Name:

Model-based Decision Support

Exam 2 (home assignment) Enrolment number: April11, 2019 latest

Use the last three digits of your student enrolment number. The last but one digit defines Z, the last but two digits defines Y and the final digit defines X. (Example: enrolment number 1499502 results in X=2, Y=5, and Z=10); note that digit "0" translates into 10.

The Company SUN 2 in Engerwitzdorf produces solar panels and they face an urgent order for 40 panels from a new German customer, who is willing to pay 1000 Euro per panel. SUN 2 has fully utilized its capacities for other orders and the only alternative declining this order is to outsource the production of these 40 panels.

SUN 2 has two options for outsourcing, Supplier A from Romania, and Supplier B from Poland. Supplier A offers to deliver the panels for 500 Euro per panel, Supplier B for 500+Z*10 Euro. Transport costs for the 40 panels are in either cases 3000 Euro in total, however, only one supplier should be chosen.

The technical specifications for the panels ordered by the new customer are challenging, and SUN 2 assumes based on prior experiences that Supplier A can produce a proper panel with probability of 70%, and Supplier B with probability of 80%. (Remark: if the supplier can produce a single panel with correct specifications, they will be able to produce the whole batch properly for sure.) If a batch did not fulfill the technical specifications, SUN 2 could sell it as regular solar panels at a price of 200 Euro per panel.

For each supplier SUN 2 has the possibility to claim a single panel for test purpose prior the decision which supplier should be chosen. However in case of external panels, SUN 2's internal test procedure indicates deficient panels only with probability (100-(X+1)/2)%, and on the other hand proper solar modules are tested improper with probability (Y+1)%. Cost for testing (purchasing 2 panels, transporting 2 single panels, testing) are 1000+Z*100 Euro.

- Continue with the decision tree drawn at Home Assignment 1 (discussed at class on March 28).
- Use Bayes' Theorem to compute missing a-posteriori probabilities. (In reality, a test panel is deficient or works properly, but you don't know the status of the test panel, when you have to decide. The information that you have, only, is the result of the internal test. With this information you can update given a-priori probabilities 70% (Supplier A) and 80% (Supplier B) for producing a proper panel.)
- Solve the problem by backward recursion.

(Remark: On Thu April 4th, 2019 there is a written exam at the beginning of the class. I will ask you some questions to check if you have browsed the two articles provided at TISS. The learning outcome is to differentiate between model-based approaches and empirical studies.)