LINKÖPINGS UNIVERSITET   732A66 Decision theory
Department of Computer and   Fall semester 2024
Information Science   Assignment 3
Division of Statistics and Machine learning/ANd

Assignment 3

You are supposed to reason in writing around this decision problem by answering and dwelling on the questions that are posed at the end of this instruction. The prerequisites, facts and specified probabilities must be retained, but you may add subordinate actions to define a step-wise procedure, or states of the world that you think are necessary components for being able to formulate a proper decision problem. You may (or rather should) assign your own probabilities to such states if you add them.

The format of your submission is free, but an electronic document is highly recommended (MSWord or similar freeware or PDF). Try to be concise in your formulations. Co-working is allowed, but there must be individual submissions (that are not just copies of one submission). For this assignment it would most probably be better to do all or most of it on your own.

Your solutions should be submitted at latest on **Wednesday 5 December 2024**.

Prerequisites and facts

- You will travel from City A to Airport B for catching a flight on a specific day
- You need to be at Airport B at latest 9:30 a.m. to not miss the flight
- You can choose between taking the train or going by car (no other means of conveyance)
- The train journey takes 3 hours according to the schedule. It departs from City A at 6 a.m. (and arrives at Airport B at 9 a.m. if on schedule)
- Going by car takes approximately 2 hours (assume it to be exactly 2 hours for simplicity), but you need to add 15 minutes for parking your car. The car is available from 6 a.m.
- The train ticket costs 50 €
- The total cost for using the car (parking included) is 70 €

Potential obstacles and costs; assumptions and assigned prior probabilities

- The probability that the train is delayed by x minutes is $(45 - x)\cdot 0.001$
- It can be assumed that the train will not derail or break down
- The additional cost from missing your flight is 300 €
- The probability of encountering an unexpected traffic incident/jam that delays your journey by y minutes is $(90 - y)\cdot 0.0002$ conditional on that the car is not involved in an accident
- It can be assumed that the car will not break down
- The probability of the car (and you) being involved in an accident is 0.01
- If the car is involved in an accident you will not catch your flight

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- If the car is involved in an accident there is a probability of 0.4 that you will be injured in such a way that medical care is needed
- If the car is involved in an accident there is a probability of 0.1 that you will be injured in such a way that you will be hospitalised or even die

Questions to be answered and dwelled on

- Which are the actions, states of nature and consequences?
- Is it possible to view (model) this as one single decision problem? Why (not)?
- What decision problem could you define for which it is possible to use the EU-criterion (maximising the expected utility or minimising the expected loss)? This could be a subordinate decision problem.

Note that there is not one correct answer to any of the questions or one correct decision problem to be identified. It is your reasoning that is the contribution and the outcome of this assignment.