EPFL

CIVIL-459	**Deep learning for autonomous vehicles**

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Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA2, MA4	Opt.

Language of teaching	English
Credits	6
Session	Summer
Semester	Spring
Exam	During the semester
Workload	180h
Weeks	14
Hours	**6 weekly**
Courses	2 weekly
Exercises	4 weekly
Number of positions	

Summary

Self-driving cars, delivery robots, or self-moving segways. Most of these AI-driven transportation systems rely on four pillars: 1-Sensing, 2-Perceiving, 3-Predicting, and 4-Acting steps. Students will learn the fundamentals behind these four pillars, i.e., the technology behind autonomous vehicles.

Content

Introduction to AI-driven systems
2. Sensing modalities
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 autonomous vehicles.
4- Predictive models
    - Intro to Recurrent Neural Networks
    - Learning to clone socially-accepted human behavior
5- Acting: challenges and ethical impacts

Students will implement perception tasks for autonomous vehicles and participate to a human-robot tandem race.

Keywords

Deep Learning, Autonomous Vehicle, Artificial intelligence, Machine learning, Self-driving car

Learning Prerequisites

Required courses

Fundamentals in Analysis, Linear algebra, Probability and Statistics.
Programming skills.

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 an autonomous vehicle

• Implement an algorithm for each step

• Explain and understand the challenges and ethical impacts

Teaching methods

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Assessment methods

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

Prerequisite for

"Le contenu de cette fiche de cours est susceptible d'être modifié en raison du covid-19"