TDT4171 Artificial Intelligence Methods

Exercise 1

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I 5-card Poker Hands

a Atomic events

The number of different poker hands available, is the combination of 52 cards, choosen 5 at a time. [1]

$\binom{52}{5} = 2598960$

b The probability of an atomic event

The probability of each atomic event is equal, given the dealer is fear. This means the probability of each event is $1/2598960 = 0.0000038477$

c The probability of special hands

c.1 The probability of a Royal Straight Flush

There are four possible different Royal Straight Flush-hands in poker. Since their probability each are equal to all other possible hands, the probability of one of them, are $0.0000038477 \cdot 4 = 0.00015391$

[1] If we take the order into account, the number would be $52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 = 311875200$.

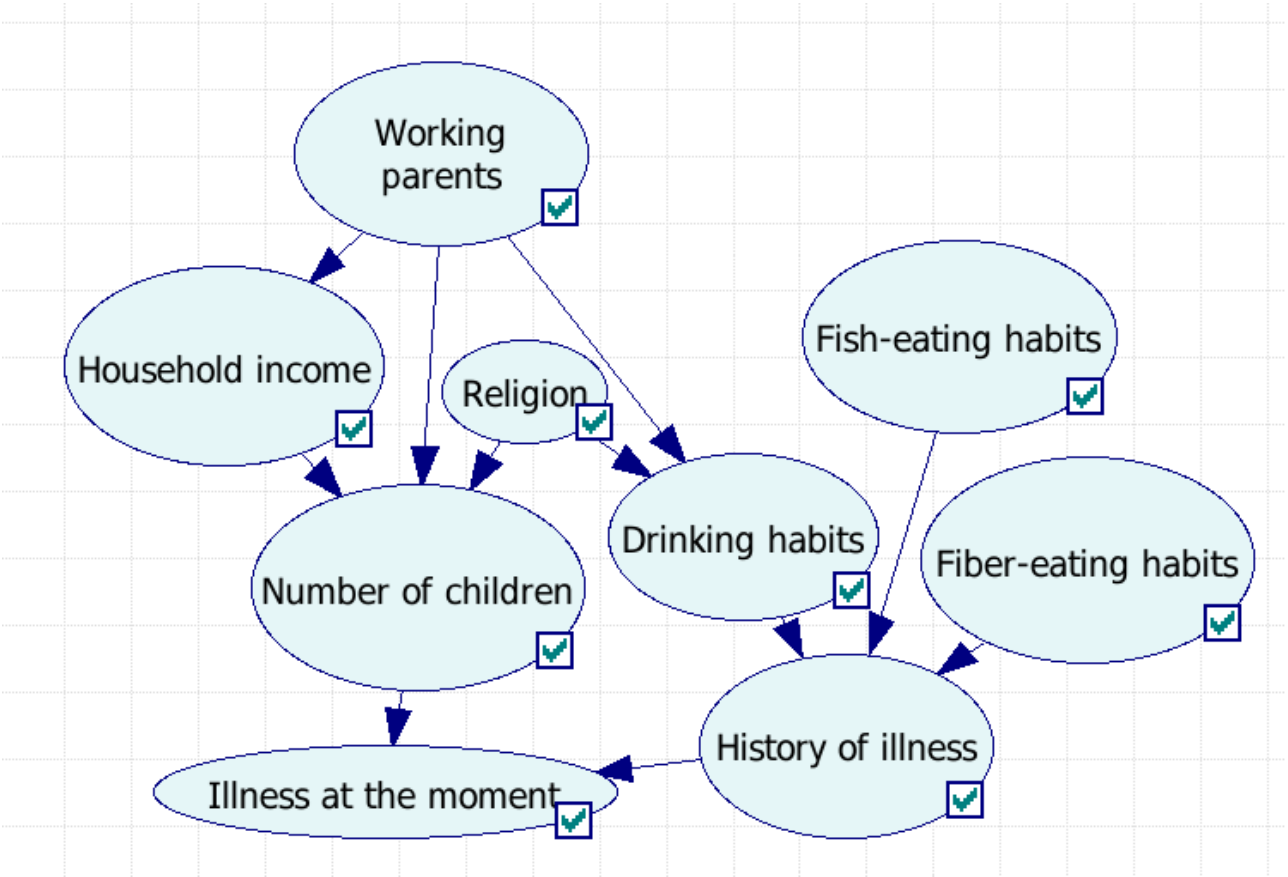
c.2 The probability of a Three of a Kind

In order to get Three of a kind, you need to get 3 cards of the same value, and 2 of any other value. First, we need to be given one card of value and color. Then we need to be delt 2 more of this color, that is $\binom{13}{1}\binom{4}{3} = 13 \cdot 4 = 52$. This is the number of ways we can choose 3 cards of same value from a normal deck of cards. We need to multiply this with the number of ways we can choose the rest of the other cards, wich is to choose 2 cards with a different value, both with any color. $\binom{12}{2}\binom{4}{1}\binom{4}{1} = 66 \cdot 4 \cdot 4 = 1056$

The mathematical formula for how many different Three of a Kind will then be: $\binom{13}{1}\binom{4}{3} \cdot \binom{12}{2}\binom{4}{1}^2 = 52 * 1056 = 54912$

Since there are 54912 Three of a Kind hands, and 2598960 poker hands total, the probability for one of these are $54912/2598960 = 0.021128$.

II Bayesian Network Construction



The conditional independence properties of this Bayesian Network are:

- Household income, given Working Parents
- Number of children, given Household income and Religion
- Drinking habits given Working parents and Religion
- History of illness given Drinking habits, Fish-eating habits and Fiber-eating habits
- Illness at the moment given Number of children and History of illness

I have chosen Working parents, Fish-eating habits and Fiber-eating habits as the "independent" nodes that has no parents.

I would say that in an isolated world, using my knowledge and understanding of the properties, this assumptions may be perfectly sound. Of course, in the real world, there are a lot more variables to add to this model. Also, there are

a lot of special cases not well represented in this network. Eg. if your religion requires you to eat a lot of fiber, there is no doubt that Fiber-eating habits should have Religion as parent, but in the general case, not so.

III Bayesian Network Application

I have constructed the Bayesian Network in GeNIe 2.0, and will explain with screenshots from the analysis of the network I made. The network-file is attached with the delivery of this exercise and is named *Bay-net-application.xdsl*.

We see that the

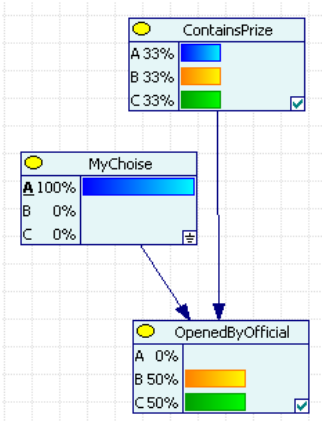


Figure 2: Choise made

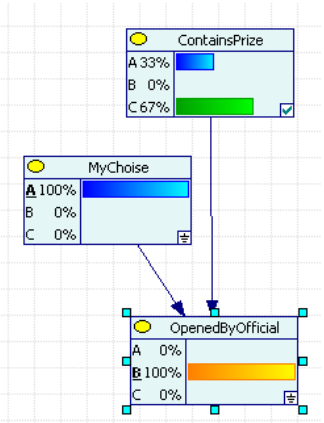


Figure 3: Official opened door

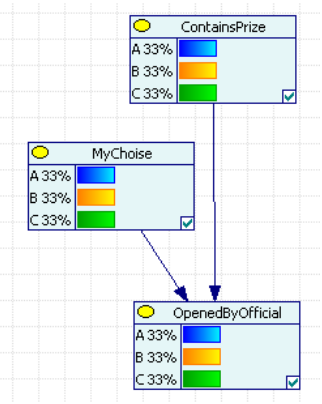


Figure 1: Initial