



Danish Informatics Network in
the Agricultural Sciences

Dansk Informatiknet i
Jordbrugsvidenskaberne

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Workshop: Dataseries, state-space models, and the Kalman filter.

Workshop for PhD students

Koldkærgaard Landboskole, April 18-19 2002.

Invitation

With modern sensor technologies very large dataseries (e.g. time series) become available. For instance within animal production, data from water and feed consumption, milk production, activity, and automatic weighing are used in some herds. Within plant production, local climate registrations, e.g. temperature and precipitation data as well as data from remote sensing of crops will be used for decision support. Such dataseries call for flexible methods of modelling and efficient methods for computation. This workshop will focus on recent approaches to modelling based on state-space models and computational methods like the Kalman filter and its extensions.

A fundamental characteristic of a state-space model is the presence of an underlying unobserved latent process whose value at each time point influences the observed value in the dataseries. Such latent processes may represent physiological states such as disease, oestrous and feed motivation, or in plant production the presence of disease or pest in the crop. We shall discuss linear Gaussian state-space models but also consider new non-linear and non-Gaussian models.

The Kalman filter is an efficient algorithm for assessment of the values of the latent process and for online updating as new observations become available. This for instance has applications for monitoring where a drastic change in the latent process may call for intervention of some sort.

The workshop will consist of lectures on methodology and case studies with examples of applications of the methodology. The lectures will be accompanied by computer exercises where the workshop participants can get a hands on experience with the methodology.

The workshop is aiming at

- Ph.D.-students in the agricultural and biological sciences whose work involves dataseries of some form and who are interested in learning about modern approaches to modelling and computation for dataseries.
- Ph.D.-students with a background in mathematics, computer science, or engineering who are interested in learning more about the applications in the biological sciences.

The DINA Research School is part of a Nordic cooperation. The workshop language will be English unless all participants have Danish as the first language.

We are looking forward to seeing you at Koldkærgård Landboskole!

Erik Jørgensen
Dina Research School

url: <http://www.dina.dk/phd/w/w10/>

**Workshop: Dataseries, state-space models, and the Kalman filter.
Preliminary Program**

Thursday, April 18

- 11.00 Arrival and accomodation.
12.00 Lunch
- 13.00 **Introduction and presentation of participants**
Erik Jørgensen, Dina Research School.
- 13.15 **Theory session I: Modelling of dataseries.**
Søren Lundbye-Christensen, Aalborg University.
- 14.00 Break.
- 14.15 **Theory session II: Estimation and prediction using the Kalman filter**
Søren Lundbye-Christensen, Aalborg University.
- 15.00 Coffee break.
- 15.30 **Computer exercises.**
- 17.00 **Theory session III: Approaches to monitoring.**
Susanne Gammelgaard Bøttcher, Aalborg University.
- 17.45 Dinner.
- 19.00 **Theory session IV: Recent trends in state-space modelling.**
Søren Lundbye-Christensen, Aalborg University
- 19.45 **Computer exercises (continued).**
- 21.45 Coffee and sandwich.

Friday, April 19

7.30 Breakfast.

8.30 **Discussion of computer exercises.**

9.00 **Case I: Applications of state-space models in data analysis.**

Flemming Skjøth, The Agricultural Advisory Centre.

9.45 Coffee Break.

10.00 **Case II: Monitoring water consumption of growing pigs.**

Thomas Nejsum Madsen, Danish Bacon and Meat Council

10.45 Break.

11.00 **Case III: Time series data - a nuisance or the whole story? personal experience**

Nic Friggins, Danish Institute of Agricultural Sciences, Foulum.

11.30 **Discussion and Closing.**

Erik Jørgensen, Dina Research School.

12.00 Lunch and departure.

Practical information

Time From Thursday noon, April 18, till Friday 1 pm, April 19, 2002.

Venue Koldkærgård Landboskole. Udkærvej 10, Skejby 8200, Århus N, Telefon 86 78 54 55, Telefax 86 78 54 70. Refer to the travel information on the web-page.

Accommodation Single rooms with shower and WC.

Board Full board starting with lunch on April 18 and ending with lunch on April 19.

Price The Dina Research School pays for participation including accommodation and meals. Travel costs are paid by the Department of the PhD student (except for accepted Nordic participants where NorFA covers the travel costs). Other participants pay directly to Koldkærgård (approximately 1300 DKK)

Target group Ph.D. students whose projects are based on a problem from the agricultural or biological sciences no matter whether the student has a background in biological or informatics science. Others may attend at their own cost.

Conditions for participation Active participation in discussions and exercises is expected.

Further information Dina Research School, Erik Jørgensen, is available for further information. Use e-mail: Erik.Jorgensen@agrsci.dk

Registration Send an e-mail to the research school with information about name, address and whether or not you are a PhD student.

Deadline for registration As soon as possible and no later than April 1, 2002.

Experts of the Dina Research School

Computer Science:	Peter Sestoft, Department of Mathematics and Physics, KVL
Statistics:	Rasmus Waagepetersen Department of Mathematical Sciences, AAU
Numerical science:	Per Grove Thomsen, Informatics and Math. Modeling, DTU