
WRITTEN EXAMINATION
“ECommerce”
WINTER TERM 07/08
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PROF. DR. RALF MÖLLER

Name, Student Id:

Name of curriculum:

Signature:

IT IS NOT PERMITTED TO WRITE ON THESE PIECES OF PAPER BEFORE THE START SIGNAL. IN ADDITION, WRITING ON THESE PIECES OF PAPER AFTER THE END SIGNAL WILL HAVE THE EFFECT THAT YOU DO NOT PASS THIS EXAM WITHOUT FURTHER WARNINGS. THIS ALSO APPLIES IF YOU WRITE YOUR NAME AND/OR STUDENT ID AFTER THE END SIGNAL.

Please note:

- 1. Do not open the exam sheets until permitted by the supervisor!**
- 2. Put your student identification card as well as your passport on the table.**
- 3. If you are not registered for the exam, then fill out a proviso, which will be given to you by the supervisor.**
- 4. You have 90 minutes for answering the questions. Additional resources are not allowed.**
- 5. There is sufficient space for your solutions on the examination sheets.**
- 6. If you receive additional pieces of paper from the supervisor, please write your name and student Id also on these pages.**
- 7. If you need to leave the examination room, silently inform the supervisor.**
- 8. The exam is closed book. That means that the only things you are allowed to have on your desk or use during the exam are pens and the exam itself.**
- 9. All phones off. A switched on phone is considered cheating.**
- 10. Cheating will cause you to fail this exam.**

- 1) Give a description of each phase of the “ECommerce Transactions - 4-Phase Model”.
(2 pts)

- 2) Describe the four different agent types explained in the lecture. Also name the main features.
(4 pts)

3) Bayesian networks:

There are a number of E-shops where you can buy and download music and video files (modeled with the random variable FT – file type). Some E-shops have more music, others have more video files. They also have different capabilities in download speed (random variable DS which can be HIGH or LOW) and file quality (random variable FQ which can be HIGH or LOW). The E-shops capability (modeled through the random variable T, Trust in an E-shop, which takes value unsatisfying and satisfying) can be presented in various aspects, such as the download speed, file quality and file type. An agent who wants to download a music file cares about whether E-shop is able to provide the music file with good quality at a fast speed, which involves the E-shop's capabilities in two aspects, quality and speed. How does the agent combine its two separated trusts together, the trust in E-shop's capability in providing music files with good quality and the trust in the file provider's capability in providing a fast download speed, in order to decide if the E-shop is trustworthy or not?

- a. Draw the Bayesian network for the problem. (2 pts)

- b. How can you statistically determine the initial values for the different CPTs? (2 pts)

- c. How can you compute the probability $P(F_T = \text{"Music"} \mid T = \text{"satisfying"})$ given that there were n downloads, m of which were satisfying and m_I downloads were satisfying and music files? (3 pts)
- d. How can you compute which provider to choose if you want to buy a music file and want to maximize your global satisfaction (Trust)? (2 pts)
- e. How can you share your experiences with other trustworthy agents? Describe a model for making the best use of the information you can get from those "agents". (3 pts)

- 4) Dynamic Bayesian Networks can be used to model temporal aspects of e-commerce scenarios like customer behavior in e-shops (e.g., kind of pages that will be accessed next). Within Dynamic Bayesian Networks we have to handle the following problems:
- An unbounded number of conditional probability tables, one for each variable in each time slice,
 - Each one might involve an unbounded number of parents because of the number of time slices
- a. List and explain the assumptions that allow us to overcome those problems.
(5 pts)

- b. Different kind of inference tasks can be formulated for dynamic Bayesian networks. Explain the following terms:

1. Filtering (2 pts)

2. Prediction (2 pts)

3. Smoothing (2 pts)

4. Most likely explanation (2 pts)

- 5) Consider an *automated* negotiation mechanism for phone calls. When you pick up your telephone receiver and dial your call, each of the carriers (AT&T, MCI, ...) responds with a price quote for the call at the moment. The companies are free to offer to carry your call for any price at all. Name and describe a *Mechanism* that ensures that the companies are truth telling/bidding and do not have an incentive to tell wrong prices? (3 pts)

6) **Decision Making with decision trees:**

Arthrodax Company has been approached by Ranger Sound with a rush order offer to purchase 100 units of a customized version of Arthrodax's SoundScreamer audio mixer at \$5,000 per unit, and Arthrodax needs to decide how to respond. The electronic modifications of the standard SoundScreamer needed for this customized version are straightforward, but there will be a fixed cost of \$100,000 to design the modifications and set up for assembly of the customized Sound-Screamers, regardless of the number of units produced. It will cost \$2,000 per unit to manufacture the circuit boards for the units. Since Arthrodax has some short term spare manufacturing capacity, the Ranger offer is potentially attractive. However, the circuit boards for the customized units will not fit into the standard SoundScreamer case, and Arthrodax must decide what to do about acquiring cases for the customized units as it decides whether to accept Ranger's purchase offer. An appropriate case can be purchased at \$500 per case, but Arthrodax could instead purchase an injection molder to make the cases. It will cost \$20,000 to purchase the molder, and there is a 0.6 probability that it will be possible to successfully make the cases using the molder. If the molder does not work, then the purchase price for the molder will be totally lost and Arthrodax must still purchase the cases at \$500 per case. If the molder works, then it will cost \$60 per case to make the cases using the molder. Regardless of which case is used, the cost of assembling the SoundScreamer circuit boards into the case is \$20

(continue your answer on the reverse of this sheet if necessary)

per unit. Unfortunately, there is no way to test the molder without purchasing it. Assume that there is no other use for the molder except to make the cases for the Ranger order.

- a. Draw a decision tree for ArthroDax's decision about whether to accept the Ranger offer and how to acquire the cases for the customized SoundScreamers. (4 pts)

- b. Using expected net profit (expected utility) as the decision criterion, determine the preferred course of action for ArthroDax. (2 pts)

7) **Value of information in decision making:**

In certain situations e-commerce agents have to decide whether to buy a source of information for making a decision or not. This mainly depends on how much worth this information is. In this scenario explain the term “Value of Perfect Information” either by a formula or by giving an example. (2 pts)

- 8) The payoff matrix below shows a *game* between politicians and the Federal Reserve. Politicians can expand or contract fiscal policy, while the Fed can expand or contract monetary policy. And of course either side can choose to do nothing. Each side also has preferences for who should do what—neither side wants to look like the bad guys. The payoffs shown are simply the rank orderings; 9 for first choice through 1 for last choice. Find the Nash equilibrium of the game by applying “Iterated Elimination of Dominated Strategies”. Is this a Pareto optimal solution? (3 pts)

	Fed: contract	Fed: do nothing	Fed: expand
Pol: contract	F=7, P=1	F=9, P=4	F=6, P=6
Pol: do nothing	F=8, P=2	F=5, P=5	F=4, P=9
Pol: expand	F=3, P=3	F=2, P=7	F=1, P=8