

MICRO-455

Applied machine learning

Billard Aude

Cursus	Sem.	Type
Civil & Environmental Engineering		Opt.
Data and Internet of Things minor	H	Opt.
Electrical and Electronical Engineering	MA1, MA3	Opt.
Energy Science and Technology	MA1, MA3	Opt.
Financial engineering	MA1, MA3	Opt.
Microtechnics	MA1, MA3	Obl.
Mineur STAS Chine	H	Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA1, MA3	Obl.
Systems Engineering minor	H	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	4 weekly
Courses	4 weekly
Number of positions	300

Summary

Real-world engineering applications must cope with a large dataset of dynamic variables, which cannot be well approximated by classical or deterministic models. This course gives an overview of methods from Machine Learning for the analysis of non-linear, highly noisy and multi dimensional data

Content

Because machine Learning can only be understood through practice, by using the algorithms, the course is accompanied with practicals during which students test a variety of machine learning algorithm with *real world data*. The courses uses matlab libraries for machine learning, as well as the MLDEMOS TOOLBOX that entails a large variety of Machine Learning algorithms.

- Binary and multi-class classifiers: LDA, GMM with Bayes, SVM, Boosting, etc.
- Pattern recognition and clustering
- Non-linear Regression
- Markov-Based Techniques for Time Series Analysis

Keywords

Machine Learning, Statistics

Learning Prerequisites**Required courses**

Linear Algebra, Probability & Statistics

Important concepts to start the course

Linear Algebra: Eigenvalue and singular value decomposition

Statistics: Definitions of probability density function, marginal, likelihood, covariance, correlation

Optimization: Lagrange multipliers, gradient descent, local and global optima

Teaching methods

Ex-cathedra, exercises, computer-based practical sessions

Expected student activities

Students who are no longer up to date with the pre-requisites should work on these in parallel to taking the class. Students are expected to attend the exercise sessions and the computer-based practice sessions. They should revise the class notes prior to going to practical session to be on top of the theoretical material prior to applying it.

Assessment methods

Final written exam (100% grade), in-class assessment through a quiz (0% grade).

Resources**Notes/Handbook**

Machine Learning Techniques, available at the Librairie Polytechnique. To be purchased before the class starts.

Prerequisite for

Advanced Machine Learning, spring semester