# DEPARTMENT OF PHILOSOPHY, LINGUISTICS AND THEORY OF SCIENCE

## Machine Learning Methods For Vision and Language (ML-V&L), 7.5 higher education credits

Maskininlärningsmetoder för datorseende och språkteknologi, 7.5 högskolepoäng

*Third Cycle/Forskarnivå*

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### Confirmation

The course syllabus was confirmed by the Department of Philosophy, Linguistics and Theory of Science on ÅÅÅÅ-MM-DD to be valid from ÅÅÅÅ-MM-DD.

### Entry requirements

General and specific entry requirements for third-cycle education according to Admissions Regulations and the General Syllabus [allmän studieplan] for Computational Linguistics.

Students are expected to have a knowledge of (i) practical programming, for example in Python, (ii) natural language processing, and (iii) machine/deep learning, or equivalent.

### Learning outcomes

After completion of the course the doctoral student is expected to be able to:

*Knowledge and understanding*
- demonstrate enhanced knowledge and understanding of the subject areas of the course,
- discuss in detail key theories, methods and issues in one or more of the subject areas of the course,

*Skills and abilities*
- offer a detailed analysis of issues, lines of arguments or methods from the literature,
- select and define issues, lines of arguments or methods from the literature that are suitable for a short critical essay or a conference paper,
- develop new practical implementations, either original or variations of implementations from technical literature,

*Judgement and approach*
- critically discuss, orally or in writing, questions, lines of arguments or methods that are used in the literature,
- critically assess the validity of the studied lines of argument.

## Course content

The course focuses on machine learning/deep learning models and techniques such as Recurrent Neural Networks (RNNs), Long-Short Term Memory Networks (LSTMs), Convolutional Neural Networks (ConvNets), Neural Auto-Encoders, Memory Networks, and others applied to computational modeling of natural language and images, and other sensory information. Theoretically, it examines how machine learning approaches address topics such as multi-modal grounded representations of meaning, representing and resolving semantic ambiguity, attention and salience, perception and dialogue interaction, natural language interpretation, natural language generation, natural language reasoning and inference, and collection of perceptual and linguistic data. Practically, the course overviews contemporary computer vision and natural language processing tasks such as generating image and video descriptions, visual question answering, image retrieval using text queries, aligning images and text in large data collections, image generation from textual descriptions, and others.

## Teaching format

The course is organised as individual reading or programming assignments that are followed by a discussion with a teacher.

*Primary language of instruction:*
English and Swedish

## Assessment

In order to pass the course, a student is expected to (i) complete reading or programming assignments and summarise each in a written report or commented code, (ii) discuss the assignments with a teacher, and (iii) complete a course project with a written report, which should be suitable for a conference/workshop paper.

## Grades

The grading scale comprises Pass (G) or Fail (U).

## Course evaluation

The course is evaluated either with a written questionnaire or oral feedback.

## Additional information

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Bibliography is appended.

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