



Faculty of Health and Medical Sciences



Exam

Advanced Quantitative Methods in Herd Management

Anders Ringgaard Kristensen & Dan Børge Jensen



Curriculum (pensum): Homepage: Hand-outs

- Jensen, F.V. 2001. *Bayesian Networks and Decision Graphs*, Springer, 2001. **Chapters 1 (p3-28), 2 (p35-62). Section 7.6.** ←
- Jensen, D.B., Hogeveen, H., De Vries, A., 2016. [Bayesian integration of sensor information and a multivariate dynamic linear model for prediction of dairy cow mastitis](#). *Journal of Dairy Science*.
- Kristensen, A.R., E. Jørgensen & N. Toft. 2010. [Herd Management Science I. Basic concepts](#). 2010 Edition, Academic Books, Copenhagen. **Chapters 1-2.**
- Kristensen, A.R., E. Jørgensen & N. Toft. 2010. [Herd Management Science II. Advanced topics](#). 2010 Edition, Academic Books, Copenhagen. **Chapters 6-14 (skip Section 8.5; skip Algorithms 8.3 - 8.10; skip sections 14.7.4, 14.7.5 and 14.11).**
- McAinsh, C.V. & A.R. Kristensen. 2004. [Dynamic modelling of a traditional African chicken production system](#). *Tropical Animal Health and Production* 36, 609-626.
- Kristensen, A.R. & T.A. Søllested. 2004b. [A sow replacement model using Bayesian updating in a three-level hierarchic Markov process II. Optimization model](#). *Livestock Production Science* 87, 25-36.

Procedure

The student show up outside the room at the time indicated under "Hand out of assignment".

An [assignment](#) is drawn at random.

One of the approved [mandatory reports](#) is drawn at random. If 4 reports have been approved, the student is allowed to remove one of them.

The student is given half an hour to prepare.

At the exam, the first 12 minutes are used for the assignment. Afterwards, 10 minutes are used for the report and 8 minutes for deciding on a mark.

Assignment I

Half an hour before examination, an assignment is drawn at random. Basically, the assignment will relate to one of the methods studied during the course, i.e.

- Linear programming
- Bayesian networks
- Monitoring: Control charts for dependent and independent observations (classical methods)
- Monitoring: Dynamic Linear Models
- Markov decision processes
- Decision graphs
- Monte Carlo simulation

Assignment II

The assignment will typically consist of a title and a subtitle.

The title will simply be one of the 7 methods mentioned before.

The subtitle (a certain aspect of the method) is meant to be something that you are supposed to explain more detailed than other aspects of the method.

Assignment III

Example:

Bayesian networks

Conditional independence and d-separation

The assignment should be understood as:

- *Give a general description of Bayesian networks and explain in particular about Conditional independence and d-separation.*

What to do ...

Having drawn an assignment you are supposed to (some items below may not be relevant to all methods):

- Define/describe describe the method as detailed as you can.
- Describe what the method basically is used for (for instance by classifying it in the "Data -> Processing -> Information -> Processing -> Decision" diagram).
- Classify the method according to general model concepts like static/dynamic, stochastic/deterministic
- Describe how different kinds of knowledge is handled by the method (here Chapters 6 & 9 of the textbook [Herd Management Science](#) may be of help to you).
- Describe what kind of data/decisions the method is particularly well suited for.
- Explain strengths and weaknesses of the method.
- Give examples of applications (if any).
- Describe the aspect mentioned as subtitle.

You have 12 minutes for this. If you don't use all 12 minutes (or if we want you to elaborate further on certain aspects) we will ask questions (relating to the assignment).



Mandatory report ...

Half an hour before examination, one of your mandatory reports is drawn at random. At the exam, the last 10 minutes will be used for a discussion of the report. Initially, you are asked to describe the strengths and weaknesses of the method in relation to the problem it is intended to solve. Afterwards, we will ask questions of the following kind:

- Further questions regarding strengths and weaknesses.
- Could the model/method be improved in order to give a better solution?
- Could we use other methods for this problem? Would that be better? Why (not)?
- Explain why the results showed ...

We have 10 minutes for this discussion.

Exam schedule (randomly assigned time slots)

First names	Last name	Hand out of assignment	Examination start
Ashley	Norval	10:00	10:30
Betina	Hammer	10:30	11:00
Emilie	Handberg	11:00	11:30
Anja	Madsen	13:00	13:30
Anita	Nielsen	13:30	14:00
Thomas	Nielsen	14:00	14:30