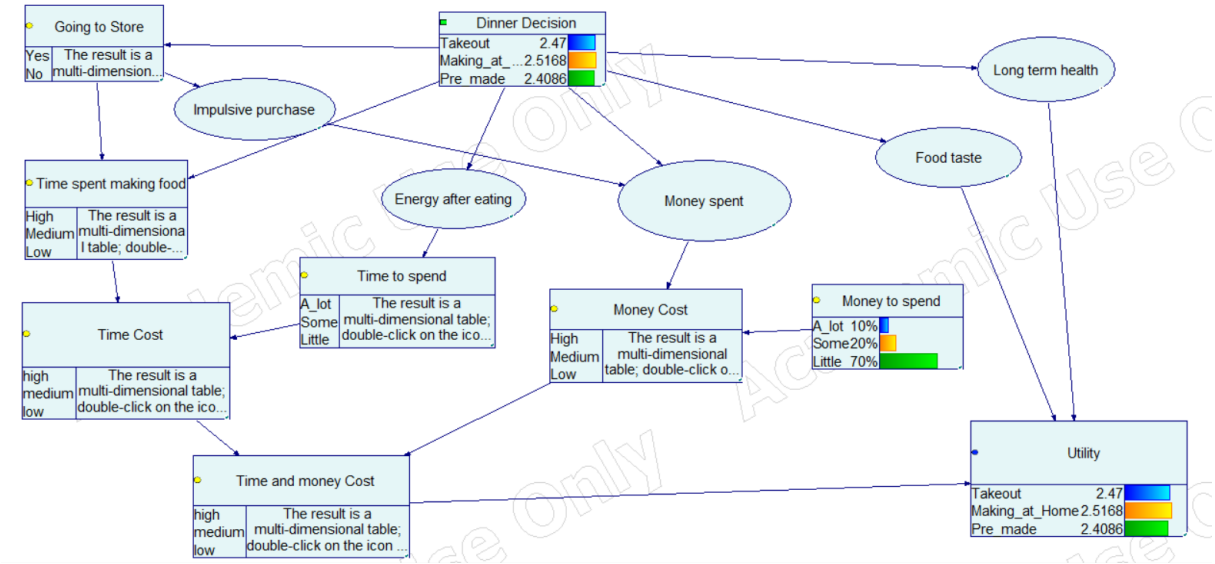
Assignment 5 – Jakub Rysiak

Dinner choice decision support system

Since I have faced the difficulty of choosing what to eat or rather how to get a dinner myself, I though it would be interesting to model it. My final decision support system looks like this:



Chance Nodes

The uncertain variables in this system I deemed reasonable were **money to spend**, **energy after meal**, **long term health effects, food taste** and **money spent**(**influenced by impulsive purchases**).
The money to spend is representing the short to medium term expenses that are somewhat uncertain. The rest of the variables are known, such as **the need to go to the store**, **the time available**, which is represented by **the time to spend** node which is a composite of **energy after meal**, since if I am low on energy after the meal, the time I will have to do tasks will be reduced.

When it comes to the probability tables of the nodes, I have made them based on some assumptions and experiences.

Speaking broadly about the model, its most complicated part is the connections between time and money and their cost. As I have mentioned time to spend is affected by the energy after meal, and has its own prior probability, resulting in a table that look like this:

Energy ...	High	Medium	Low
A_lot	0.35	0.25	0.15
Some	0.5	0.5	0.5
Little	0.15	0.25	0.35

Which in short says that the probability of having a lot of time is mostly low, but is even lower if combined with low energy after meal. The probability of being low on energy is highest after eating a pre-made meal, and lowest after eating home made food, from my experience.

Then there is the variable time spent to make food, which is a combination of the time spent grocery shopping and cooking. It looks like this:

Dinner Decision	Takeout		Making_at_Home		Pre_made	
Going to Store	Yes	No	Yes	No	Yes	No
High	0	0	0.5	0	0	0
Medium	0	0	0.5	0.5	1	0
Low	1	1	0	0.5	0	1

The probability in case of takeout is the same for both since there is no need for grocery shopping, and it will always be low. At the same time making the food and shopping is somwhere between long and short, whereas the time to warm up a pre made food is low unless there is a need to go to the store.

The two time tables are combined into one variable with a value saying what is the time cost, this takes into account the fact that the cost to use time cooking if one has a lot of time is lower when one has a lot of time. Combined it results in a variable that says whether the cost in time is high or low.

Time spent ma...	High			Medium			Low		
Time to spend	A_lot	Some	Little	A_lot	Some	Little	A_lot	Some	Little
high	0	0.5	1	0	0	0.5	0	0	0
medium	1	0.5	0	0.5	1	0.5	0	0.5	1
low	0	0	0	0.5	0	0	1	0.5	0

Similarily for the the money cost, it is affected by the amount of money to spend in the short to medium term, and how much the meal will cost.

The money spent table looks accordingly:

Impulsive purch...	Yes			No		
Dinner Decision	Takeout	Making_at_...	Pre_made	Takeout	Making_at_...	Pre_made
High	0.9	0.1	0.7	0.9	0.05	0.6
Medium	0.1	0.6	0.2	0.1	0.65	0.3
Low	0	0.3	0.1	0	0.3	0.1

Here the takeout is high, as it usually costs a lot, and making at home and pre-made are affected by whether a impulsive purchase has been made, which is only possible when one has been to the store. Making the food at home is usually cheaper than pre-made, since I usually make dinner for two days, which reduces the costs.

The money cost, which represents how “painful” it will be to me financially, is then a combination of money spent and money to spend. Here the thought is similarily to the time cost, that if I have a lot of money to spend, I will not mind to spend more. Combined it gives me the following table:

Money spent	High			Medium			Low		
Money to spend	A_lot	Some	Little	A_lot	Some	Little	A_lot	Some	Little
High	0	0.5	1	0	0	0.5	0	0	0
Medium	1	0.5	0	0.5	1	0.5	0	0.5	1
Low	0	0	0	0.5	0	0	1	0.5	0

And then lastly, combining the time and money cost into one table, we get a table that represents both these, were two high numbers will be a pure high cost, two low will be low, and the rest is a mix.

Time Cost	high			medium			low		
Money Cost	High	Medium	Low	High	Medium	Low	High	Medium	Low
high	1	0.5	0	0.5	0	0	0	0	0
medium	0	0.5	1	0.5	1	0.5	1	0.5	0
low	0	0	0	0	0	0.5	0	0.5	1

The two nodes left are the food taste and long term health effects. These two are relatively straightforward. Since I am a pretty good cook, the taste will rarely be bad, takeout can be a hit or miss and pre made food is mostly the same, which is average:

Dinner Decision	Takeout	Making_at_...	Pre_made
Good	0.4	0.3	0.1
Medium	0.4	0.5	0.8
Bad	0.2	0.2	0.1

And lastly there is the long term health node, which represents the fact that making food from wholefoods like I usually do is healthy, pre-made food has a bad effect on health, and takeout will be not necessarily the worst, depending on what is ordered:

Dinner Decision	Takeout	Making_at_...	Pre_made
Healthy	0.1	0.75	0
Neutral	0.4	0.15	0.1
Unhealthy	0.5	0.1	0.9

Decision and utility nodes

The rest of the network is rather simple, it consists of a decision node, which has the three options that I have already mentioned, and a utility node. The utility node is directly affected by three values, the food taste, health effects and the time/money cost. Each of these has a value of low, medium or high, hence I give them a number of 1-3. Since I value my health mostly, the health value gets a weight of 0.5, the cost is 0.4, and the taste is not that important, and gets a 0.1 weight factor.

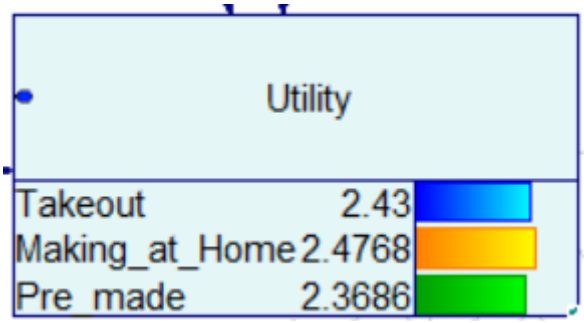
Long term health	Healthy								
Time and mone...	high			medium			low		
Food taste	Good	Medium	Bad	Good	Medium	Bad	Good	Medium	Bad
Value	2.2	2.1	2	2.6	2.5	2.4	3	2.9	2.8

Long term health	Neutral								
Time and mone...	high			medium			low		
Food taste	Good	Medium	Bad	Good	Medium	Bad	Good	Medium	Bad
Value	1.7	1.6	1.5	2.1	2	1.9	2.5	2.4	2.3

Long term health	Unhealthy								
Time and mone...	high			medium			low		
Food taste	Good	Medium	Bad	Good	Medium	Bad	Good	Medium	Bad
Value	1.2	1.1	1	1.6	1.5	1.4	2	1.9	1.8

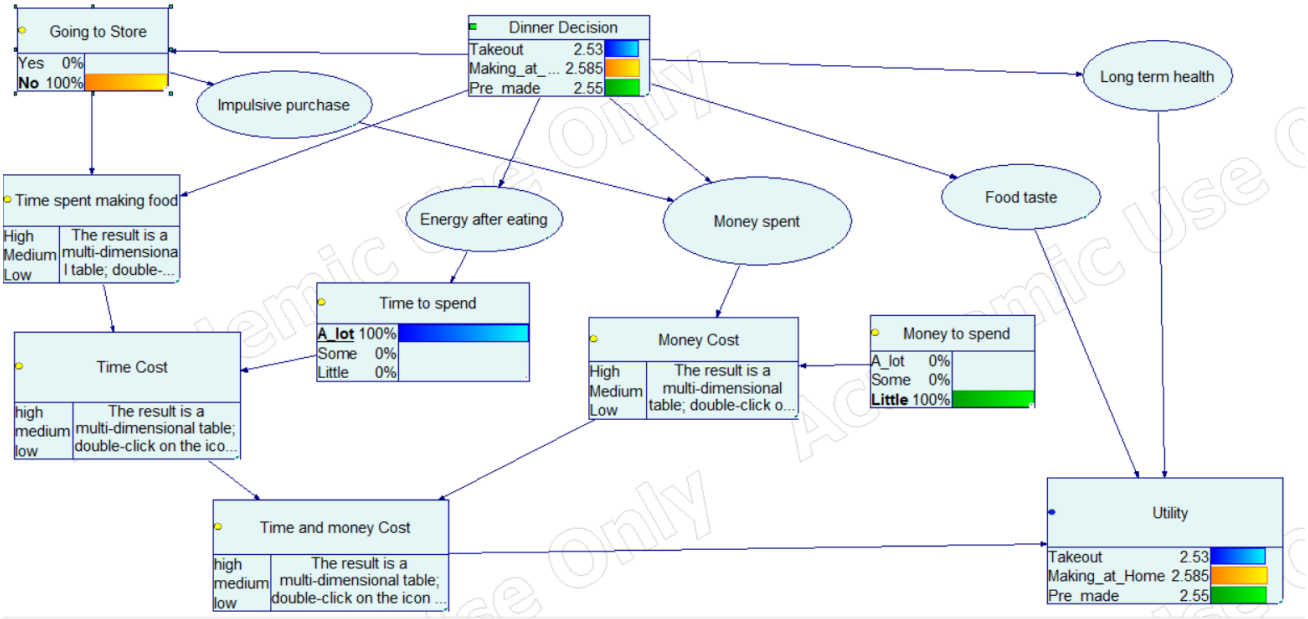
Verification

Considering all those variables, the models shows the following general utilities for the options:



Which looks mostly correct, since making food at home is what I think is most of the time the best option, but maybe some of the probabilities should be adjusted, mainly the cost or the weight of time or relative cost values, since the takeout has a higher utility than I would expect. The pre made option should be low, since the health factor is important to me, and eating prosessed pre-made food is not good for long term health.

When applying some known variables such as a lot of time, litte money to spend and no need to go to store, it shows highest utility of home made food:



At the same time, the model still says making home food is the best option, even though I have a lot of money and little time, which I would not necessarily agree with in a normal scenario, which possibly points at too much weight on health and too little on costs.