



DEPARTMENT OF MATHEMATICAL SCIENCES

MSA301 Spatial Statistics and Image Analysis, 7.5 credits

Spatial statistik och bildanalys, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2018-02-09 to be valid from 2018-02-09, spring semester of 2018.

Field of education: Science 100%

Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programmes: 1) Mathematical Sciences, Master's Programme (N2MAT) and 2) Bachelor's Programme in Mathematics (N1MAT)

Main field of studies

Mathematical Statistics

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

Knowledge corresponding to the courses *MSG110 Probability Theory* and *MSG800 Basic Stochastic Processes*.

Learning outcomes

On successful completion of the course the student will be able to:

- Perform basic image processing, including filtering and noise reduction.
- Identify and describe stochastic models and methods for problems in spatial statistics and image analysis.
- Implement computer programs for solving statistical problems in image analysis with a given method.

- Report motivations, approaches and conclusions when solving a given statistical problem, both in writing and orally.
- Suggest and analyze stochastic models for problems in spatial statistics and image analysis.

Course content

The aim of the course is to provide basic knowledge of models and methods with practical applications in spatial statistics and image analysis.

Topics covered by the course are:

- Basic methods of filtering and pattern recognition in images.
- Statistical methods for classification and reconstruction.
- Stochastic fields, Gaussian fields, Markov fields, Gaussian Markov random fields, and point processes.
- Covariance functions, kriging, and simulation methods for stochastic inference.
- Applications to climate, environmental statistics, remote sensing, microscopy, photography, and medical imaging.

Form of teaching

Lectures and computer exercises where MATLAB or R is used. An important part of the course is project work that is presented in a project report and at a seminar.

Language of instruction: English

Assessment

The assessment is based on a written exam and project work.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

At the end of the course the students will be asked to answer a questionnaire. The results of the evaluation and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.