Visual Object Recognition and Detection

Programme course

6 credits

Visuell detektion och igenkänning

TSBB17

Valid from: 2017 Spring semester

Determined by
Board of Studies for Computer Science and Media Technology

Date determined
2017-01-25

Replaced by
TSBB19

Main field of study
Computer Science and Engineering

Course level
Second cycle

Advancement level
A1X

Course offered for
- Computer Science and Engineering, M Sc in Engineering
- Information Technology, M Sc in Engineering
- Computer Science and Software Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Basic image processing: thresholding, segmentation, edge detection from for example Signals, Information and Images or Digital Image Processing. Use of Matlab. Probability Theory and Statistics.

Intended learning outcomes
After the course the students should be able to:
- identify basic terminologies, theories and methods for recognition and detection of objects in images
- understand current approaches for object recognition and detection, to actively analyse their strengths and weaknesses
- develop, experimentally evaluate different recognition/detection algorithms and summarize the results
- select appropriate methods for automatic training of recognition and detection systems
- understand basic theories of how the brain processes visual information to perform object recognition and detection tasks

Course content

Invariant local features and feature extraction in digital images, bag-of-features framework, principles of object recognition and detection, local spatial constraints, introduction to convolutional neural networks, support vector machines learning, shape descriptors and matching, part-based models for recognition, the role of context in recognition, overview of object recognition in biological systems and deep features.

Teaching and working methods

The course consists of two parts that are presented in parallel. One part is more theoretical and is based on a larger number of lectures that present and illustrate basic methods for object recognition and detection. This part concludes with a written examination. The other part is more practical and begins with an introduction to two projects: one in the area of object recognition and the other in the area of object detection. The course participants are divided into small groups, and each group carries out both these applied projects, which shall demonstrate a number of methods presented in the theoretical part of the course. The results from each project group are presented orally at seminars and are documented in reports. Guidance for the projects is only given during the course semester. Each project is concluded by an analysis and reflection of the project work.

Examination

PRA1	Oral and written presentation of project assignment	3 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Course literature

There is no required textbook for the course. Material will be handed out or made available on the course web page. We will obtain most of our content from the papers we read. Further, Steve Palmer's Vision Science, Richard Szeliski's Computer Vision: Algorithms and Applications, and Forsyth and Ponce's Computer vision: A Modern Approach have useful source material.

Department

Institutionen för systemteknik

Director of Studies or equivalent
Klas Nordberg

Examiner
Fahad Khan

Education components
Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.