**EPFL**

CIVIL-332     **Data Science for infrastructure condition monitoring**

Fink Olga

| Cursus | Sem. | Type |
|---|---|---|
| Civil Engineering | BA6 | Opt. |
| HES - GC | E | Obl. |

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|---|---|
| Language of teaching | English |
| Credits | 3 |
| Session | Summer |
| Semester | Spring |
| Exam | During the semester |
| Workload | 90h |
| Weeks | 14 |
| **Hours** | **3 weekly** |
| Lecture | 2 weekly |
| Exercises | 1 weekly |
| **Number of positions** | |

## Summary

The course will cover the relevant steps of data-driven infrastructure condition monitoring, starting from data acquisition, going through the steps pre-processing of real data, feature engineering to developing suitable machine learning algorithms.

## Content

Monitoring the condition of infrastructure systems is critical to assessing their health state and for deciding about the optimal mitigation and maintenance actions.
Different types of data can be collected on the infrastructure system condition, including vision-based data and (distributed) acoustic and vibration monitoring.
Data collected under real conditions is facing different challenges that need to be taken into account when pre-processing the data and developing the corresponding algorithms.
The course aims to cover the chain from data collection, pre-processing, feature engineering to developing machine learning algorithms that enable the detection of anomalous conditions.
Specific topics include:
-Condition monitoring data collection (including vision-based and (distributed) acoustic-based)
-Pre-processing of collected data
-Feature engineering (including feature extraction and feature selection)
-Machine learning algorithms for anomaly detection
-Classification-based machine learning algorithms

## Keywords

- infrastructure condition monitoring
- Feature engineering
- signal processing
- anomaly detection
- machine learning

## Learning Prerequisites

### Required courses

Mandatory pre-requisite course: Introduction to machine learning for engineers or other machine learning courses

**Learning Outcomes**

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

- Assess / Evaluate the main challenges of collecting and processing real condition monitoring data
- Apply different machine learning algorithms for anomaly detection
- Apply classification-based machine learning algorithms for assessing the health condition
- Interpret the results of the algorithms

**Teaching methods**

Lectures, excercises

**Assessment methods**

Performance will be assessed during the semester based on
-3 exercises, requiring the students to perform defined sub-tasks for designing Data Science approaches for infrastructure condition monitoring

**Supervision**

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|---|---|
| Office hours | Yes |
| Assistants | Yes |
| Forum | Yes |

**Resources**

**Moodle Link**

- https://go.epfl.ch/CIVIL-332