

PAP303 Statistical Inverse Methods

HUOMI! OPINTOJAKSOJEN TIETOJEN TÄYTTÄMISTÄ KOORDINOIVAT KOULUTUSSUUNNITTELIJAT HANNA-MARI PEURALA JA TIINA HASARI

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 - 2. Course code
 - 3. Course status: compulsory or optional
 - 4. Course level (first-, second-, third-cycle/EQF levels 6, 7 and 8)
 - 5. Recommended time/stage of studies for completion
 - 6. Term/teaching period when the course will be offered
 - 7. Scope of the course in credits
 - 8. Teacher coordinating the course
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 - 16. Assessment practices and criteria, grading scale

1. Course title

Tilastolliset inversiomenetelmät
Statistisk inversion metoder
Statistical Inverse Methods

2. Course code

PAP303

Previous codes: 53834 Tilastolliset inversiomenetelmät, 5 cr

3. Course status: compulsory

-Which degree programme is responsible for the course?
Master's Programme in Particle Physics and Astrophysical Sciences

-Which module does the course belong to?
PAP300 Advanced Studies in Particle Physics and Astrophysical Sciences (compulsory for Study Track in Astrophysical Sciences)
ATM300 Advanced Studies in Atmospheric Sciences (optional for Study Track in Meteorology)

-Is the course available to students from other degree programmes?
Yes

4. Course level (first-, second-, third-cycle/EQF levels 6, 7 and 8)

Master's level, degree programmes in medicine, dentistry and veterinary medicine = secondcycle degree/EQF level 7
Doctoral level = third-cycle (doctoral) degree/EQF level 8

-Does the course belong to basic, intermediate or advanced studies (cf. Government Decree on University Degrees)?
Advanced studies

5. Recommended time/stage of studies for completion

Recommended time for completion is in the mid-phase of Master's studies.

6. Term/teaching period when the course will be offered

Annually in the spring term, periods 3–4.

7. Scope of the course in credits

5 cr

8. Teacher coordinating the course

University researcher Antti Penttilä.

9. Course learning outcomes

You will learn

- Advanced statistical methods to describe and analyze research data
- Theory and practice of statistical estimation and testing
- Multivariate methods
- Monte Carlo statistical techniques
- Bayesian inference
- Statistical inversion using Markov Chain Monte Carlo methods

10. Course completion methods

The student must complete weekly exercise tasks, which will include traditional 'pen-and-paper' problems and computer tasks. There will be final exam in the end of the course.

11. Prerequisites

MAPU I–III, Scientific Computing I, Havaintojen tilastollinen käsittely

12. Recommended optional studies

Scientif Computing II

13. Course content

Statistical inference, linear model, nonlinear model, kernel estimation, multivariate methods, Bayesian inference, Monte Carlo methods, MCMC.

14. Recommended and required literature

The material is collected to handout that is distributed to students.

15. Activities and teaching methods in support of learning

Weekly lectures and exercises.

16. Assessment practices and criteria, grading scale

Final grade is based on exercises and final exam.

17. Teaching language

English, optionally Finnish