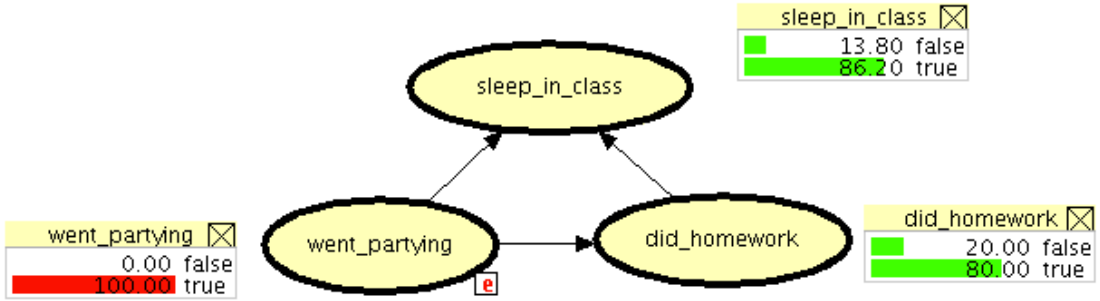
Luis Carlos Acosta
Eduardo Emilio Tavarez

# Lab 4. Bayesian Networks Report

The main difference between both is that if you solve by the enumeration algorithm you get way more results and calculations, it is more tedious and time consuming but in the end it helps you to understand how the Bayes theorem works. On the other hand the Hugin GUI provides you a faster and intuitive way to build Bayes networks and compute the results, it also throws the results in a default/predetermined way, so you don't have to worry about defining the queries.





They use different algorithms to solve the same problem; on our implementation we used the enumeration algorithm that uses the function of conditional probability, in order to do this the program has to check all the nodes that are given in the query; the ones that are not given should be evaluated by their probability of the node being true and false, then all the permutations possible have to be calculated, here is where the most challenging part was, which was implementing the chain rule that basically calculates the probability for each node considering all the node's parents, this by consulting the probability table of each node. Then all the permutations are added up. This applies to both sides of the division, numerator and denominator. Lastly the calculation is made. This seems like a very complex method at first, but once you practice it and understand it is somehow simple to implement, the method used by the Hugin GUI seems simpler and more straightforward, the only thing you have to do is create the Bayes network (nodes and arcs), define that the nodes have Boolean values and fill in the

probability tables for each node. Then you can give full probability to a node (intending it happened) and see how the probability of the other nodes changes.

What they have in common is that they follow the same theorem that is the Bayes theorem, this theorem basically calculates the probability that an event will happen given certain evidence and some probabilities.
Which tool would you use for what cases in real life applications?

I believe the most interesting application for Bayes networks is the application it has on the health area, the ability to make diagnosis based on different symptoms. I think this should be calculated with the enumeration algorithm since more data is generated and also the person in charge of giving the diagnosis has to know what is happening behind the calculations. I think the Hugin method is better for a quick and graphical representation of a Bayes network; it's also really intuitive and good for educational purposes.