**JÖNKÖPING UNIVERSITY**
*School of Engineering*

COURSE SYLLABUS
# State-of-the-Art in AI Research, 7.5 credits

*Spetsforskning inom AI teknik, 7,5 högskolepoäng*

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|---|---|---|---|
| **Course Code:** | TSFS22 | **Education Cycle:** | Second-cycle level |
| **Confirmed by:** | Dean Mar 1, 2022 | **Disciplinary domain:** | Technology |
| **Revised by:** | Director of Education Nov 28, 2024 | **Subject group:** | DT1 |
| **Valid From:** | Aug 1, 2025 | **Specialised in:** | A1F |
| **Version:** | 2 | **Main field of study:** | Computer Science |

## Intended Learning Outcomes (ILO)

After a successful course, the student shall

Knowledge and understanding
- show familiarity with top conferences and journals in AI and machine learning research
- display knowledge of novel methods, trends and challenges related to AI and machine learning that are of interest to the research community
- demonstrate comprehension of how to apply recent AI and machine learning methods to different kinds of problems

Skills and abilities
- demonstrate the ability to search for literature outlining the state-of-the-art within AI and machine learning
- demonstrate the ability to analyse, present and critically review recent AI scientific work
- demonstrate the ability to produce a draft version of a scientific publication

Judgement and approach
- demonstrate an understanding of critical thinking by critically assessing scientific papers in relevant areas of AI

## Contents

The course goes into depth in terms of selected topics and methods within AI, machine learning and their applications. Examples may include areas, such as computational intelligence algorithms in search, optimization and classification, natural language processing and FAT (fairness, accountability, transparency) aspects. Examples of relevant applications could include robotics, music, health and medicine.

The course is an advanced course in state-of-the-art research in the field of AI engineering. The course covers advanced research and recent trends in the field, alternating theory with practice. After completing the course, the student shall have acquired a broad knowledge of state-of-the-art research in the field of AI engineering. Specifically, the student should be familiar with state-of-

the-art research and trends in the field, advantages and challenges of AI, areas in need of further research, and be able to evaluate and criticize a subset of the research topics covered.

The course includes the following elements:
- Introduction to recent trends the field, alternating theory and practice
- Introduction to theory and methods within AI
- Introduction to challenges of AI
- Introduction to the advantage of AI

## Type of instruction

The teaching in the course consists mainly of lectures, discussion seminars and tutoring. The course content is based on contemporary developments in the AI field and presented by the course manager, members of the Jönköping AI Laboratory research group, invited guest speakers or the participants.

The teaching is conducted in English.

## Prerequisites

Passed courses at least 90 credits within the major subject Computer Engineering, Computer Science, Electrical Engineering (with relevant courses in Computer Engineering), or equivalent, or passed courses at least 150 credits from the programme Computer Science and Engineering, and completed course Data Science Programming, 7,5 credits or equivalent. Proof of English proficiency is required.

## Examination and grades

The course is graded 5,4,3 or Fail.

The examination consists of active participation in the discussion seminars, a presentation by the participants on a relevant state-of-the-art topic within the AI and machine learning domain, and a research project including the preparation of a draft paper. In order to pass the course and receive a final grade, a passing grade (pass or at least 3) is required for all examination components. The final grade is based on the research project with the associated draft paper.

Registration of examination:

| Name of the Test | Value | Grading |
|---|---|---|
| Project[I] | 2.5 credits | 5/4/3/U |
| Discussion Seminars | 2.5 credits | U/G |
| Final Seminar | 2.5 credits | U/G |

[I] Determines the final grade of the course, which is issued only when all course units have been passed.

## Course literature

Literature
The literature list for the course will be provided 8 weeks before the course starts.

Compulsory readings may include books, book chapters or journal/magazine/conference articles.