

Data-analysis and Inverse Methods in Astronomy, spring 2014

Course page for Data-analysis and Inverse Methods in Astronomy (DAIM) — Tähtitieteen data-analyysi ja inversiomenetelmät

Advanced Course, 8 credits, 53834, Spring 2014, Periods 3 and 4

Course is held in Physicum, Wednesdays at 10-12 in D117. Exercise sessions will be held Mondays at 10-12 in D211.

Lecturers: Antti Penttilä and Heikki Haario, course assistant: Olli Wilkman. You can contact us by e-mail, Antti.I.Penttila (a t) helsinki.fi or Olli.Wilkman (a t) helsinki.fi, or you can come and visit us, room D308 in Physicum.

Lectures and schedule

- 22.1. 10-12, D117. First meeting. Practicalities, random variable, descriptive statistics, distributions, statistical plots
- 29.1. 10-12, D117. First exercise session
- 05.2. 10-12, D117. Statistical inference
- 12.2. 10-12, D117. Linear model, introduction
- 19.2. 10-12, D117. Linear model, diagnostics
- 26.2. 10-12, D117. Nonlinear model, kernel estimation, spline regression
- 12.3. 10-12, D117. Multivariate methods, multivariate distributions, principle component analysis
- 19.3. 10-12, D117. Bayesian inference
- 26.3. 10-12, D117. Monte Carlo - sampling, bootstrap, jackknife, cross-validation
- 10.4. 08-12, D211. MCMC
- 11.4. 10-14, D211. MCMC

Course material

The material is collected to handout that will be completed during the course. Latest versions of the handout chapters are distributed here, but note that they may change.

Handout by A. Penttilä:

1. [Introduction \(exercises\)](#)
2. [Statistical inference \(exercises\)](#)
3. [Linear model \(exercises\)](#)
4. [Nonlinear model](#)
5. [Nonparametric regression and distribution estimation \(exercises\)](#)
6. [Multivariate methods \(exercises\)](#)
7. [Bayesian inference \(exercises\)](#)
8. [Monte Carlo methods \(exercises\)](#)
9. [Appendix](#)

Complete handout in one file: [DAIM2014](#)

Material by H. Haario: MCMC [lecture notes](#) and [slides](#)

Exercise sessions

- 27.1. 10-12, D211. Lecture on chapter 1 continued
- 03.2. 10-12, D211. Lecture on chapter 2
- 10.2. 10-12, D211. Exercises 2
- 24.2. 10-12, D211. Exercises 3
- 10.3. 10-12, D211. Exercises 4
- 17.3. 10-12, D211. Exercises 5
- 24.3. 10-12, D211. Exercises 6
- 31.3. 10-12, D211. Exercises 7

Supplementary data: [two-variable.dat](#), [linear-model-data-1.dat](#), [linear-model-data-2a.dat](#), [linear-model-data-2b.dat](#), [linear-model-data-3.dat](#), [dataRed.dat](#), [asteroid_density.dat](#), [MN-data-1.dat](#), [MN-data-2.dat](#), [MN-data-3.dat](#), [spectra.dat](#)

Previous courses

- [DAIM in spring 2012](#)
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Recently Updated

[Statistical Inverse Methods, spring 2019](#)

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