AH2179 Applied Artificial Intelligence in Transportation 7.5 credits

Tillämpad artificiell intelligens inom transportsektorn

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The course syllabus is valid from Autumn 2024 according to decision of the Director of First and Second Cycle Education: A-2024-0867

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

The Built Environment

Specific prerequisites

Degree of Bachelor or equivalent in societal building, geography, engineering physics, computer science, statistics, finance or mathematics.

Documented knowledge in linear algebra, equivalent contents in the course SF1672 and probability theory and statistics, 3 credits equivalent to contents in the course SF1918, 3 credits or equivalent knowledge be approved by the examiner

And English B according to the Swedish upper secondary school system.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The main goal of the course is to introduce models and algorithms for artificial intelligence (AI) and provide in-depth knowledge of how one uses them to analyse, model and optimise transport systems. The course is both theoretical and applied and the aim is to educate the students in research and practical skills in applying advanced AI technician to diagnose and solve complex transport problems.

On completion of the course, the student should be able to

- Describe and explain AI concept, models, algorithms and underlying ideas.
- Identify and apply AI framework to model transport problems.
- Collect and process open source transport data.
- Implement AI algorithms by means of programming language (e.g. Python).

Interpret the model results and reflect on the limitations of the methodology.

Course contents

Applied AI in transportation is the art of using AI to solve transportation problems. It involves using the different AI concepts and developing different programs, applications and software that solve real-world problems. It is a combination of interdisciplinary expertise in subject areas such as transportation/urban planning, mathematics/statistics, and computer science/IT.

The course content is structured around models/algorithms, practical Python exercises, and real projects in transportation: AI models and learning algorithms, tutorials on Python implementation using TensorFlow, and AI applications in transportation projects.

During AI models and learning algorithms, you will learn: Conventional machine learning models (supervised and unsupervised learning, such as regression, classification, text mining, clustering, and PCA), deep learning models (such as neural networks, convolutional neural networks, transfer learning), and reinforcement learning models (such as deep Q learning).

During the training sessions you will have: Two hours of practical training with two parts. Part I - Instructed tutorial to illustrate learned algorithms in the lecture (data and code provided). Part II - Individual practice and Q&A with the teaching assistants to solve the practice tasks.

During AI applications in transportation projects, we will present real projects and share our experiences/lessons on using AI in practice. For example, optimization (robust scheduling), prediction (real-time prediction in public transport), and inference (estimation of traffic conditions).

Examination

- INL1 - Hand-in assignments, 1.5 credits, grading scale: P, F
- SEM1 - Seminars, 1.5 credits, grading scale: P, F
- PRO1 - Project work, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

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Other requirements for final grade

Students must be actively participating in the seminar to pass the course.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.