GÖTEBORG UNIVERSITY **COURSE PLAN MSA300**
Faculty of Sciences
Mathematical Sciences

MSA300, STATISTICAL IMAGE ANALYSIS, 7.5 credit points

Level: advanced

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1. Authorization

The course plan has been authorized by the vice-dean of the Department of Mathematical Sciences on November 9, 2006, to be valid from July 1, 2007.

Educational field: Mathematical Sciences

2. Educational context

The course is part of the Master Program in Mathematical Sciences. It is also open for students outside these program who meet the course prerequisites.

3. Prerequisites

The student is supposed to have completed a basic course in mathematical statistics worth of 7.5 credit points.

4. Goals and learning outcomes

After finishing the course, the student should
- have experience with image acquisition and basic image processing,
- be able to understand how to use statistical image analysis techniques including methods for pattern recognition
- have competence of applying statistical modeling to image analysis, including the use of models for point patterns and spatial correlation.

5. Course description

Digital image processing and analysis of information in images are methods that become increasingly important in many technical and scientific fields, including almost all biological sciences. The aim of the course is to provide a basic knowledge of how to use probabilistic and statistical methods for image analysis.

Methods for acquiring, showing, filtering and segmentation of images are briefly covered in the first part of the course, including methods for performing quantitative measurements in images.

Core subjects in the course are pattern recognition and spatial statistics applied to images. In pattern recognition we study methods for discrimination between classes of objects characterized by suitably chosen features. Spatial statistical models are used for describing point patterns, spatial correlation and the shape and structure of objects in two and three dimensions.

Examples are taken from remote sensing, microscopy, photography, medical imaging and fingerprint analysis. In the course special interest will be devoted to applications in bioinformatics, including analysis of images of microarrays for comparing DNA expression levels and images of two-dimensional electrophoresis gels for studying proteins.

Practical computer work is included, typically using Matlab. An important part of the course is to carry through a project in a small group, presenting the results at a seminar and writing a project report.

6. Literature

See separate list and the course homepage.

7. Assessment

The assessment is based both on a written final examination and the project report.

8. Grades

The grade levels are Fail (U), Pass (G), and High Pass (VG). A wish for an ECTS grade should be reported to the examiner at the beginning of the course.

9. Course evaluation

In the middle and at the end of the course the teacher arranges an oral feedback discussion with the students.

There may also be a questionnaire for the students to answer. The results of the questionnaire will be processed by the lecturer together with student representatives.

10. Additional information