Artificial Intelligence Methods
Assignment 5
Kacper Multan

Exercise 1

I chose to make a decision support system for the decision problem:
Should I join the skiing trip with ESN?

Chance nodes:

- Amount of money in savings
- Quality of the rented equipment
- Weather conditions
- Group of people joining the trip
- Amount of academic work
- Money spent
- Improvement of skiing skills
- Relaxing holiday
- Meeting new people
- Academic performance

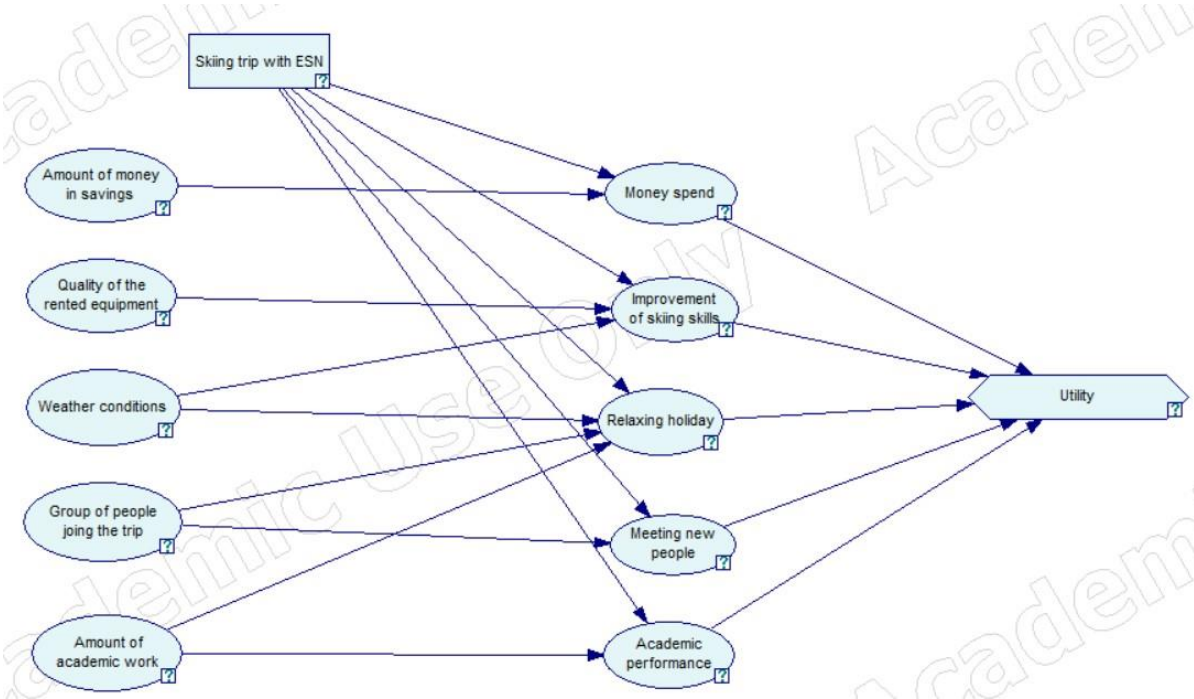
Decision nodes:

- Skiing trip with ESN

Utility nodes:

- Utility

The variables and the relations between them:



Assumptions:

- The nodes: Amount of money in savings, Quality of the rented equipment, Weather conditions, Group of people joining the trip, Amount of academic work, describe situations we have no control over or situations that look so far forward into the future we cannot predict their outcome. Therefore, to simplify the problem, I gave each option represented by them a probability of 50%. For example - there is a 50% chance for good weather and a 50% chance for bad weather.
- All of the nodes listed in the first point are independent of each other. If we know the values of these nodes then the nodes: Money spent, Improvement of skiing skills, Relaxing holiday, Meeting new people, Academic performance are also independent of each other.
- I tried to make the dependencies as realistic as possible, for example how relaxing a holiday is can be the outcome of multiple different factors - weather conditions, people taking part in the trip, amount of academic work.

The probability tables for the nodes:

Money spent probability table

Skiing trip with ESN	Yes		No	
Amount of money in savings	A_lot	Little	A_lot	Little
A_lot	0.8	0.2	0.05	0
Little	0.2	0.8	0.95	1

Improvement of skiing skills probability table

Skiing trip with ESN	Yes				No			
Weather conditions	Good		Bad		Good		Bad	
Quality of the rented equipment	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Improve	0.95	0.8	0.7	0.5	0	0	0	0
Not_improve	0.05	0.2	0.3	0.5	1	1	1	1

Relaxing holiday probability table

Skiing trip with ESN	Yes								No							
Group of people joing the trip	Nice				Not_nice				Nice				Not_nice			
Amount of academic work	A_lot		Little		A_lot		Little		A_lot		Little		A_lot		Little	
Weather conditions	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Relaxing	0.8	0.7	1	0.9	0.5	0.1	0.7	0.6	0.2	0.4	0	0.1	0.9	1	0.4	0.4
Not_relaxing	0.2	0.3	0	0.1	0.5	0.9	0.3	0.4	0.8	0.6	1	0.9	0.1	0	0.6	0.6

Meeting new people probability table

Skiing trip with ESN	Yes		No	
Group of people joing the trip	Nice	Not_nice	Nice	Not_nice
Yes	1	0.8	0.1	0.2
No	0	0.2	0.9	0.8

Academic performance probability table

Skiing trip with ESN	Yes		No	
Amount of academic work	A_lot	Little	A_lot	Little
Good	0.5	0.9	0.9	0.9
Bad	0.5	0.1	0.1	0.1

Utility probability table

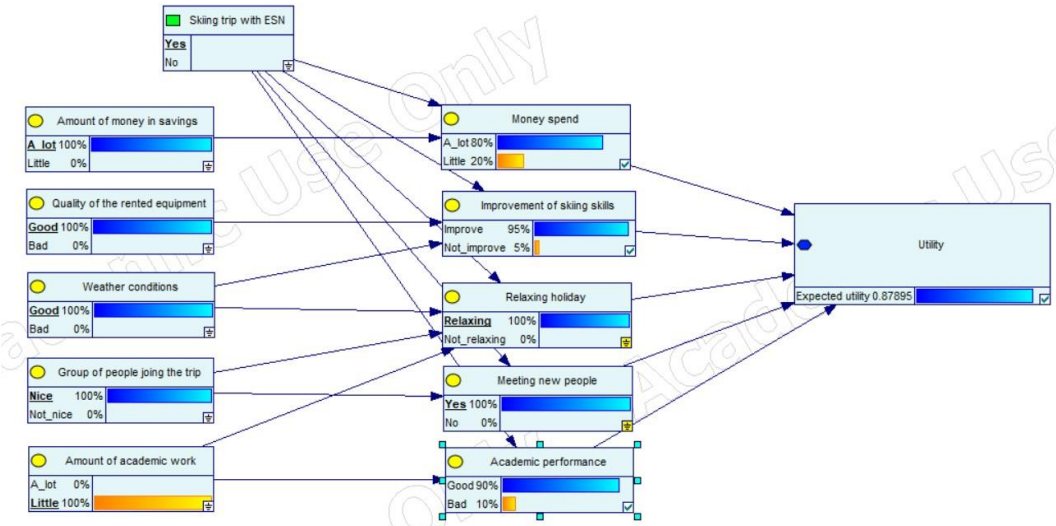
Money spend	A_lot															
Improvement of skiing skills	Improve								Not_improve							
Relaxing holiday	Relaxing				Not_relaxing				Relaxing				Not_relaxing			
Meeting new people	Yes		No		Yes		No		Yes		No		Yes		No	
Academic performance	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Value	0.9	0.6	0.8	0.5	0.9	0.7	0.7	0.4	0.6	0.4	0.4	0.2	0.6	0.3	0.2	0

Money spend	Little															
Improvement of skiing skills	Improve								Not_improve							
Relaxing holiday	Relaxing				Not_relaxing				Relaxing				Not_relaxing			
Meeting new people	Yes		No		Yes		No		Yes		No		Yes		No	
Academic performance	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Value	1	0.8	0.8	0.6	0.9	0.7	0.6	0.4	0.85	0.7	0.7	0.5	0.8	0.6	0.6	0.3

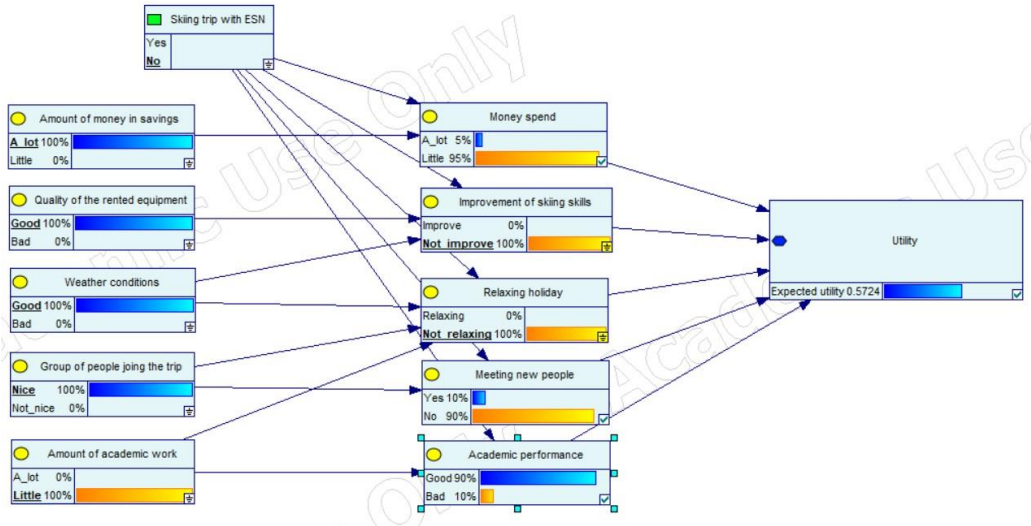
The action with the highest utility

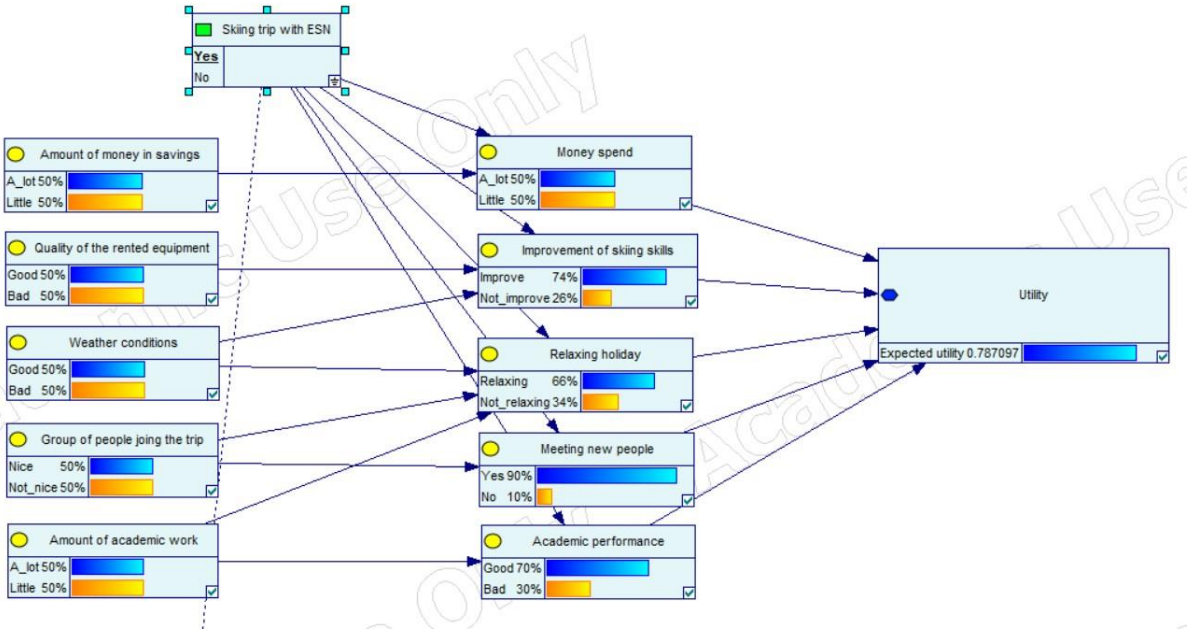
The highest utility function for joining the skiing trip with ESN. This situation takes place when I have a lot of savings, the quality of the rented equipment will be good, weather conditions will be good, the people joining the trip will be nice and there will not be a lot of academic work.

My utility function had the value 0.87895.



The action with the lowest utility




Skiing trip with ESN
Yes
No
Amount of money in savings
A_lot 50%
Little 50%
Quality of the rented equipment
Good 50%
Bad 50%
Weather conditions
Good 50%
Bad 50%
Group of people joing the trip
Nice 50%
Not_nice 50%
Amount of academic work
A_lot 50%
Little 50%
Money spend
A_lot 50%
Little 50%
Improvement of skiing skills
Improve 74%
Not_improve 26%
Relaxing holiday
Relaxing 66%
Not_relaxing 34%
Meeting new people
Yes 90%
No 10%
Academic performance
Good 70%
Bad 30%
Utility
Expected utility 0.787097