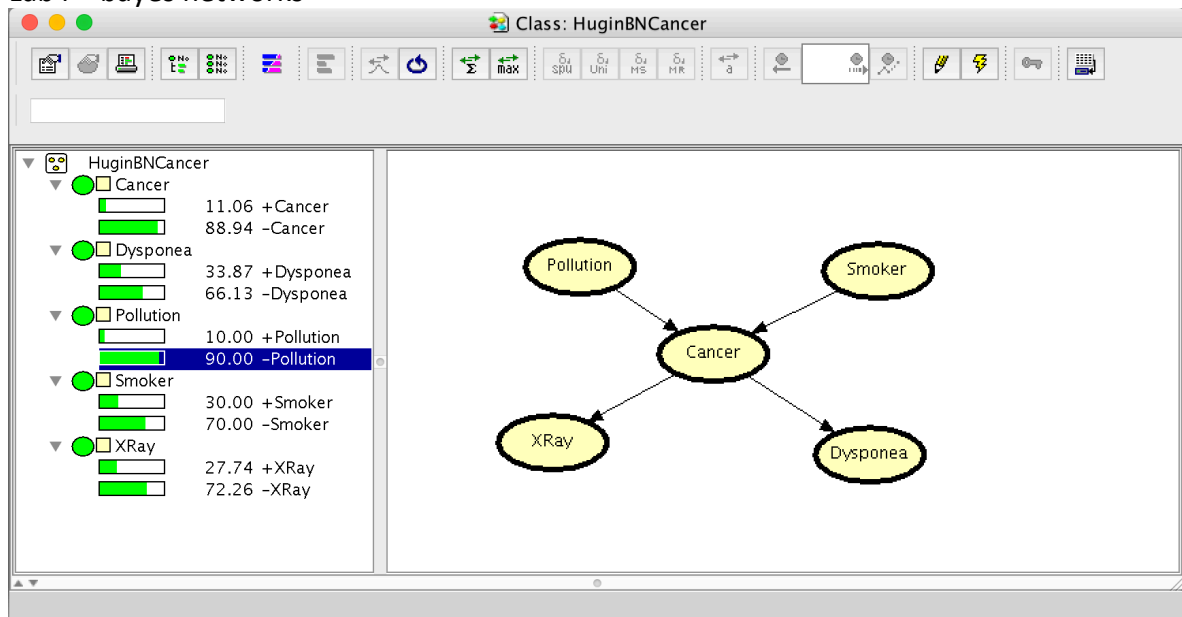
The full implementation of this problem in Hugin is the following image.

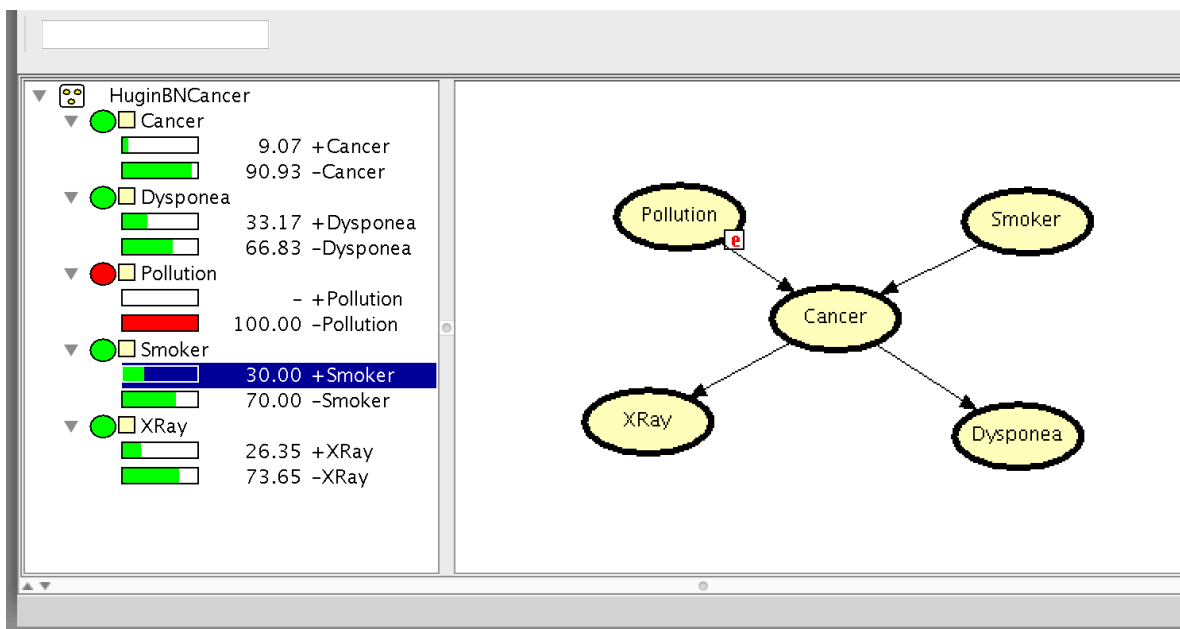
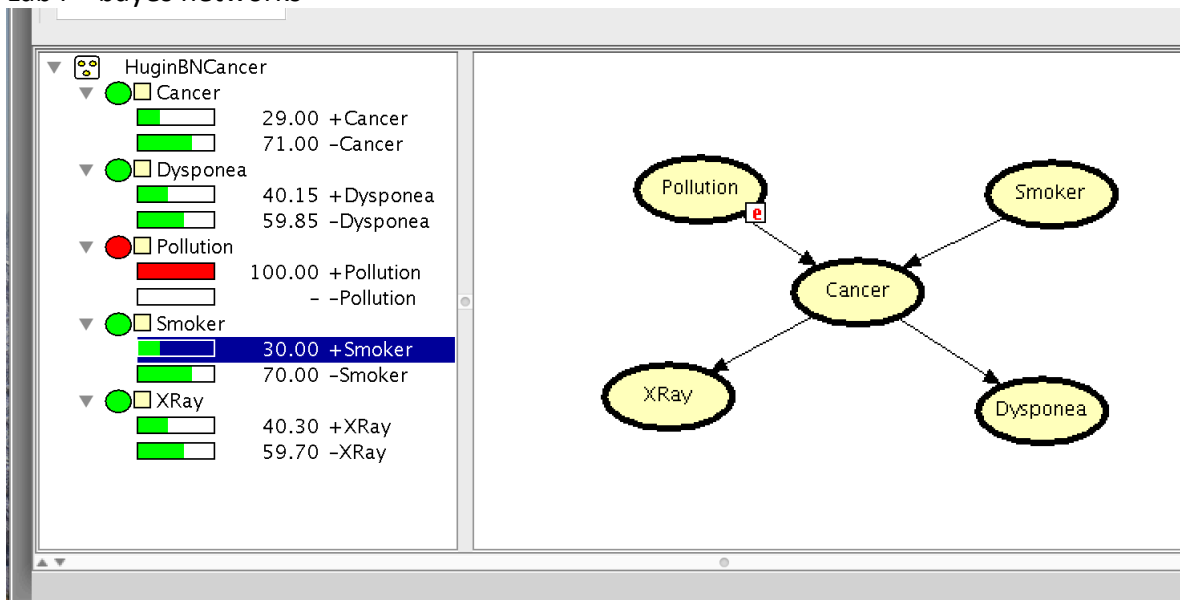
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Comparing results from both solutions are:

Tests cases	Our solution	Hugin
-Smoker	0.7	0.7
+Pollution	0.1	0.1
+Cancer -Pollution, +Smoker	0.3	0.3
+Cancer +Pollution	0.29	0.29
-XRay +Smoker	0.7776	0.576
+Dyspnea -Pollution	0.303395	0.3317

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-Dyspnea -Pollution,+Smoker	0.6895	0.595

According to results obtained, there are some differences with queries that don't use all the nodes, because in the example of (-XRay|+Smoker) the result is completely different, due to the Cancer node is between XRay and Smoker, so we don't know how to put the unused nodes to not affect the result in Hugin. However, we think Hugin makes a different implementation of the algorithm to get the probability, because you need to put in a 100% probability for the conditioned nodes.

Finally, there are similar bases for the simple queries like the first two, in which the program just sees the parent tables and looks for the probability requested. In this case, we decide to use Hugin because it has a visual representation of the nodes and their values, so it could be better for users and people to understand what is happening, it is the only reason to use Hugin instead of our program.