CIVIL-459

Data and artificial intelligence for transportation

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Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Data science and Artificial Intelligence (AI) are poised to reshape the transportation industry with self-driving cars, delivery robots, self-moving segways, or smart terminals. In this course, students will learn the fundamentals behind these AI-driven systems.

Content

1. Introduction to AI-driven systems
2. Sensing modalities and data in transportation systems
3. Perceiving: how to extract meaningful information from raw data?
   - Intro to machine learning (fundamentals to regression and classification)
   - Intro to deep learning (Neural Network, CNN, regularization techniques)
   - State-of-the-art techniques for localisation, detection, and tracking objects in the context of self-driving cars and smart terminals.
4- Predictive models
   - Intro to Recurrent Neural Networks
   - Learning to clone socially-accepted human behavior in the context of self-moving segways
5- Acting: challenges and ethical impacts of intelligent transportation systems

The course is case-study based using real data. Students will implement in groups projects in computer vision, robotic controls, localization, path planning, and more. The projects involve parameter tuning and experimentation.

Keywords

Intelligent Transportation System, Artificial intelligence, Machine learning, Self-driving car

Learning Prerequisites

Required courses

Concepts importants à maitriser : Fundamentals in Analysis, Linear algebra, Probability and Statistics.Programming skills (although an introductory class to python will be given).

Learning Outcomes

By the end of the course, the student must be able to:

- Define the fundamental steps behind an AI-driven system
- Design the building steps of a self-driving car, a self-moving segway and a smart terminal
- Implement an algoritm for each step

- Explain and understand the challenges and ethical impacts of intelligent transportation systems

Assessment methods

Lab projects (in group): 30%
Midterm: 30%
Final project (in group): 40%