

Grade FZ (taken from IE102 Syllabus) – You have to hand in all the homework assignments. Otherwise, you receive an FZ.

IE102 Fall 2019 Homework IX - Due:30.12.19, Monday, 15:00

IMPORTANT: READ BEFORE YOU START WORKING ON THE HOMEWORK

Information on Homework IX

- Homework IX is 1%. Make sure that you review course material before you start. Cite sources used if any.
- Homework assignment will be conducted in groups of 2. We randomly form the groups. You can find your group member and his/her contact information in the e-mail. **If you cannot reach your group member by all means, indicate this on the cover page of your submission.**
- Grading Policy: The grading scale for each question is 2 points (correct), 1 point (partially correct), and 0 (no effort or no submission).
- Academic Dishonesty (taken from IE102 Course Information): **Academic misconduct is not tolerated, and violations will be treated in accordance with the university policy.** For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you actually prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- Submission Information: An assignment submission box will be placed in front of office **EA305** on the morning of the submission date and will be removed at the time of the deadline. You need to put your assignment in the designated box before the submission deadline. **Submission via e-mail is NOT accepted.**

Contact TA Serife Yetiskin if you have questions related to this HW:
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IE102 Fall 2019 HW9

A patient enters the hospital with severe abdominal pains. Based on past experience, Doctor Craig believes there is a 28% chance that the patient has appendicitis and a 72% chance that the patient has nonspecific abdominal pains. Dr. Craig may operate on the patient now or wait 12 hours to gain a more accurate diagnosis. In 12 hours, Dr. Craig will surely know whether the patient has appendicitis. The problem is that in the meantime, the patient's appendix may perforate (if he has appendicitis), thereby making the operation much more dangerous. For each option Dr. Craig has these information:

If Dr. Craig performs surgery now and he finds out that the patient has nonspecific abdominal pains, the patient may recover fully with a probability of 85% or may have the abdominal pain, with the same severity as before, after the operation. If Dr. Craig finds out that the patient indeed has appendicitis, the operative mortality for the surgery is 8%. If the patient survives the operation, the patient may recover fully with a probability of 70% or may have the abdominal pain, with the same severity as before, after the operation.

If Dr. Craig waits for 12 hours, with a probability of 60%, he might find out that the patient surely has nonspecific abdominal pain and does not require surgery. If the patient indeed has appendicitis, after 12 hours of wait, with a probability of 60% he may suffer from perforated appendix. If the patient's appendix perforates, the operative mortality for the surgery becomes as high as 25%, or he may survive with more severe abdominal pain than before. If the patient's appendix is not perforated, the operative mortality for the surgery is 20%. If the patient survives the operation, he may recover fully with a probability of 80% or may have the abdominal pain, with the same severity as before, after the operation.

Using the utilities in the table below, draw the decision tree and calculate expected utilities. Which procedure should Dr. Craig follow?

Perform one-way sensitivity analysis on the utility of "recovery with pain". Answer the questions below. Also provide a graphical solution as in the lecture notes.

- What is the threshold value of the utility of "recovery with pain"?
- What is the expected utility of the corresponding threshold value of the utility of "recovery with pain"?
- When Dr. Craig should prefer waiting over acting immediately?

Possible Outcome	Utility
No surgery	1
Full recovery after surgery	0.8
Recovery with pain	0.55
Recovery with more severe pain	0.4
Operative death	0